

# **What determines sharing behaviour on P2P networks?**

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## **Abstract**

Peer-to-peer (P2P) file-sharing networks allow individuals to swap computer files with one another over the internet. However, whilst network users can take files from the network with no restriction they are not compelled to offer files. This makes P2P networks somewhat akin to voluntarily provided public goods. Further, as offering files is costly in terms of computer and network resources, and due to the threat of prosecution by media industries, the selfish economic model predicts that nobody will offer files. This prediction is refuted by the scale of present day networks. In addition, it is observed that, out of the users who share files, some users share vastly more than others. Hence, this project seeks to discover why users share at all, and also why some users share disproportional amounts. A survey is carried out and theories of moral norms, social norms and reciprocity are tested. It is found that familiarity with the network is necessary before a user becomes a free-rider or an active sharer, and that, whilst network incentives are also important, active sharers are morally motivated whilst free-riders tend to lack such norms. Heavy sharing is also morally motivated but is also linked to lower sharing costs. It is also found that legal concerns can lead to free-riding and reduced sharing.

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*“How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortunes of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it.”*  
Adam Smith

## **1. Introduction**

Peer-to-peer (P2P) is a form of computer network topology that is notoriously associated with the activity known as file-sharing. When joining a file-sharing network<sup>1</sup> individuals are able to share computer files with other users freely, allowing them to gain access to a vast quantity of digital content. Notably, this has provoked anger from the film and record industries as P2P users access and redistribute copyrighted works in great numbers.

The purpose of this project is to investigate why these networks exist at all. When an individual joins a network, they are not compelled to share any files but are able to receive files in an unlimited fashion. This non-excludable feature essentially makes P2P networks voluntarily provided public goods (VPPGs hereafter). Contributing to networks by sharing data is costly not just in terms of computer and network resources but also due to of the threat of prosecution. Therefore, as use is not dependent on sharing, it is economically rational to share nothing, and this strategy pursued by all users would lead to network collapse. This is clearly not the case as the vast scale of present day P2P networks demonstrates.

When looking at users on P2P networks in more detail a variety of behaviour is observed. Some follow the path that economic rationality predicts, and share nothing

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<sup>1</sup> Whilst P2P has many applications other than file-sharing, this essay is concerned only with file-sharing and as such I will use the terms ‘file-sharing network’ and ‘P2P network’ interchangeably.

– the free-riders – and others share small to moderate numbers of files. However, there is also a small group of users that share a disproportionately large number of files – the *heavy sharers*. A study of the Gnutella network by Adar and Huberman (2000) found that the top 1% of sharers accounted for 37% of network content, whilst the top 5% shared 70% of network content (see Table 1.1).

**Table 1.1, Cumulative sharing on the Gnutella Network (Adar and Huberman, 2000)**

<b>The top</b>	<b>Share</b>	<b>As percent of the whole</b>
333 hosts (1%)	1,142,645	37%
1,667 hosts (5%)	2,182,087	70%
3,334 hosts (10%)	2,692,082	87%
5,000 hosts (15%)	2,928,905	94%
6,667 hosts (20%)	3,037,232	98%
8,333 hosts (25%)	3,082,572	99%

Sariou et al (2002) attained similar findings in their studies of the Gnutella and Napster networks:

“We see that as high as 25% of the Gnutella clients do not share any files. Furthermore, about 75% of the clients share 100 files or less, whereas only 7% of the clients share more than 1000 files. A simple calculation reveals that these 7% of users together offer more files than all of the other users combined.”

The behaviour of P2P network users therefore features both extremes – sharing nothing and sharing vast amounts of data. Economic rationality can explain free-

riding but cannot explain why some users share, or why some users feel compelled to share so much. Different theories are required and these are explored and tested in this project. Specifically, this project asks:

1. Why do some users share?
2. Why do some users share much more than others?

It is also hoped that the project will contribute to the ‘real world’ evidence in the VPPG field - currently dominated by experimental empirical work.

The remainder of this project is set out as follows. Section 2 examines relevant literature and introduces various rationales for voluntary contributions to public goods with regard to the P2P network setting. Section 3 introduces a survey of P2P users undertaken to try to provide evidence of various rationales and Section 4 analyses and discusses the results. Finally, Section 5 concludes.

## 2. Rationales for Sharing

### 2.1 Rational Sharing

The simplest explanation of sharing is that users are rationally responding to incentives. For instance, software that connects to P2P networks (network clients) automatically shares any file that the user has taken from the network. Whilst it is trivial to prevent this process and free-ride, users may either be unaware of it or feel the costs associated with this ‘default’ form of sharing are not high enough for them to expend effort overcoming it. Also, on many networks incentive schemes exist to try to reward users who share more. Free-riding and various levels of sharing may therefore be explained by different users varying in levels of usage, beliefs in the effectiveness of incentive schemes, and costs of sharing.

However, whilst default sharing undoubtedly takes place, this form of sharing cannot introduce new files into the network but only re-share existing files. Additionally, default sharing is inconsistent with heavy sharing as whilst the cost of disabling the default sharing process is constant the costs of sharing increase with the number of files shared. Despite this, incentive schemes should motivate sharing. However, although users are often informed that they will be rewarded for sharing, the incentive schemes are often ineffective<sup>2</sup>. Through experience users learn this and become less

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<sup>2</sup> Due to the decentralised nature of P2P networks it is very difficult to design algorithms that can determine how much a user is sharing that are not subject to tampering. Hence, incentive schemes are easily disabled on some networks, and do not seem to function well on others. For example, the FastTrack network client Kazaa implemented a scheme whereby users received a score depending upon how many files they uploaded to others. Within a very short period of time a ‘rogue’ client was freely available which automatically set this score to its maximum value.

motivated to share. As such, it is debateable whether rational incentives alone explain sharing.

## 2.2 Confusion and Repeated Game Effects

In the VPPG literature where it is frequently observed in both real world situations and experiments that public good provision is always non-zero and typically significantly high despite the selfish model prediction that free-riding should be ubiquitous (Samuelson 1954, Olsen 1965). For example, many people freely donate blood and public goods experiments on average find that 40% to 60% of participants contribute (Ledyard, 1995). As for why individuals choose to contribute, it is seen that confusion and repeated game effects offer little in the way of explanation. Research suggests that contributors are neither confused about their situation (Palfrey and Prisbrey, [1997], Andreoni [1995b]), nor lack optimisation skill (Clark, 1998)<sup>3</sup>. Additionally, repeated game effects<sup>4</sup> that can explain cooperation in small scale scenarios cannot explain cooperation in the large public goods setting due to difficulties identifying free-riders. As such, research has concentrated on rationales that are inconsistent with the rational model.

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<sup>3</sup> Infact, Clark found that those exhibiting cooperative behaviour actually performed better at tests of optimisation skill.

<sup>4</sup> For example, in a two player game players may follow a Tit-for-Tat strategy where non-cooperation in one period by the other player results in non-cooperation in all subsequent periods. Following this strategy it is clearly optimal for both players to cooperate.

In considering the rationales that follow it should be borne in mind that P2P networks are very large, anonymous and that sharing choices are unobservable (or at least, impractical to observe)<sup>5</sup>.

### 2.3 Altruistic Models

One theory of cooperation that goes beyond the selfish model is known as the *pure altruistic model* and stems from the concept of interdependent utility (Becker, 1974). However, this model has little explanatory power in large-scale VPPG settings (Andreoni, 1988). Alternatively, the *impure altruistic model* suggests a private benefit to contributing referred to as the *warm glow of giving* (Andreoni, 1990). A broad definition of warm glow is any direct payoff from the act of giving, including those from acting in accordance with social or moral norms.

### 2.4 Social Norms

A social norm is a rule of behaviour that is enforced by a social sanction in the form of social approval or disapproval<sup>6</sup> (Coleman, 1990). As social approval is required to enforce the sanction such norms have no effect unless actions are observable by others. Providing the opportunity for participants to be subject to social sanction in

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<sup>5</sup> To observe another user's sharing choice, a user must first identify a target user and then look up their shared files. This in itself is not too problematic, but as a user may take part in hundreds or thousands of transactions in a given network session, and these transactions are often short-lived, considerable active effort would be required to identify which of the users encountered in just one session are free-riders and which are not. As it is costly to observe sharing behaviour, users know that their choice of how much to share typically will not be observed by other network users.

<sup>6</sup> It is important to realise that a social sanction is not necessarily a physical act of social approval or disapproval. Simply knowing in one's mind that an act brings social approval or disapproval may be enough to enforce the social norm. For example, it can be observed that individuals are far less likely to drop litter in the presence of others, not because they fear that passers-by would berate them in the street, but because they know that their act brings social disapproval in the minds of others.

voluntary public goods game has shown to increase average contributions by up to 100% (Rege and Telle, 2002).

Whilst social norms play a part in many social dilemmas they should not function on P2P networks as sharing choices are difficult to observe. However, they may play a role on some special case networks where sharing choices are readily observable. This is explained in more detail in Section 3.

## **2.5 Moral Norms**

A moral norm is a rule of behaviour that when properly generalised to the entire population results in an efficient outcome. As with social norms, moral norms are enforced with sanctions but unlike social norms the sanction is completely internal. Evidence in support of moral norms includes studies of morally motivated recycling behaviour (Brekke et al, 2003).

## **2.6 Reciprocity**

Aside from warm glow explanations of cooperation there are theories involving preferences toward reciprocity, being defined as kindness in response to kindness. Negative reciprocity, correspondingly, is cruelty in response to cruelty. Preferences toward reciprocity are seen in many social interactions (see Fehr and Gächter [2000] for a survey). For example, a request for a charitable donation is often accompanied by a small gift as charities believe this increases the propensity to donate, and waitresses who smile more tend to get tipped more (Tidd and Lochard, 1978). Similarly, when supermarkets offer free-samples of new products many people have difficulty accepting them without feeling committed to buying something in return (Cialdini, 1993). In the context of VPPG games it is seen that, when given the

opportunity to punish, reciprocal types will punish non-cooperation even if punishment is costly. This form of negative reciprocity can enforce cooperation even if the proportion of reciprocal types in the public good scenario is relatively small (Fehr and Schmidt, 1999). As the threat of punishment is credible it is in the interests of any rationally inclined individuals to cooperate.

Both positive and negative reciprocity may apply to P2P networks, however as sharing choices are unobservable users are unable to target specific individuals. Therefore, the only tools of reward or punishment available are users' own decisions whether to share or free-ride. Some users may believe that other users are sharing lots of files so will respond in kind and share lots of files in return. Other users may believe most people share nothing and therefore they will also share nothing.

## 2.7 Evolutionary Psychology Theories

It has been suggested that consistent rewards for cooperative behaviour and punishment for non-cooperative behaviour may make individuals predisposed to the former through a process of mental conditioning (Cosmides and Tooby, 1992).<sup>7</sup> This argument is illustrated well by Muella (1986):

“Most of us choose the cooperative strategy most of the time. Why? Because we were taught to do so. Our first contact with prisoners' dilemma situations occurred as children. We were taught to pick up our clothes, be quiet, not throw food etc., by being rewarded when we did so

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<sup>7</sup> Indeed, it has been a recent triumph in evolutionary psychology to show that cooperative behaviour can be 'selected for survival' in an evolutionary context despite seemingly putting cooperative individuals at a disadvantage in comparison to their free-riding peers.

and punished when we did not. Cooperative behaviour was thus reinforced, non-cooperative behaviour punished. Preferring reward to punishment, we increased the frequency of cooperative behaviour, and reduced the frequency of non-cooperative behaviour.”

This theory is based upon the idea that individuals generalize situations rather than rationally analyze each one. When individuals are faced with a social dilemma they choose cooperation because that is what they have been rewarded for doing in previous social dilemmas. This theory predicts that framing is important and, along with moral norm theories, can explain the observation of Andreoni (1995a) that whilst public goods experiments yield cooperative outcomes, very similar or identical oligopoly games result in non-cooperation.

As such a disposition is learnt, it is to be expected that not all individuals will exhibit it to the same degree. For example, it may be that users from different countries systematically differ in how much they share due to differences in culture. However, empirical efforts to detect such predispositions have been disappointing. For example, Ma et al. (2002) did not find any differences between the giving behaviour of two groups, one of which had been selected as having a predisposition to altruism based on a psychological questionnaire.

## **2.8 Costs of Sharing**

Whatever the rationale for sharing, the motivation to share is likely to be tempered by the existence of sharing costs. Costs include time, connection bandwidth and use of hard disk space. An important factor when considering hard disk space is its opportunity cost as shared data is likely to be kept on disk for other purposes. For

example, many people amass thousands of music files for their ongoing leisure and they would remain on their hard drives whether they were being shared or not. Hence, in this case, there would be no cost of sharing associated with hard disk usage. Factors important in determining this opportunity cost are thus those that determine preferences for computerised media files and include age, gender and social status.

Another important sharing cost is the threat of prosecution. Whilst the punishment if prosecuted for copyright infringement is substantial, the present probability of being prosecuted is fairly negligible.<sup>8</sup> However, it is often supposed that individuals ‘overweight’ small probabilities when making decisions (for example, prospect theory - Kahneman and Tversky [1979]) so, despite the small probability, the fact that the chance of prosecution is non-zero may be enough to deter users.

## **2.9 Existing Work and Project Goals**

The literature on P2P networks recognises their public good nature but much of it is focused on ‘fixing’ the networks with incentive schemes (Antoniadis et al [2004], Golle et al [2001], Lai et al [2003]). However, the question of why users share on P2P networks has been looked at previously by Becker and Clement (2004) (BC hereafter) who theorize that free-riding is motivated by negative reciprocity. In their model, free-riders are relative newcomers to the network who use the network little. As they join at a mature network stage they perceive that there is a lot of free-riding on the network and hence free-ride themselves in reciprocation.

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<sup>8</sup> In November 2004 the number of P2P users was estimated at 7.5 million ([www.bigchampagne.com](http://www.bigchampagne.com)) whilst the total number of prosecutions ever brought (against music sharers only) was just 6,952 (News.com – ‘RIAA files a new round of P2P lawsuits’).

In a survey of MBA students users are split into three groups based on behaviour and the number of files shared and the effect of relevant factors on each group are estimated. They find that heavy-sharing is motivated by social and moral norms. Specifically, they find that big sharers on networks do so because they believe that being identified as a sharer is ‘cool’ and because they are irritated by free-riders (and are morally motivated not to repeat such behaviour themselves). The former result appears to lend support to social norm theory, but the framing of the question may be regarded as a little ambiguous.

BC limit their scope to just a few rationales and do not consider the possibility that sharing is a rational response to incentives. Also, they use the number of files shared as a signal of sharing behaviour, a signal that is inappropriate when default sharing is considered. Additionally, users may not know how many files they are sharing and asking them directly may cause such users to give up on the survey and cause sample bias.

This project extends their work by:

- 1. Increasing the scope and size of the study in terms of networks and users.**
- 2. Testing a greater range of unselfish rationales.**
- 3. Testing whether sharing is purely a rational response.** Specifically this project will test the following two null hypotheses:

*Null Hypothesis 1: Individuals that share files on P2P networks are rationally responding to network provided incentives and client features.*

*Null Hypothesis 2: Individuals that share disproportionately large numbers of files on P2P networks display no different rationale to that of those sharing lesser amounts but do so because their direct and indirect costs of sharing are lower.*

4. **Not relying on revealed preference to determine sharing behaviour.** As determining behaviour indirectly may be flawed and as I do not believe users face any incentives to incorrectly report their sharing behaviour, users will be asked directly about their behaviour.

### 3. Survey Design

To obtain data a survey of P2P users was carried out. To collect results from respondents a custom website was constructed and was put online at [www.p2psurvey.com](http://www.p2psurvey.com) (see Figure A1.1 for a screenshot). Data was collected for seven different networks and four different types of file – music, films, television episodes and computer games. The networks asked about were (clients for each network are given in brackets):

- FastTrack (Kazaa, Kazaa Lite, K++, Grokster, iMesh, iMesh Lite)
- Edonkey (Overnet, Emule)
- Gnutella (BearShare, Gnutella, LimeWire, Phex, Swapper, XoloX)
- Bit Torrent
- Direct Connect (Neo Modus, DC++)
- WinMX
- Soulseek

#### 3.1 Dependant Variables

The survey collected data on two dependant variables: sharing behaviour and sharing amounts. For each network, users were asked which of the following three types of sharing behaviour best described their own behaviour:

1. **Free-rider:** the user tries to share nothing or as little as possible.
2. **Active-sharer:** the user deliberately chooses files to share on the network.
3. **Casual-sharer:** the user participates in the network to download, but does not give much thought to sharing. (As such, they will automatically re-share files they have downloaded.)

Users who chose ‘Active-sharer’ were asked how much they shared of each type of file in five fairly wide bands.<sup>9</sup>

### 3.2 Explanatory Variables

To try to provide evidence of the various rationales discussed above and data regarding sharing costs, for each network users were asked (rationales being tested are given in brackets):

- How much of each type of media they had downloaded from the network in the last six months (Opportunity Cost of Sharing).
- How much time they had spent on the network (Default Sharing).

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<sup>9</sup> As the majority of files are shared illegally, to encourage responses users were asked only roughly how much they shared in by specifying one of five fairly wide bands. Also, as different types of files have different file sizes, it is to be expected that they will be shared in different amounts due to differing disk-space requirements. For example, it would not be too unusual to find users sharing 1000 music files taking up around 3 gigabytes (GB) of disk space, but it would be highly unusual to find a user sharing 1000 films taking up around 1000 GB. As such different bands were used for each type of file and are given in Table A1.1 in the appendix.

- Whether they believed sharing more would encourage others to share (Reciprocity).
- Whether they believed sharing enabled them to access files more easily (Network Provided Incentives).

Additionally, users were asked in general:

- Whether free-riding by others annoyed them (Moral Norm, e.g. Free-riding is annoying so don't do it).
- Whether they thought that ideally everyone should contribute many files (Moral Norm, e.g. P2P networks are public goods so I should contribute).
- Whether they were disillusioned about sharing due to the number of free riders (Negative Reciprocity).
- Whether they had given to charity in the past year (Predisposition to Cooperation).
- Whether they thought it was 'cool' to be identified as a sharer (Social Norms).

This last question is equivalent to one asked by BC. As I have stated that social norms should not generally apply to P2P networks except in a few special cases, the effect of this question is expected to be insignificant when these special cases are accounted for (see below).

Users were also asked how worried they were about being prosecuted for sharing each type of media on each network. Lastly, users were asked some demographic information - age, gender, country, employment status and household income - which may be related to indirect sharing costs. To see how variables were coded and the specific questions that were asked, please refer to Table A1.2.

### **3.3 Special Cases**

FastTrack, Edonkey, Gnutella, WinMX and Soulseek are large, anonymous networks where sharing choices are unobservable. The other two networks (Direct Connect and BitTorrent) are special cases because, although they are used for file-sharing, they are not actually P2P networks and user communities may exist around them. For these and other reasons the questions asked for these networks were slightly different (please see Appendix A1.3 for details).

## 4. Results

The survey was put online in mid-November 2004 and taken down mid-February 2005. In this time 423 responses were collected.

### 4.1 Survey Sample

In drawing any conclusions from the survey it is important to keep in mind the sample on which those conclusions are based. As such, some important descriptive statistics with brief commentary can be found in Appendix 2. It is emphasised that no special action was taken to ensure the sample was random and that it has not been adjusted for more general P2P user demographics<sup>10</sup>. Although wide participation was encouraged<sup>11</sup> it should be noted that a large minority<sup>12</sup> of responses are most likely from students at Warwick University. I do not believe these facts impair the goals of the project to any great extent as explaining sharing in any portion of the P2P user population is worthwhile whether or not the results apply more generally.

### 4.2 Data Aggregation

Individual networks had relatively few observations given the high number of explanatory variables, especially when the many Likert-scale and categorical variables were appropriately split into dummies. Regressions were run on individual network data where possible and elsewhere data was aggregated over networks to increase sample size. As users may use more than one network such aggregate data

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<sup>10</sup> It was investigated whether such demographics could be obtained. Unfortunately the only studies I came across containing such information were in the hands of market research firms.

<sup>11</sup> The survey included a feature whereby respondents could recommend their friends and colleagues to complete the survey.

<sup>12</sup> The survey advertised on public forums on the internet before it was publicised to Warwick students. Before Warwick students were informed the survey already comprised around 300 responses.

is, in effect, panel data. However, as there is no multinomial or ordered logit model for panel data it is implicitly assumed that individuals decide what to share on each network independently of their decisions on other networks. Additionally, as it is hard to conceive of differences between networks that would reverse the effects of the explanatory variables, interactive network effects were ignored. As such, when using aggregate data more importance is placed on the sign and significance of coefficients than their magnitude.

As disaggregate data is more reliable in the sense of fewer implicit assumptions, and aggregate data is more reliable due to larger sample size, the greatest emphasis was placed on factors that had significant effects over both types of analysis.

### **4.3 Multinomial Logit on Sharing Behaviour**

The choice between casual sharing, active sharing and free-riding was modelled as a multinomial logit. Regressions for individual networks proved problematic and analysis proceeded using aggregate data. An initial regression was run on all explanatory variables (Regression A3.1). Insignificant variables were then excluded based on a Log-Likelihood Ratio test (at 10%) to yield the final regression (Regression A3.2). The resulting coefficients, based on 705 observations, were converted into odds-ratios for interpretation (as interpreting marginal effects for multinomial logit models is somewhat complex). These are shown in Table A3.1. Effects which increased the probability of one group in comparison with both the other groups, sorted roughly in order of magnitude, are shown in Tables 4.1-3.

## Casual Sharing

**Table 4.1, Factors that make it more likely a user with casual share**

<b>More Likely to Casual Share Compared to:</b>	<b>Free-riding</b>	<b>Active Sharing</b>
Not on the Direct Connect network	19.25	16.02
Female	5.26	4.17
More games usage	4.12	5.78
Not Employed (i.e. unemployed, student etc.)	3.67	4.63
Thinks sharing is very cool	3.33	1.92
Richer	3.13	3.85
Less time on the network	2.56	2.38
Less belief in network incentives	2.44	2.13 and 0.16
Less TV usage	2.22	1.96
Not given to charity in past year	1.88	2.15

When considering the decision to casually share, network incentives are significant. However, contrary to expectations it is found that, whilst those with high beliefs in network incentives are more likely to actively share than casually share, those with low beliefs in network incentives are more likely to be casual sharers than free-riders.

It is found that users that have spent less time on the network and those with less TV usage are also more likely to be casual sharers. In addition it is found that women are 4 to 5 times as likely as men to casually share. If it is assumed that women are likely to be more infrequent P2P users than men, each of these results support a view that casual sharers are the most inexperienced users with not enough ‘stake’ in the network to either free-ride or actively share. The large effect of using the Direct Connect network may also lend support. Users on the Direct Connect network are 19 times more likely to free-ride and 16 times more likely to actively share than to casually share. This may be a result of minimum sharing requirements (see Appendix 1.3) forcing many users who would typically casually share to make a choice and therefore free-ride or actively share.

Perversely it is also found that believing sharing is ‘cool’ improves chances of casual sharing, a result that may reflect the ambiguity of the question. In addition, those who are not employed (such as students), richer individuals and those who have not given to charity in the past year are also more likely to casual share. Whilst these results are not perverse there is no ready explanation for them except that they reflect some features of the sample.

### Free-riding

**Table 4.2, Factors that make it more likely a user will free-ride**

<b>More Likely to Free Ride Compared to:</b>	<b>Casual Sharing</b>	<b>Active Sharing</b>
High legal music worries	29.11	6.67
No community	12.5	3.53
No free-rider annoyance	3.20	6.67
No reciprocal beliefs	3.20	3.85
Less belief in network incentives	2.86	2.36
Less music downloads (per download)	Low <sup>13</sup>	Low

When considering the decision to free-ride, network incentives have a significant effect with those who believe in lower or no network incentives being around 2.5 times as likely to free-ride. Network usage is also significant with those with higher music downloads being less likely to free-ride. This supports the casual sharer rationale (above) and also the idea that lower network usage results in higher opportunity costs of sharing.

In addition, Table 4.2 shows that high legal worries surrounding music sharing make users 29 times and 6.7 times more likely to free-ride. It is noteworthy that only ‘very

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<sup>13</sup> As music downloads are typically measured in hundreds or thousands the effect of downloading an additional file is necessarily quite small.

high’ legal concerns are significant to affect ones sharing choice (merely ‘high’ legal concerns were not significant).

When considering non-rational effects, social norms, moral norms and reciprocity appear significant. The absence of a community (see Section A1.3) makes users 12.5 and 3.53 times more likely to free-ride. Those who are annoyed at free-riders are 3.2 times and 6.67 times less likely to free-ride, demonstrating moral behaviour. Additionally, those with belief in (positive) reciprocity are less likely to free-ride.

**Active-Sharing**

**Table 4.3, Factors that make it more likely a user will actively share**

<b>More Likely to Active Share Compared To:</b>	<b>Casual Sharing</b>	<b>Free-riding</b>
Lower legal games worries	5.00	6.67
Higher annoyance with free-riders	2.08	6.67
Higher moral motivation	2.38	1.75
Higher belief in incentives	0.47 and 6.45	2.36

When considering factors making it more likely that a user actively shares, high belief in network incentives is significant (low belief leads to casual sharing as already noted). Also, legal concerns again appear significant with those with moderate legal concerns about computer games 5 and 6.67 times more likely to actively share than those with higher concerns.

Both a moral norm not to free-ride and a moral norm to provide good networks were also significant.

## **Conclusions**

From the results, some conclusions can be drawn. It is seen that casual sharing is mostly undertaken by those with least network experience and free-riders are those users who have high legal concerns, lack moral norms and social incentives, and do not believe other users act in a reciprocal manner. Active sharers are the opposite with low legal worries and appear morally motivated to share. It is significant that network incentives are not alone in explaining active sharing and that moral motivation is also a factor. When considering the numbers of sharers that might respond to either factor it should be noted that 96.85% of active sharers responded positively to the moral norm question whilst only 42.52% had non-zero beliefs in network incentives. This being the case, Null Hypothesis 1 can be rejected.

### **4.4 Ordered Logit on Sharing Amount**

For active sharers, the choice of how much to share was modelled as an ordered logit.

#### **4.4.1 Disaggregate Analysis**

Initially, five regressions were run for music sharing for each of the five networks with sufficient observations (Regressions A3.4-9). At this stage Likert-scale and categorical variables were not split up into dummies. Significant and perverse variables in each regression are noted and are listed in Table 4.4.

**Table 4.4, The significance of variables on sharing amount over five networks**

Variable	Significant (p < 0.10)	Nearly Significant (p < 0.15)	Sig. or Nearly sig.	Perverse
Gender	1		1	
Age	4		4	
Income	1		1	
Charity	2		2	
Harddisk	5		5	2
CompUsageHome	3	1	4	
CompUsageWork	2		2	
CompUsageMusic	4	1	5	
Time	1		1	
UsageMusic	4		4	
LegalMusic	2		2	1
Reciprocity	2	2	4	2
Incentive	2		2	2
Morals	4	1	5	
Fairness2	1	1	2	
CoolFactor	1		1	
CountryOther	1		1	
Connection1	4		4	2
Connection3	1	1	2	1
Status1 (Employed)	2		2	
Status2 (Unemployed)	2		2	
Status3 (At School)	2		2	
Status5 (Retired)	1		1	
DirectConnectIntranet		1	1	

From this first stage of analysis it can be seen that hard disk size is consistently significant across all networks. Age, music usage and music downloads are also significant suggesting that the sharing costs are large determinants of sharing volume. However, public good morals are also significant on 4 out of 5 networks, and nearly significant on the 5<sup>th</sup>.

No single network had sufficient observations to split up all variables into dummies, however, the FastTrack and DirectConnect networks did have sufficient observations to split up some variables. To decide which variables were split up, each was split in

turn and tested for constant incremental effects<sup>14</sup>. After insignificant variables were removed using a log-likelihood ratio test (at 10%) this process yielded Regressions A3.9 and A3.10. Marginal effects on the probability of being in the highest sharing category were calculated and are shown in Tables 4.5 and 4.6 below. (Marginal effects are computed relative to a hypothetical average user with all explanatory variables taken at mean values).

**Table 4.5, Marginal effects on the probability of music heavy sharing on the FastTrack network**

	<b>Y</b>	<b>Pr(Heavy Sharer)</b>	<b>Marginal Effect</b>
Average	17.098	36.10%	
No public good morals	13.343	1.30%	
Very high public good morals	19.602	87.35%	+86.04%
100-150GB hard disk	19.775	89.15%	
Upgrading from 100-150GB hard disk to a 250GB+ hard disk	16.827	30.10%	-59.05%
On broadband or higher	17.005	33.98%	
On modem	19.859	89.93%	+55.95%
A Student, Schoolchild or Retired	17.609	48.48%	
Employed	14.909	5.95%	-42.53%
Unemployed	12.618	0.64%	-47.85%
Does not get annoyed with free-riders	16.803	29.60%	
Gets somewhat annoyed with free-riders	18.401	67.52%	+37.92%
Male	17.364	42.43%	
Female	15.733	12.61%	-29.82%
Higher belief in network incentives	16.658	26.67%	-9.42%
Downloading 100 more music files than average	17.485	45.39%	+9.30%

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<sup>14</sup> The regressions for these tests have not been included in the appendix due to their number, but have been kept and are available on request.

**Table 4.6, Marginal effects on the probability of music heavy sharing on the DirectConnect network**

	<b>Y</b>	<b>Pr(Heavy Sharer)</b>	<b>Marginal Effect</b>
Average	7.538	34.10%	
No public good morals	4.935	3.70%	
Very high public good morals	8.337	53.50%	+49.80%
Rarely listen to music	4.997	3.90%	
Very often listen to music	7.877	42.00%	+38.10%
50-100gb hard disk	6.753	19.10%	
Upgrading from 50-100GB hard disk to 250+ hard disk	8.478	57.00%	+37.90%
Moderate belief in reciprocity	6.763	19.20%	
Strong belief in reciprocity	7.836	41.00%	+21.80%
Younger than 19	6.701	18.30%	-15.80%
Over 36	5.593	6.90%	-11.40%
Download 100 more music files than average	7.599	35.40%	+1.40%

The average chance of being a heavy sharer of music on the FastTrack network is 36.1%. Downloading more music files increases the chance of being a heavy sharer which supports the idea that higher preferences for music decrease the opportunity cost of hard disk space. In addition, non-students and women are less likely to share which also supports the opportunity cost view if it is assumed that students and males are more likely to want to horde music files than other groups. However, it is also observed that having a larger hard drive and a lower connection speed perversely reduces the probably of heavy sharing and I can only conclude that this is a result of sample bias (i.e. in the specific sample lots of FastTrack heavy music sharers just happened to have mid-sized drives and used modems).

When considering explanations other than sharing costs, it is seen that the largest marginal effect is the difference between an individual with no public good morals (i.e. does not recognise that P2P networks are like public goods or does not wish to

maximise provision) and one who has ‘very high’ public good morals. The latter individual would be 86% more likely to share. Those who are annoyed with free-riders are 37.9% more likely to be heavy sharers than those who do not get annoyed.

In addition, there is the apparently perverse result that an increase in belief in network incentives reduces heavy sharing. However, this can be explained as one may suppose that heavy sharers are the most experienced users and recognise that network incentives do not work in practice.

On Direct Connect the average chance of sharing was a similar 34% and cost of sharing factors are significant. Also, being younger than 19 or older than 36 decreases the chance of heavy sharing and, as with status variables on FastTrack, this can be interpreted as different age groups having different opportunity costs of sharing. Again it is seen that public good morals has the largest effect making a person 49.8% more likely to be a heavy sharer. It is also seen that beliefs in reciprocity increase the probability of heavy sharing. Notably, network incentives were not significant in this regression.

#### **4.4.2 Aggregate Analysis**

Before proceeding to aggregate analysis, it was tested whether interactive network effects were significant for the five initial network regressions. An aggregate music sharing regression was run (Regression A3.11) using the same variables<sup>15</sup> and a log-likelihood ratio test conducted to test for differences between this and the

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<sup>15</sup> As the initial Direct Connect regression included the variable DirectConnectIntranet, the regression was re-run without this variable to ensure aggregate and disaggregate regressions were comparable.

disaggregate regressions (Table A3.2). It was found that interactive network effects are significant (at 5%) suggesting that variations between networks or differences in user clienteles have significant effects. However, as mentioned above, it is hard to conceive of differences between networks that would reverse the effect of the explanatory factors. As such I reiterate that aggregate analysis is appropriate but more emphasis should be placed on the signs of coefficient estimates than their magnitude.

An initial regression was run on aggregate data for music sharing (Regression A3.12) and insignificant variables were excluded to yield Regression A3.13. Marginal effects were computed and these are shown in Table 4.7 below.

**Table 4.7, Marginal effects on the probability of heavy music sharing**

	<b>Y</b>	<b>Pr(Heavy Sharer)</b>	<b>Marginal Effect</b>
Average	-0.714	29.70%	
No legal worries about music sharing	-0.688	30.30%	
Very high legal worries about music sharing	-1.88	11.70%	-18.60%
19 to 25 years of age	-0.604	32.10%	
Less than 19 years of age	-1.252	19.80%	-12.30%
Older than 50 years of age	0.773	65.20%	33.10%
Downloading 100 more music files than average	-0.663	30.80%	1.10%
Listening to music sometimes	-4.858	0.70%	
Listening to music very often (instead of sometimes)	-0.476	34.90%	34.30%
Listening to music often (instead of sometimes)	-2.116	9.40%	8.80%
Listening to music occasionally (instead of sometimes)	-2.154	9.10%	8.40%

Not using a computer at home	2.259	89.20%	
Using a computer at home for 3-5 hours a day	-0.722	29.60%	-59.60%
Using a computer at work for 3-5 hours a day	-0.612	31.90%	
Using a computer at work for 2 more hours a day	-1.347	18.30%	-13.60%
250GB+ Hard drive	-0.571	32.80%	
Upgrading to a 250GB+ hard drive from 100-150GB	0.467	58.00%	-25.10%
Upgrading to a 250GB+ hard drive from 20-50GB	-1.37	18.00%	14.80%
Upgrading to a 250GB+ hard drive from 10-20GB	-1.679	13.90%	18.90%
Less than a year on the network	-0.25	40.20%	
More than two years on the network	-0.834	27.30%	-12.90%
FastTrack Users	-0.477	34.90%	
Edonkey Users	-1.534	15.70%	-19.20%
Gnutella Users	-1.231	20.20%	-14.80%
No public good morals	-5.506	0.30%	
Some public good morals	-2.105	9.50%	9.20%
Moderate public good morals	-1.487	16.30%	16.00%
High public good morals	-0.935	25.30%	25.00%
Very high public good morals	0.071	48.10%	47.80%
Thinking sharing is not cool	-0.894	26.10%	
Thinking sharing is very cool	0.008	46.60%	20.50%
Fair belief in other users reciprocity	-1.064	23.00%	
Strong belief in other users reciprocity	-0.586	32.50%	9.50%

The average chance of heavy sharing is 29.7%, which is not dissimilar to the disaggregate results. Also in line with the disaggregate results the costs of sharing are significant. It is also seen that those with more time spent on the network are less likely to heavy share: a result that seems counter intuitive and again may be due to sample bias. The network used also affects the probability of heavy sharing with Edonkey and Gnutella users being less likely to heavy share than FastTrack users. This result is not surprising as the FastTrack network is particularly popular for music swapping.

All dummies for public good morals were significant. ‘Cool factor’ is also significant with those thinking it is cool to be identified as a sharer being more likely to heavy share than those that do not, possibly supporting social norm theory. Beliefs in reciprocity were also significant.

Regressions for aggregate film sharing were also attempted (Regressions A3.14 and A3.15). The results of this regression were disappointing in that many variables were either insignificant or perverse. However, this regression has substantially fewer observations than the music regression. Results for aggregate TV sharing fared better (Regressions A3.16 and A3.17) and the marginal effects are shown in Table 4.8 below.

**Table 4.8, Marginal effects on the probability of heavy TV sharing**

	<b>Y</b>	<b>Pr(Heavy Sharer)</b>	<b>Marginal Effect</b>
Average	-0.221	1.80%	
19 to 25 years of age	-0.102	2.10%	
Over 25 years of age	-1.259	0.70%	-1.40%
Downloading 50 more TV episodes than average	0.215	2.80%	1.00%
View TV episodes sometimes	-2.175	0.30%	
View TV episodes very often	0.291	3.00%	2.80%
Use a computer at home for 0-2 hours a day	0.545	3.90%	
Use a computer at home for 2 hours a day more	-0.355	1.60%	-2.30%
Not concerned about sharing TV episodes	-0.054	2.20%	
A little concerned about downloading TV episodes	-0.73	1.10%	-1.10%
250GB+ Hard drive	1.055	6.30%	
Upgrading to a 250GB+ hard drive from 20-50GB	-2.281	0.20%	6.10%
Strong public morals	-0.617	1.20%	
Very strong public morals	0.034	2.40%	1.10%

The average chance of heavily sharing TV files is much lower than that for music files, presumably due to their increased size. Costs are again significant but, perversely, using a computer more at home reduces the probability which suggests that this is a poor measure of the opportunity cost of sharing but again may be due to sample bias. Strong public morals again increase the probability of heavy sharing.

Regressions were also run for game sharing (Regressions A3.18 and A3.19) but as with film sharing many results were perverse. This regression had the least number of observations out of the four.

#### **4.4.3 Conclusions**

From both the disaggregate and aggregate results it is clear that direct and indirect costs of sharing are a consistent determinant of heavy sharing. However, it is also seen that public good moral motivation has a consistently significant effect over all regressions. Heavy sharers seem more morally motivated than lesser sharers, in addition to facing lower costs, and therefore Null Hypothesis 2 is rejected. The moral norm relating to frustration with free-riders, which had significant effects in BC's analysis, was here only significant in the FastTrack regression. Also notable was that legal concerns proved significant suggesting that some users are sufficiently worried about punishment to share less. However, it is worth bearing in mind that 54.14% of respondents had any legal concerns about sharing music and just 4.73% considered themselves very worried. Therefore whilst the effect of high legal concerns may be large where they exist, they do not appear widespread.

## 5. Conclusions

The questions regarding sharing on P2P networks have been partially answered. With regard to why users share, it is found that:

- Less experienced and more infrequent users are more likely to casually share whilst higher network usage, more network experience or an external factor such as a minimum sharing requirement makes it more likely that users will not casually share.
- Both a moral norm for efficient network provision and a moral norm not to free-ride are significant factors in determining whether a user actively shares or free-rides, in addition to belief in network incentives.
- As less than half the sample believe in network incentives but nearly all users responded positively to the public good moral norm question it can be firmly concluded that network incentives do not fully explain why users share and that users are not merely rational maximisers.

Also notable was that legal concern can be a significant factor when it is sufficiently high, but that concerns are not widespread. It is also seen that free-riding is much less likely where some form of community exists.

As for why some users share more than others, it is found that:

- Sharing costs are highly significant.

- Despite other rationales being significant in some instances, only a moral norm for efficient network provision is consistently significant over all disaggregate and aggregate results. Hence, lower sharing costs alone do not fully explain heavy sharing.

In relation to BC's previous study, their finding that individuals share because they believe it is 'cool' to be identified as a sharer has had mixed results being sometimes significant, sometimes insignificant and occasionally perverse. The alternative social norm question dealing with special case networks (see Section 3.3) provided no explanation for heavy sharing, but was significant in the decision of whether or not to share. Similarly, BC's finding that frustration with free-riders encourages heavy-sharing is also not upheld but is instead found to apply to the decision to actively share, not how much to share.

Negative reciprocity was notable for its complete lack of significance. In one way this lends even more support to moral norm behaviour: When faced with free-riding by others it appears that users are not likely to become disillusioned and free-ride themselves (as BC's free-riders did) but rather are more likely to 'set an example' and not free-ride themselves. Positive reciprocity fared better, but was not consistently significant. It is possible that reciprocal preferences manifest themselves strongly only where there is the possibility for selective reward or punishment, a feature the P2P setting lacks. Further studies could investigate this.

With specific regard to P2P, finding that a moral norm for efficient provision is a significant factor suggests that other potential norms may be significant. In particular, alternative moral norms may explain further why some users share far more than

others as some users may be morally motivated by factors related to P2P networks aside from their public good nature. For example, some users may believe that the music and film industries are heavily oligopolistic and as such price their products too highly and thus feel a moral obligation to share.

In addition, the robustness of the moral norm result could be enhanced by testing the effect identified against other criteria for moral norms. For example, Brekke et al. (2003) in their work on recycling behaviour find that monetary incentives decrease the effect of moral norms. In the P2P scenario it might be interesting to discover if heavy sharers might share less instead of more if sharing were legal or if users were paid to share.

Additionally, merely conducting a larger survey would do much to test the significance of these findings to reduce the substantial sample bias illustrated by the numerable perverse coefficients encountered. A larger survey could also test more carefully for significant differences between users on different networks and would not have to rely so heavily on aggregated data. More time and care could also be taken in the framing of questions to ensure that they conceptually target the theory being tested, especially in the case of rationales that in this survey have appeared sometimes significant, often insignificant and occasionally perverse. For example, the fact that responses for BC's 'cool' question were not consistently insignificant warrants further study. BC's question can be interpreted as asking whether sharers believe they would receive social approval were they identified but does not ask whether users believe they are likely to be identified. In future work a question that more carefully targets social norm theory should be used.

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## Appendix 1: Survey Design

Figure A1.1, P2Psurvey.com

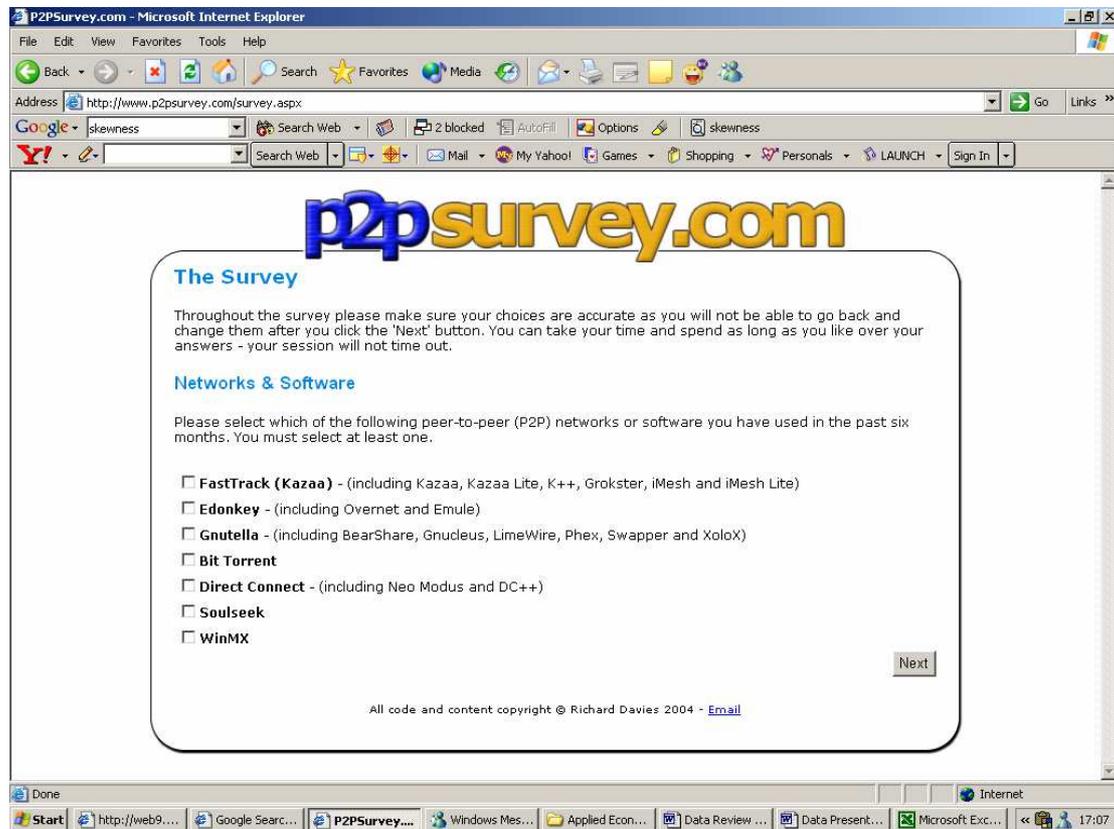


Table A1.1, Bands for the number of shared files for each type of media

	Music	Film	TV	Games
<b>A Few</b>	1-50	1-10	1-20	1-10
<b>Quite a Bit</b>	51-200	11-30	21-80	11-30
<b>A Substantial Amount</b>	201-1000	31-70	81-200	31-70
<b>A Good Amount</b>	1001-2000	71-150	201-400	71-150
<b>More</b>	2001+	151+	401+	150+

**Table A1.2, Survey Variables and Questions**

<b>Continuous Variables</b> – These were collected for each network. NNNN in the variable name should be replaced with either FastTrack, Edonkey, Gnutella, BitTorrent, DirectConnect, WinMX or Souseek to get the variable for each network, e.g. FastTrackUsageMusic. In aggregate data the variable name drops the network prefix, e.g. UsageMusic.	
Variable Name	Question
NNNNUsageMusic	In the last six months, roughly how many of each of the following have you downloaded using the NNNN network?
NNNNUsageFilm	
NNNNUsageTV	
NNNNUsageGames	

<b>Dummy Variables</b> – Uses the same naming convention as continuous variables.	
Variable Name	Question
UseNNNN	Which of the following file-sharing software have you used in the past six months?
Gender	
Charity	Have you given any money to charity in the past year?

<b>Categorical Variables</b> – Uses the same naming convention as continuous variables. Additionally, MMMM should be replaced with either Music, Film, TV, or Games to get the name of a variable for a particular type of media. Responses were coded in order with the first response corresponding to 0, the second to 1, etc. These variables are typically split up into dummy variables in regressions. Where variables can be interpreted as linear, occasionally the linear form of the variable was used in a regression due to lack of observations.			
Variable Name	Question	Responses	Related Dummy Variable
Age	What is your age?	Under 12	Age1
		13 to 18	Age2
		18 to 25	Age3
		25 to 35	Age4
		35 to 50	Age5
		50 or over	Age6
Country	In what country do you live?	United Kingdom	CountryUK
		United States	CountryUS
		Anything else specified	CountryOther
Status	What is your employment status?	Employed	Status1
		Unemployed	Status2
		At School	Status3
		Student	Status4
		Retired	Status5
Income	Roughly, what is	Less than	Income1

	your annual household income?	£15,000	
		£15,001 to £25,000	Income2
		£25,001 to £35,000	Income3
		£35,001 to £60,000	Income4
		£60,001 or more	Income5
Harddisk	How big, in gigabytes (GB), is your computer's hard disk?	Less than 10GB	Harddisk1
		10GB to 20GB	Harddisk2
		20GB to 50GB	Harddisk3
		50GB to 100GB	Harddisk4
		100GB to 150GB	Harddisk5
		150GB to 250GB	Harddisk6
		250GB or more	Harddisk7
Connection	How are you connected to the internet?	Modem	Connection1
		Cable or DSL (Broadband)	Connection2
		Leased line, business or university connection	Connection3
CompUsageHome	How many hours a day do you use a computer at home on average?	Not at all	CompUsageHome1
		0 to 2	CompUsageHome2
		3 to 5	CompUsageHome3
		6 to 8	CompUsageHome4
		More than 8	CompUsageHome5
CompUsageWork	How many hours a day do you use a computer at work/school/college on average?	Not at all	CompUsageWork1
		0 to 2	CompUsageWork2
		3 to 5	CompUsageWork3
		6 to 8	CompUsageWork4
		More than 8	CompUsageWork5
CompUsageMMMM	How often do you use your computer to [listen to music/watch full-length films/watch television episodes/play computer games]?	Never	CompUsageMMMM1
		Rarely	CompUsageMMMM2
		Occasionally	CompUsageMMMM3
		Often	CompUsageMMMM4
		Very often	CompUsageMMMM5

NNNNTime	How long ago did you first start using a NNNN client?	Less than 6 months ago	NNNNTime1
		About one year ago	NNNNTime2
		About two years ago	NNNNTime3
		More than two years ago	NNNNTime4
NNNNBehaviour	Which of the following statements best describes how you share files on the NNNN network?	I don't think about what I share, I just use the program.	
		I deliberately try to share nothing, or as little as possible.	
		I specify directories and files that I want to share.	
NNNNShareMMMM * Bands given in Table A1.1. Not applicable to BitTorrent.	On NNNN, roughly how many do you share of each of the following?	None at all	
		A few	
		Quite a bit	
		A substantial amount	
NNNNReciprocity	How much do you agree with the following statement? <i>If I share files on this network, it will encourage others to share.</i>	Not true	NNNNReciprocity1
		A little true	NNNNReciprocity2
		Somewhat true	NNNNReciprocity3
		Often true	NNNNReciprocity4
		Very true	NNNNReciprocity5
NNNNIncentive	How much do you agree with the following statement? <i>If I share files on this network I will be able to download files more quickly.</i>	Not true	NNNNIncentive1
		A little true	NNNNIncentive 2
		Somewhat true	NNNNIncentive 3
		Often true	NNNNIncentive 4
		Very true	NNNNIncentive 5
NNNNLegalMMMM	How much do you agree with the following	Not true	NNNNLegalMMMM1
		A little true	NNNNLegalMMMM2
		Somewhat	NNNNLegalMMMM3

	statement? <i>I am worried about being prosecuted if I share MMMM on this network.</i>	true	
		Often true	NNNNLegalMMMM4
		Very true	NNNNLegalMMMM5
BitTorrentCommunity	How do you typically find your torrents?	Listings on a public website	
		Links on a private community site	
DirectConnectIntranet	Do you usually connect to Direct Connect servers on the internet or on your university or company's local area network (intranet)?	Internet	
		Local Area Network (Intranet)	
Fairness	How much do you agree with the following statement? <i>It annoys me to think that people who download files from me may not be sharing any files themselves.</i>	Not true	Fairness1
		A little true	Fairness2 * See Fairnesstwo below.
		Somewhat true	Fairness3
		Often true	Fairness4
		Very true	Fairness5
Morals	How much do you agree with the following statement? <i>In an ideal situation, I think sharing lots of files is the right thing to do because it improves the experience for everyone.</i>	Not true	Morals1
		A little true	Morals2
		Somewhat true	Morals3
		Often true	Morals4
		Very true	Morals5
CoolFactor	How much do you agree with the following statement? <i>I think its cool to be identified as a sharer.</i>	Not true	CoolFactor1
		A little true	CoolFactor2
		Somewhat true	CoolFactor3
		Often true	CoolFactor4
		Very true	CoolFactor5

Fairnesstwo * This variable sometimes appears as 'Fairness2' when variables are being treated as linear.	How much do you agree with the following statement? <i>I often think lots of users who download files don't share anything themselves, so why should I bother sharing anything?</i>	Not true	Fairnesstwo1
		A little true	Fairnesstwo2
		Somewhat true	Fairnesstwo3
		Often true	Fairnesstwo4
		Very true	Fairnesstwo5

### Appendix A1.3

BitTorrent is a file download protocol rather than a file-sharing network. When a user downloads a file using BitTorrent they are forced simultaneously upload it to other BitTorrent users<sup>16</sup>. As such, users do not share files on BitTorrent but may choose to continue uploading to other users after their own download has finished. As such, for this network the question regarding sharing behaviour the options were changed to:

1. **Free-rider:** the user closes the client as soon as they have finished downloading.
2. **Active-sharer:** the user deliberately leaves the client open for some time after they finish downloading.

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<sup>16</sup> Earlier when discussing the role of incentive schemes I commented that, due to P2P networks decentralised nature, it was difficult to implement a scheme that was not subject to tampering. As such, readers may wonder how the BitTorrent clients can force users to upload files to other users as one would think that a rogue client could be developed that allowed users to download but blocked uploads. The answer is that BitTorrent can do this because it is involved in downloading and uploading only a single file at a time and is aware of all other users downloading and uploading this file. Due to this limited scope, the BitTorrent client is able to play a 'Tit-For-Tat' strategy with other clients (as discussed in Section 2) to ensure that 'free-riders' are appropriately punished. Hence, rogue clients would not be able to receive files if they did not upload them. This all happens at a software level without the user's knowledge. It is an interesting example of economic theory and artificial intelligence working in combination.

3. **Casual-sharer:** the user leaves the client open for some time after they finish downloading because it is convenient (because, for example, they are away from their computer at the time).

Further, being a file-download protocol rather than a file-sharing network, BitTorrent users must find files to download from a third party. This is typically a big public website, or a smaller private community forum or website. It is possible that users who obtain files from different sources display different sharing behaviour. For example, a finding that users who are part of a small private community share substantially more than users who use a public website would lend support to social norm theory. As such, BitTorrent users were also asked where they obtained their files from. Also, BitTorrent users were not asked how much they shared as this is not applicable to a file-download protocol: users share whatever they download<sup>17</sup>.

Direct Connect is a centralised protocol relying upon designated servers. Servers are available publicly on the internet, but also commonly available on university and company intranets. For reasons analogous to the BitTorrent scenario, users were asked where they obtained their files. Additionally, it is a feature of Direct Connect clients that a list of users appears on screen displaying how much each is sharing. As such Direct Connect users on private servers may be especially subject to social approval or disapproval. It is also the case that some servers impose minimum sharing amounts. As such, users may be forced to share some files to use a server

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<sup>17</sup> It is possible for BitTorrent users to introduce a file to other BitTorrent users by ‘seeding’ it. However, only a very few users do so as a file typically only needs to be seeded once. For this reason, and the fact that seeding does not conceptually correspond to sharing on other networks, I have not sought to collect data on it in the survey.

even when they prefer to share nothing. Therefore, for the sharing behaviour question Direct Connect users were allowed an additional response if they shared the minimum amount so as not to confuse such users with active sharers.

## Appendix 2: Sample Statistics

The respondents were 86% male and over 60% were students (Table A2.2). Correspondingly the largest age group comprising nearly 60% of respondents was the 19-25 years of age band (Table A2.1). The largest household income group was 'Less than £15,000' per year (Table A2.3) which leads me to speculate that some respondents may be confusing household income and personal income. Respondents also mainly originated from the UK (68.4%) but a sizeable number came from the United States (12.74%) (Table A2.4). Additionally, 70.99% of respondents gave to charity in the past year.

Nearly half of respondents use their computer at home for between 3 and 5 hours daily and virtually no one did not use a computer at home (Table A2.5). At work, a third of users used their computer for an average of 0 to 2 hours daily and some 17% did not use a computer at work (Table A2.6). Surprisingly, over 23% of users had a hard drive larger than 250GB, the highest band, suggesting that an even higher band should be allowed were the survey repeated (Table A2.7).

Over 81% of respondents said they listened to music on their computer 'often' or 'very often' (Table A2.8). Music appears to be the most popular media as the corresponding proportions for film, TV episodes and computer games were 41.27%, 45.28% and 38.44% respectively.

The most popular networks are FastTrack, BitTorrent and DirectConnect with around a quarter of users participating in these networks (Table A2.9). The majority (65.72%) of users participate in 4 networks or less.

The pattern of user behaviour was similar over all networks with on average around 20% of users free-riding, 20% of users casually sharing and the remaining 60% actively sharing (Table A2.11).

The percentage of active users that heavy share was much higher for music than other types of file (Table A2.12). This reflects the popularity of music files, but also suggests that a higher maximum band should have been used.

**Table A2.1, Age of Survey Respondents**

<b>Band</b>	<b>Frequency</b>	<b>Percentage</b>
Under 13	2	0.47
13 to 18	75	17.73
19 to 25	252	59.57
26 to 35	58	13.71
36 to 50	29	6.86
51 or over	7	1.65

**Table A2.2, Household Incomes of Survey Respondents**

<b>Band</b>	<b>Frequency</b>	<b>Percentage</b>
Less than £15,000	154	36.32
£15,000 to £25,000	63	14.86
£25,000 to £35,000	59	13.92
£35,000 to £60,000	81	19.1
£60,000 or more	67	15.8

**Table A2.3, Work Status of Survey Respondents**

<b>Status</b>	<b>Frequency</b>	<b>Percentage</b>
Employed	97	23.72
Unemployed	24	5.87
At School	35	8.56
At University	247	60.39
Retired	6	1.47

**Table A2.4, Country of Survey Respondents**

<b>Country</b>	<b>Frequency</b>	<b>Percentage</b>
United Kingdom	290	68.4
United States	54	12.74
Other	80	18.86

**Table A2.5, Average Daily Computer Use at Home**

<b>Band</b>	<b>Frequency</b>	<b>Percentage</b>
None	3	0.71
0 to 2 Hours	72	16.98
3 to 5 Hours	211	49.76
5 to 7 Hours	65	15.33
More than 8 Hours	73	17.22

**Table A2.6, Average Daily Computer Use at Work**

<b>Band</b>	<b>Frequency</b>	<b>Percentage</b>
None	74	17.45
0 to 2 Hours	164	38.68
3 to 5 Hours	80	18.87
5 to 7 Hours	63	14.86
More than 8 Hours	43	10.14

**Table A2.7, Hard disk size**

<b>Band</b>	<b>Frequency</b>	<b>Percentage</b>
Less than 10GB	7	1.65
10GB to 20GB	33	7.8
20GB to 50GB	87	20.57
50GB to 100GB	80	18.91
100GB to 150GB	44	10.4
150GB to 250GB	74	17.49
250GB or more	98	23.17

**Table A2.8, Computer use for each media**

	<b>Music</b>		<b>Films</b>		<b>TV Episodes</b>		<b>Games</b>	
Never	4	0.94	35	8.25	91	21.46	50	11.79
Rarely	21	4.95	72	16.98	56	13.21	97	22.88
Occasionally	52	12.26	142	33.49	85	50.05	114	26.89
Often	82	20.05	99	23.35	97	22.88	75	17.69
Very Often	262	61.79	76	17.92	95	22.41	88	20.75

**Table A2.9, Network use**

<b>Network</b>	<b>Frequency</b>	<b>Percentage</b>
FastTrack	95	22.46
Edonkey	41	9.69
Gnutella	25	5.91
BitTorrent	117	27.66
DirectConnect	96	22.7

WinMX	32	7.57
Soulseek	17	4.02

**Table A2.10, Number of networks participated in**

<b>Number of Networks</b>	<b>Frequency</b>	<b>Percentage</b>
1	114	26.89
2	136	32.08
3	98	23.11
4	50	11.79
5	14	3.3
6	7	1.65
7	4	0.94

**Table A2.11, Aggregate User Behaviour**

<b>Behaviour</b>	<b>Frequency</b>	<b>Percentage</b>
Casual Sharer	204	20.00
Free-rider	203	19.90
Active Sharer	613	60.10

**Table A2.12, Aggregate Percentage of Users Heavy-Sharing**

<b>Music</b>	<b>Film</b>	<b>TV Episodes</b>	<b>Games</b>
27.8	3.31	4.13	1.04



incentive2	-.1.212546	.5676332	-2.14	0.033	-2.325086	-.1000051
incentive3	-.0523223	.5781952	-0.09	0.928	-1.185564	1.080919
incentive4	-.817065	.6590332	-1.24	0.215	-2.108746	.4746163
incentive5	1.188679	1.123846	1.06	0.290	-1.014018	3.391377
coolfactor2	.5018998	.6115283	0.82	0.412	-.6966738	1.700473
coolfactor3	.5946206	.6567149	0.91	0.365	-.6925169	1.881758
coolfactor4	.3540147	.7817798	0.45	0.651	-1.178246	1.886275
coolfactor5	-1.811054	.9266087	-1.95	0.051	-3.627173	.005066
legalmusic2	-.4335413	.8927943	-0.49	0.627	-2.183386	1.316303
legalmusic3	.5086197	.914087	0.56	0.578	-1.282958	2.300197
legalmusic4	-.2709929	1.045902	-0.26	0.796	-2.320922	1.778937
legalmusic5	4.4431	2.087982	2.13	0.033	.3507309	8.53547
legalfilm2	.3283475	.9274817	0.35	0.723	-1.489483	2.146178
legalfilm3	-.1254037	1.199921	-0.10	0.917	-2.477205	2.226398
legalfilm4	.2575436	1.39558	0.18	0.854	-2.477742	2.992829
legalfilm5	-.4962865	2.026179	-0.24	0.807	-4.467524	3.474951
legaltv2	.0185676	.8045206	0.02	0.982	-1.558264	1.595399
legaltv3	.8827548	1.063899	0.83	0.407	-1.202448	2.967958
legaltv4	2.565808	1.639172	1.57	0.118	-.6469092	5.778525
legaltv5	-1.759291	2.776824	-0.63	0.526	-7.201767	3.683185
legalgames2	.1858348	.7856823	0.24	0.813	-1.354074	1.725744
legalgames3	.3453839	1.064916	0.32	0.746	-1.741813	2.432581
legalgames4	-1.114101	1.474579	-0.76	0.450	-4.004222	1.77602
legalgames5	1.451859	2.490276	0.58	0.560	-3.428993	6.332712
time1	-.6170925	.6153285	-1.00	0.316	-1.823114	.5889292
time2	-1.090712	.5942697	-1.84	0.066	-2.255459	.0740353
time3	-1.24272	.4970076	-2.50	0.012	-2.216837	-.2686032
_cons	-.7022068	1.625094	-0.43	0.666	-3.887332	2.482919
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2						
gender	-.1.212593	.5240798	-2.31	0.021	-2.23977	-.1854151
charity	.6481399	.4084455	1.59	0.113	-.1523986	1.448678
community	-.9410128	1.031244	-0.91	0.362	-2.962214	1.080188
usagemusic	-.0000167	.0000631	-0.26	0.792	-.0001404	.0001071
usagefilm	.0031739	.0113897	0.28	0.781	-.0191494	.0254972
usagetv	.0115469	.0053279	2.17	0.030	.0011044	.0219894
usagegames	.0269751	.0442708	0.61	0.542	-.0597942	.1137443
network1	.3087613	.7092983	0.44	0.663	-1.081438	1.69896
network2	1.100804	.7193578	1.53	0.126	-.3091116	2.510719
network3	.6267292	.7420454	0.84	0.398	-.827653	2.081111
network5	2.782919	1.102539	2.52	0.012	.6219827	4.943855
network6	.9043922	.7457518	1.21	0.225	-.5572545	2.366039
income2	.2254872	.5865545	0.38	0.701	-.9241384	1.375113
income3	-.5703704	.5342133	-1.07	0.286	-1.617409	.4766684
income4	-.9597317	.484754	-1.98	0.048	-1.909832	-.0096313
income5	.673946	.5742394	1.17	0.241	-.4515425	1.799434
age2	.0065487	.5280094	0.01	0.990	-1.028331	1.041428
age4	2.104134	1.037159	2.03	0.042	.0713399	4.136929
age5	.7255672	.9338661	0.78	0.437	-1.104777	2.555911
age6	-.4748473	1.513374	-0.31	0.754	-3.441005	2.491311
status1	1.610983	.8085096	1.99	0.046	.0263331	3.195633
status2	.7988741	.9330843	0.86	0.392	-1.029938	2.627686
status3	-1.772551	.8660666	-2.05	0.041	-3.47001	-.0750913
status5	-1.112995	1.958138	-0.57	0.570	-4.950875	2.724885
connection1	.2248791	1.18152	0.19	0.849	-2.090858	2.540616
connection3	.6393727	.5059638	1.26	0.206	-.3522981	1.631043
countryUS	-.4180819	.7011768	-0.60	0.551	-1.792363	.9561994
countryOther	1.166663	.5531895	2.11	0.035	.0824317	2.250895
harddisk1	1.521198	4.450253	0.34	0.732	-7.201138	10.24353
harddisk2	-.9180552	.7926672	-1.16	0.247	-2.471654	.635544
harddisk3	-.9331243	.6458936	-1.44	0.149	-2.199052	.3328038
harddisk4	-.6602559	.5967823	-1.11	0.269	-1.829928	.5094159
harddisk5	.3437159	.8251677	0.42	0.677	-1.273583	1.961015
harddisk6	-1.076244	.5653466	-1.90	0.057	-2.184303	.0318154
morals1	-.792352	1.009577	-0.78	0.433	-2.771087	1.186383
morals2	-.1167417	.7054698	-0.17	0.869	-1.499437	1.265954
morals3	-.9162864	.598497	-1.53	0.126	-2.089319	.2567461
morals4	.1704455	.4838182	0.35	0.725	-.7778208	1.118712
fairness1	-.593755	.6020212	-0.99	0.324	-1.773695	.5861848
fairness2	-1.654721	.5692282	-2.91	0.004	-2.770388	-.539054
fairness3	-.7200215	.5723336	-1.26	0.208	-1.841775	.4017317
fairness4	.5971588	.5750767	1.04	0.299	-.5299709	1.724288
reciprocity1	-.2148262	.5067639	-0.42	0.672	-1.208065	.7784128
reciprocity2	.2523117	.4727621	0.53	0.594	-.6742851	1.178908
reciprocity4	.7334988	.4817743	1.52	0.128	-.2107616	1.677759
reciprocity5	.8273038	.6673417	1.24	0.215	-.4806619	2.135269
compusageh~1	20.04617	1.664929	12.04	0.000	16.78297	23.30937
compusageh~2	.0998778	.5267152	0.19	0.850	-.932465	1.132221
compusageh~4	-.6394107	.5121607	-1.25	0.212	-1.643227	.3644057
compusageh~5	-.67203	.6318904	-1.06	0.288	-1.910512	.5664523
compusagew~1	-1.219456	.5807961	-2.10	0.036	-2.357795	-.0811166
compusagew~3	-1.235634	.5294983	-2.33	0.020	-2.273432	-.1978367
compusagew~4	-1.385684	.6403773	-2.16	0.030	-2.640801	-.1305676
compusagew~5	-1.656703	.8197938	-2.02	0.043	-3.26347	-.049937
compusage~c1	-46.83937	1.81e+09	-0.00	1.000	-3.54e+09	3.54e+09
compusage~c2	-1.438209	1.028824	-1.40	0.162	-3.454667	.5782482





status1	-1.241305	.5436556	-2.28	0.022	-2.306851	-1.1757599
status3	-1.1355024	.4980557	-0.27	0.786	-1.111674	.8406689
harddisk5	-0.6939478	.6765867	-1.03	0.305	-2.020033	.6321378
harddisk6	.9828772	.4265378	2.30	0.021	.1468785	1.818876
morals3	.2755151	.4052256	0.68	0.497	-0.5187125	1.069743
fairness1	-1.204615	.4475683	-2.69	0.007	-2.081833	-0.3273976
fairness2	.6080221	.4796249	1.27	0.205	-0.3320254	1.54807
fairness3	-0.3826679	.4821887	-0.79	0.427	-1.32774	.5624046
reciprocity1	-0.8113067	.444579	-1.82	0.068	-1.682665	.0600521
reciprocity2	-1.070666	.4364874	-2.45	0.014	-1.926166	-0.2151669
reciprocity4	-0.6158314	.4726741	-1.30	0.193	-1.542256	.3105929
compusageh~4	.8394545	.457645	1.83	0.067	-0.0575133	1.736422
compusagew~1	1.048459	.4958341	2.11	0.034	.076642	2.020276
compusagew~5	.5923933	.5431626	1.09	0.275	-0.4721858	1.656972
compusagef~1	1.894647	.6793923	2.79	0.005	.5630624	3.226231
compusagef~2	-1.280583	.5035867	-2.54	0.011	-2.267595	-0.2935717
compusagetv2	-0.7820703	.5307983	-1.47	0.141	-1.822416	.2582753
compusagetv3	.7338876	.4022888	1.82	0.068	-0.0545841	1.522359
compusageg~1	-1.423738	.6392478	-2.23	0.026	-2.676641	-0.1708357
incentive2	1.214111	.4709279	2.58	0.010	.2911096	2.137113
incentive3	.8651338	.4781321	1.81	0.070	-0.071988	1.802255
incentive4	1.160003	.536124	2.16	0.030	.1092191	2.210787
incentive5	-0.0406212	.7952296	-0.05	0.959	-1.599243	1.518
coolfactor5	1.072369	.5671104	1.89	0.059	-0.0391465	2.183885
legalmusic5	-2.862134	1.248911	-2.29	0.022	-5.309955	-0.4143132
legalfilm4	-0.7337629	.6851349	-1.07	0.284	-2.076603	.6090768
legalfilm5	-0.7713838	1.183734	-0.65	0.515	-3.09146	1.548692
legaltv5	1.710155	1.274707	1.34	0.180	-0.788226	4.208535
legalgames2	.2178536	.3976455	0.55	0.584	-0.5615172	.9972244
legalgames3	-0.6103393	.4882896	-1.25	0.211	-1.567369	.3466907
legalgames4	-0.4926444	.8733104	-0.56	0.573	-2.204301	1.219013
time1	.9615161	.4678441	2.06	0.040	.0445586	1.878474
time2	1.009364	.482551	2.09	0.036	.0635815	1.955147
time3	1.241395	.4134574	3.00	0.003	.4310335	2.051757
_cons	-0.3204512	.6742454	-0.48	0.635	-1.641948	1.001046
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2						
gender	.2371511	.430856	0.55	0.582	-0.6073111	1.081613
charity	.1202384	.2850557	0.42	0.673	-0.4384605	.6789373
<b>community</b>	<b> 1.260851</b>	<b> .588187</b>	<b> 2.14</b>	<b> 0.032</b>	<b> .1080255</b>	<b> 2.413676</b>
<b>usagemusic</b>	<b> .0007401</b>	<b> .0003224</b>	<b> 2.30</b>	<b> 0.022</b>	<b> .0001081</b>	<b> .001372</b>
usagetv	.0004926	.0021712	0.23	0.821	-0.0037629	.0047481
network2	-0.0484292	.3724071	-0.13	0.897	-0.7783338	.6814753
network5	-0.2463113	.484623	-0.51	0.611	-1.196155	.7035322
income4	-0.1922425	.345325	-0.56	0.578	-0.8690671	.4845821
status1	.233557	.3803507	0.61	0.539	-0.5119167	.9790307
<b>status3</b>	<b> -1.616345</b>	<b> .4342436</b>	<b> -3.72</b>	<b> 0.000</b>	<b> -2.467447</b>	<b> -0.7652435</b>
harddisk5	.3108773	.4371176	0.71	0.477	-0.5458573	1.167612
harddisk6	.7424483	.3648937	2.03	0.042	.0272698	1.457627
<b>morals3</b>	<b> -0.5656689</b>	<b> .3200758</b>	<b> -1.77</b>	<b> 0.077</b>	<b> -1.193006</b>	<b> .0616682</b>
<b>fairness1</b>	<b> -1.90341</b>	<b> .3423334</b>	<b> -5.56</b>	<b> 0.000</b>	<b> -2.574372</b>	<b> -1.232449</b>
<b>fairness2</b>	<b> -1.208654</b>	<b> .3830434</b>	<b> -3.16</b>	<b> 0.002</b>	<b> -1.959405</b>	<b> -0.4579024</b>
<b>fairness3</b>	<b> -1.166166</b>	<b> .3677212</b>	<b> -3.17</b>	<b> 0.002</b>	<b> -1.886887</b>	<b> -0.445446</b>
<b>reciprocity1</b>	<b> -1.329604</b>	<b> .3598036</b>	<b> -3.70</b>	<b> 0.000</b>	<b> -2.034806</b>	<b> -0.6244017</b>
<b>reciprocity2</b>	<b> -0.905264</b>	<b> .3366326</b>	<b> -2.69</b>	<b> 0.007</b>	<b> -1.565052</b>	<b> -0.2454763</b>
reciprocity4	.0555873	.3636286	0.15	0.879	-0.6571117	.7682863
compusageh~4	.596803	.3652169	1.63	0.102	-0.1190089	1.312615
compusagew~1	.700454	.4186334	1.67	0.094	-0.1200524	1.52096
compusagew~5	-0.20781	.4199314	-0.49	0.621	-1.03086	.6152403
compusagef~1	-0.6736684	.596635	-1.13	0.259	-1.843051	.4957147
compusagef~2	.0122789	.341416	0.04	0.971	-0.6568841	.6814419
compusagetv2	.1067865	.373118	0.29	0.775	-0.6245113	.8380842
compusagetv3	.1256933	.3330452	0.38	0.706	-0.5270633	.7784498
compusageg~1	.3453154	.4139871	0.83	0.404	-0.4660844	1.156715
<b>incentive2</b>	<b> .7385604</b>	<b> .3840039</b>	<b> 1.92</b>	<b> 0.054</b>	<b> -0.0140734</b>	<b> 1.491194</b>
<b>incentive3</b>	<b> .1462655</b>	<b> .389247</b>	<b> 0.38</b>	<b> 0.707</b>	<b> -0.6166446</b>	<b> .9091756</b>
<b>incentive4</b>	<b> .8584719</b>	<b> .4447884</b>	<b> 1.93</b>	<b> 0.054</b>	<b> -0.0132973</b>	<b> 1.730241</b>
<b>incentive5</b>	<b> 1.49447</b>	<b> .5646207</b>	<b> 2.65</b>	<b> 0.008</b>	<b> .3878335</b>	<b> 2.601106</b>
coolfactor5	-0.5284298	.4929784	1.07	0.284	-0.4377902	1.49465
<b>legalmusic5</b>	<b> -1.869868</b>	<b> .6791277</b>	<b> -2.75</b>	<b> 0.006</b>	<b> -3.200934</b>	<b> -0.5388021</b>
legalfilm4	.4060911	.5031589	0.81	0.420	-0.5800822	1.392264
legalfilm5	.8068239	.772882	1.04	0.297	-0.7079969	2.321645
legaltv5	-1.459033	.9348867	-1.56	0.119	-3.291377	.3733115
<b>legalgames2</b>	<b> -0.8129516</b>	<b> .3159985</b>	<b> -2.57</b>	<b> 0.010</b>	<b> -1.432297</b>	<b> -0.1936059</b>
<b>legalgames3</b>	<b> -1.532806</b>	<b> .3770009</b>	<b> -4.07</b>	<b> 0.000</b>	<b> -2.271715</b>	<b> -0.7938981</b>
<b>legalgames4</b>	<b> -1.883828</b>	<b> .6105616</b>	<b> -3.09</b>	<b> 0.002</b>	<b> -3.080507</b>	<b> -0.687149</b>
time1	-0.0068552	.3698802	-0.02	0.985	-0.731807	.7180966
time2	.5190087	.3896155	1.33	0.183	-0.2446236	1.282641
time3	.4729804	.3279476	1.44	0.149	-0.169785	1.115746
_cons	2.166349	.530155	4.09	0.000	1.127265	3.205434

(Outcome behaviour==1 is the comparison group)

**Table A3.1, Sharing Behaviour Odds-Ratios**

Significant effects for each outcome have been highlighted in bold.

	Free-rider (vs Casual Sharer)		Active Sharer (vs Casual Sharer)		Active Sharer (vs Free-Rider)	
	Beta	Odds	Beta	Odds	Beta	Odds
gender	<b>-1.68</b>	<b>0.19</b>	<b>-1.45</b>	<b>0.24</b>	0.24	1.27
charity	<b>0.63</b>	<b>1.88</b>	<b>0.77</b>	<b>2.15</b>	0.12	1.13
community	<b>-2.55</b>	<b>0.08</b>	-1.38	0.25	<b>1.26</b>	<b>3.53</b>
usagemusic	<b>0.00</b>	<b>1.00</b>	0.00	1.00	<b>0.00</b>	<b>1.00</b>
usagetv	<b>0.01</b>	<b>1.01</b>	<b>0.01</b>	<b>1.01</b>	0.00	1.00
network2	0.69	1.99	0.63	1.87	-0.05	0.95
network5	<b>2.96</b>	<b>19.25</b>	<b>2.77</b>	<b>16.02</b>	-0.25	0.78
income4	<b>-1.15</b>	<b>0.32</b>	<b>-1.34</b>	<b>0.26</b>	-0.19	0.83
status1	<b>1.30</b>	<b>3.67</b>	<b>1.53</b>	<b>4.63</b>	0.23	1.26
status3	0.27	1.31	<b>-1.33</b>	<b>0.26</b>	-1.62	0.20
harddisk5	0.73	2.08	1.02	2.79	0.31	1.36
harddisk6	<b>-1.02</b>	<b>0.36</b>	<b>-0.27</b>	<b>0.76</b>	0.74	2.10
morals3	-0.30	0.74	<b>-0.86</b>	<b>0.42</b>	<b>-0.57</b>	<b>0.57</b>
fairness1	<b>1.16</b>	<b>3.20</b>	<b>-0.74</b>	<b>0.48</b>	<b>-1.90</b>	<b>0.15</b>
fairness2	-0.68	0.50	<b>-1.88</b>	<b>0.15</b>	<b>-1.21</b>	<b>0.30</b>
fairness3	0.30	1.34	<b>-0.87</b>	<b>0.42</b>	<b>-1.17</b>	<b>0.31</b>
reciprocity1	<b>0.77</b>	<b>2.17</b>	-0.54	0.58	<b>-1.33</b>	<b>0.26</b>
reciprocity2	<b>1.04</b>	<b>2.82</b>	0.13	1.14	<b>-0.91</b>	<b>0.40</b>
reciprocity4	0.54	1.72	0.59	1.81	0.06	1.06
compusagehome4	<b>-0.89</b>	<b>0.41</b>	-0.29	0.75	0.60	1.82
compusagework1	<b>-1.06</b>	<b>0.35</b>	-0.38	0.68	0.70	2.01
compusagework5	-0.66	0.52	<b>-0.87</b>	<b>0.42</b>	-0.21	0.81
compusagefilm1	<b>-2.03</b>	<b>0.13</b>	<b>-2.72</b>	<b>0.07</b>	-0.67	0.51
compusagefilm2	<b>1.21</b>	<b>3.36</b>	<b>1.23</b>	<b>3.43</b>	0.01	1.01
compusagetv2	0.74	2.10	<b>0.85</b>	<b>2.35</b>	0.11	1.11
compusagetv3	<b>-0.79</b>	<b>0.45</b>	<b>-0.67</b>	<b>0.51</b>	0.13	1.13
compusagegames1	<b>1.42</b>	<b>4.12</b>	<b>1.75</b>	<b>5.78</b>	0.35	1.41
incentive2	<b>-1.18</b>	<b>0.31</b>	-0.44	0.64	<b>0.74</b>	<b>2.09</b>
incentive3	<b>-0.89</b>	<b>0.41</b>	<b>-0.76</b>	<b>0.47</b>	0.15	1.16
incentive4	<b>-1.06</b>	<b>0.35</b>	-0.21	0.81	<b>0.86</b>	<b>2.36</b>
incentive5	0.39	1.48	<b>1.86</b>	<b>6.45</b>	<b>1.49</b>	<b>4.46</b>
coolfactor5	<b>-1.20</b>	<b>0.30</b>	<b>-0.66</b>	<b>0.52</b>	0.53	1.70
legalmusic5	<b>3.37</b>	<b>29.11</b>	1.52	4.58	<b>-1.87</b>	<b>0.15</b>
legalfilm4	0.93	2.54	<b>1.34</b>	<b>3.83</b>	0.41	1.50
legalfilm5	0.88	2.42	1.72	5.56	0.81	2.24
legaltv5	-1.86	0.16	<b>-3.23</b>	<b>0.04</b>	-1.46	0.23
legalgames2	-0.22	0.81	<b>-1.03</b>	<b>0.36</b>	<b>-0.81</b>	<b>0.44</b>
legalgames3	0.60	1.82	<b>-0.93</b>	<b>0.39</b>	<b>-1.53</b>	<b>0.22</b>
legalgames4	0.27	1.30	<b>-1.62</b>	<b>0.20</b>	<b>-1.88</b>	<b>0.15</b>
time1	<b>-0.95</b>	<b>0.39</b>	<b>-0.87</b>	<b>0.42</b>	-0.01	0.99
time2	<b>-0.97</b>	<b>0.38</b>	-0.44	0.65	0.52	1.68
time3	<b>-1.16</b>	<b>0.31</b>	<b>-0.69</b>	<b>0.50</b>	0.47	1.60

**Regression A3.4, Music sharing on FastTrack**

Ordered logit estimates Number of obs = 92  
LR chi2(25) = 78.18  
Prob > chi2 = 0.0000  
Pseudo R2 = 0.2672  
 Log likelihood = -107.19168

fasttracks~c	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
<b>gender</b>	<b>-1.415914</b>	<b>.7693192</b>	<b>-1.84</b>	<b>0.066</b>	<b>-2.923752</b>	<b>.0919242</b>
<b>age</b>	<b>.9403618</b>	<b>.5472011</b>	<b>1.72</b>	<b>0.086</b>	<b>-.1321326</b>	<b>2.012856</b>
income	-.1072218	.1643681	-0.65	0.514	-.4293774	.2149337
charity	.2184663	.5979575	0.37	0.715	-.953509	1.390441
<b>harddisk</b>	<b>.3411988</b>	<b>.1733122</b>	<b>1.97</b>	<b>0.049</b>	<b>.0015131</b>	<b>.6808845</b>
compusageh~e	-.5560952	.3488254	-1.59	0.111	-1.23978	.12759
compusagew~k	-.1965875	.2634051	-0.75	0.455	-.712852	.3196771
<b>compusagem~c</b>	<b>1.601199</b>	<b>.5094879</b>	<b>3.14</b>	<b>0.002</b>	<b>.6026208</b>	<b>2.599777</b>
fasttrackt~e	.3464621	.3455697	1.00	0.316	-.3308421	1.023766
<b>fasttracku~c</b>	<b>.0048675</b>	<b>.0012631</b>	<b>3.85</b>	<b>0.000</b>	<b>.0023918</b>	<b>.0073431</b>
fasttrackr~y	.0384807	.2382687	0.16	0.872	-.4285173	.5054788
<b>fasttracki~e</b>	<b>-.3690181</b>	<b>.189852</b>	<b>-1.94</b>	<b>0.052</b>	<b>-.7411211</b>	<b>.003085</b>
fasttrackl~c	.2674891	.2211476	1.21	0.226	-.1659522	.7009305
fairness	-.0343734	.2009304	-0.17	0.864	-.4281897	.359443
<b>morals</b>	<b>.9049904</b>	<b>.2657708</b>	<b>3.41</b>	<b>0.001</b>	<b>.3840892</b>	<b>1.425892</b>
coolfactor	-.2073054	.2182358	-0.95	0.342	-.6350398	.220429
fairness2	-.0692911	.2410324	-0.29	0.774	-.5417059	.4031238
countryUS	1.13239	1.292004	0.88	0.381	-1.399892	3.664671
countryOther	-.1796911	.8328252	-0.22	0.829	-1.811998	1.452616
<b>connection1</b>	<b>3.101856</b>	<b>1.624567</b>	<b>1.91</b>	<b>0.056</b>	<b>-.0822379</b>	<b>6.285949</b>
connection3	.6628728	.6164054	1.08	0.282	-.5452596	1.871005
status1	-1.519148	1.429532	-1.06	0.288	-4.32098	1.282684
<b>status2</b>	<b>-3.446209</b>	<b>1.71654</b>	<b>-2.01</b>	<b>0.045</b>	<b>-6.810565</b>	<b>-.0818525</b>
status3	.2942185	1.788954	0.16	0.869	-3.212066	3.800503
status5	36.62072	1.02e+08	0.00	1.000	-2.00e+08	2.00e+08
-----						
_cut1	9.17408	2.9246	(Ancillary parameters)			
_cut2	10.61754	2.963114				
_cut3	11.92218	3.02333				
_cut4	13.13629	3.090232				

note: 3 observations completely determined. Standard errors questionable.

**Regression A3.5, Music Sharing on Edonkey**

Ordered logit estimates Number of obs = 58  
LR chi2(24) = 61.27  
Prob > chi2 = 0.0000  
Pseudo R2 = 0.3552  
 Log likelihood = -55.618236

edonkeysha~c	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
<b>age</b>	<b>1.815698</b>	<b>.7537893</b>	<b>2.41</b>	<b>0.016</b>	<b>.3382982</b>	<b>3.293098</b>
income	-.2293264	.268363	-0.85	0.393	-.7553081	.2966553
charity	-.16056	.8531916	-0.19	0.851	-1.832785	1.511665
<b>harddisk</b>	<b>-.9066251</b>	<b>.3494991</b>	<b>-2.59</b>	<b>0.009</b>	<b>-1.591631</b>	<b>-.2216196</b>
<b>compusageh~e</b>	<b>1.374341</b>	<b>.4998963</b>	<b>2.75</b>	<b>0.006</b>	<b>.3945623</b>	<b>2.35412</b>
compusagew~k	-.0252497	.3500598	-0.07	0.942	-.7113543	.660855
compusagem~c	.8892266	.6247035	1.42	0.155	-.3351697	2.113623
edonkeytime	-.1042308	.5064621	-0.21	0.837	-1.096878	.8884167
<b>edonkeyusa~c</b>	<b>.000577</b>	<b>.0002264</b>	<b>2.55</b>	<b>0.011</b>	<b>.0001333</b>	<b>.0010206</b>
edonkeyrec~y	-.5189073	.3496182	-1.48	0.138	-1.204146	.1663317
edonkeyinc~e	.0239328	.2894233	0.08	0.934	-.5433265	.5911921
<b>edonkeyleg~c</b>	<b>-.7334363</b>	<b>.3410236</b>	<b>-2.15</b>	<b>0.032</b>	<b>-1.40183</b>	<b>-.0650424</b>
fairness	-.0928068	.3390147	-0.27	0.784	-.7572633	.5716498
<b>morals</b>	<b>2.563919</b>	<b>.697285</b>	<b>3.68</b>	<b>0.000</b>	<b>1.197266</b>	<b>3.930572</b>
coolfactor	-.2747767	.3028557	-0.91	0.364	-.868363	.3188096
<b>fairness2</b>	<b>2.096265</b>	<b>.613522</b>	<b>3.42</b>	<b>0.001</b>	<b>.8937844</b>	<b>3.298746</b>
countryUS	-.8669428	1.076572	-0.81	0.421	-2.976985	1.2431
countryOther	.5416746	.9711958	0.56	0.577	-1.361834	2.445183
<b>connection1</b>	<b>4.89636</b>	<b>2.206682</b>	<b>2.22</b>	<b>0.026</b>	<b>.5713429</b>	<b>9.221377</b>
connection3	.9056012	.9676838	0.94	0.349	-.9910243	2.802227
<b>status1</b>	<b>-3.154266</b>	<b>1.685877</b>	<b>-1.87</b>	<b>0.061</b>	<b>-6.458524</b>	<b>.1499925</b>
status2	-2.004086	1.755858	-1.14	0.254	-5.445504	1.437332
<b>status3</b>	<b>-3.49611</b>	<b>1.81503</b>	<b>-1.93</b>	<b>0.054</b>	<b>-7.053503</b>	<b>.0612832</b>
status5	31.1884	1.70e+08	0.00	1.000	-3.34e+08	3.34e+08
-----						
_cut1	10.23692	3.76005	(Ancillary parameters)			
_cut2	11.75853	3.880439				
_cut3	13.45973	4.02835				
_cut4	14.21526	4.068101				

note: 2 observations completely determined. Standard errors questionable.

### Regression A3.6, Music Sharing on Gnutella

Ordered logit estimates Number of obs = 45  
LR chi2(25) = 59.60  
Prob > chi2 = 0.0001  
 Log likelihood = -40.249703 Pseudo R2 = 0.4254

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
gnutellash~c						
gender	-.2031265	2.747724	-0.07	0.941	-5.588567	5.182314
age	<b>1.588897</b>	<b>.791684</b>	<b>2.01</b>	<b>0.045</b>	<b>.0372253</b>	<b>3.14057</b>
income	<b>-1.57104</b>	<b>.5179605</b>	<b>-3.03</b>	<b>0.002</b>	<b>-2.586224</b>	<b>-.5558564</b>
charity	<b>4.2362</b>	<b>1.492879</b>	<b>2.84</b>	<b>0.005</b>	<b>1.310211</b>	<b>7.162189</b>
harddisk	<b>-1.49243</b>	<b>.4285138</b>	<b>-3.48</b>	<b>0.000</b>	<b>-2.332302</b>	<b>-.6525586</b>
compusageh~e	<b>2.121778</b>	<b>.8186481</b>	<b>2.59</b>	<b>0.010</b>	<b>.5172569</b>	<b>3.726299</b>
compusagem~k	<b>1.616193</b>	<b>.6815083</b>	<b>2.37</b>	<b>0.018</b>	<b>.2804615</b>	<b>2.951925</b>
compusagem~c	.7549323	.874183	0.86	0.388	-.9584348	2.468299
gnutellatime	.363288	.4961005	0.73	0.464	-.609051	1.335627
gnutellaus~c	<b>.0065456</b>	<b>.0023645</b>	<b>2.77</b>	<b>0.006</b>	<b>.0019112</b>	<b>.01118</b>
gnutellare~y	-.9991455	.6744316	-1.48	0.138	-2.321007	.3227162
gnutellain~e	<b>-1.725102</b>	<b>.6933308</b>	<b>-2.49</b>	<b>0.013</b>	<b>-3.084005</b>	<b>-.3661984</b>
gnutellale~c	<b>1.500642</b>	<b>.5705793</b>	<b>2.63</b>	<b>0.009</b>	<b>.3823271</b>	<b>2.618957</b>
fairness	.5305383	.4788343	1.11	0.268	-.4079596	1.469036
morals	<b>2.427028</b>	<b>.9966432</b>	<b>2.44</b>	<b>0.015</b>	<b>.4736433</b>	<b>4.380413</b>
coolfactor	-.7264589	.5974108	-1.22	0.224	-1.897363	.4444449
fairness2	.3958032	.632583	0.63	0.532	-.8440367	1.635643
countryUS	-.5955683	2.138556	-0.28	0.781	-4.787061	3.595924
countryOther	1.70994	1.581934	1.08	0.280	-1.390594	4.810474
connection1	<b>-9.926485</b>	<b>3.538702</b>	<b>-2.81</b>	<b>0.005</b>	<b>-16.86221</b>	<b>-2.990757</b>
connection3	<b>-2.57778</b>	<b>1.260035</b>	<b>-2.05</b>	<b>0.041</b>	<b>-5.047404</b>	<b>-.1081566</b>
status1	-.578608	1.718947	-0.34	0.736	-3.947683	2.790467
status2	.0791953	2.206629	0.04	0.971	-4.245717	4.404108
status3	<b>14.00998</b>	<b>4.155188</b>	<b>3.37</b>	<b>0.001</b>	<b>5.865959</b>	<b>22.154</b>
status5	45.449	3.35e+07	0.00	1.000	-6.57e+07	6.57e+07
-----						
_cut1	12.62189	4.667423	(Ancillary parameters)			
_cut2	14.01159	4.754884				
_cut3	16.43862	4.988411				
_cut4	18.35321	5.222505				

note: 2 observations completely determined. Standard errors questionable.

### Regression A3.7, Music Sharing on DirectConnect

Ordered logit estimates Number of obs = 133  
LR chi2(26) = 83.31  
Prob > chi2 = 0.0000  
 Log likelihood = -158.17133 Pseudo R2 = 0.2085

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dire~remusic						
gender	.292885	.575748	0.51	0.611	-.8355603	1.421133
age	.4523749	.4023113	1.12	0.261	-.3361407	1.24089
income	.0536411	.1202118	0.45	0.655	-.1819697	.2892518
charity	-.1407454	.4736695	-0.30	0.766	-1.069121	.7876298
harddisk	<b>.3844734</b>	<b>.128012</b>	<b>3.00</b>	<b>0.003</b>	<b>.1335745</b>	<b>.6353722</b>
compusageh~e	.2923786	.2382778	1.23	0.220	-.1746373	.7593946
compusagem~k	.0213523	.210457	0.10	0.919	-.3911359	.4338405
compusagem~c	<b>1.188244</b>	<b>.3383864</b>	<b>3.51</b>	<b>0.000</b>	<b>.5250189</b>	<b>1.851469</b>
directcon~me	-.1127912	.1734147	-0.65	0.515	-.4526777	.2270953
dire~gemusic	<b>.0004345</b>	<b>.0002066</b>	<b>2.10</b>	<b>0.035</b>	<b>.0000296</b>	<b>.0008393</b>
directconn~y	<b>.3094651</b>	<b>.1711466</b>	<b>1.81</b>	<b>0.071</b>	<b>-.025976</b>	<b>.6449063</b>
directcon~ve	-.0268802	.1681791	-0.16	0.873	-.3565052	.3027447
direc~lmusic	-.2737281	.2196934	-1.25	0.213	-.7043193	.156863
fairness	.0029702	.1580372	0.02	0.985	-.3067769	.3127174
morals	<b>.6515147</b>	<b>.2415992</b>	<b>2.70</b>	<b>0.007</b>	<b>.1779889</b>	<b>1.125041</b>
coolfactor	.0106401	.1759934	0.06	0.952	-.3343007	.3555808
fairness2	-.0933399	.2219471	-0.42	0.674	-.5283482	.3416683
countryUS	.6184093	1.450894	0.43	0.670	-2.22529	3.462109
countryOther	.0304639	.5906083	0.05	0.959	-1.127107	1.188035
connection1	31.81163	1.02e+07	0.00	1.000	-1.99e+07	1.99e+07
connection3	-.7382007	.6458894	-1.14	0.253	-2.004121	.5277192
status1	.2900449	1.223833	0.24	0.813	-2.108623	2.688713
status2	-.9680711	1.574069	-0.62	0.539	-4.05319	2.117048
status3	1.563451	1.78398	0.88	0.381	-1.933087	5.059988
status5	<b>-3.966011</b>	<b>2.0451</b>	<b>-1.94</b>	<b>0.052</b>	<b>-7.974333</b>	<b>.042311</b>
directconn~t	1.349249	.9481041	1.42	0.155	-.5090009	3.207499
-----						
_cut1	7.76589	2.025059	(Ancillary parameters)			
_cut2	8.998128	2.064338				
_cut3	10.42292	2.122777				

\_cut4 | 11.37538 2.156915

note: 2 observations completely determined. Standard errors questionable.

**Regression A3.8, Music Sharing on WinMX**

Ordered logit estimates Number of obs = 41  
LR chi2(25) = 62.87  
Prob > chi2 = 0.0000  
Pseudo R2 = 0.4793

Log likelihood = -34.143413

winmxshare~c	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
gender	-1.198247	1.433304	-0.84	0.403	-4.006953	1.61046
age	<b>-2.066627</b>	<b>1.07137</b>	<b>-1.93</b>	<b>0.054</b>	<b>-4.166474</b>	<b>.0332188</b>
income	-.2455972	.3671085	-0.67	0.503	-.9651166	.4739221
charity	<b>3.194803</b>	<b>1.522366</b>	<b>2.10</b>	<b>0.036</b>	<b>.21102</b>	<b>6.178586</b>
harddisk	- .7113662	.4281091	-1.66	0.097	-1.550445	.1277122
compusageh~e	-1.641054	.8288319	-1.98	0.048	-3.265535	-.0165736
compusagew~k	<b>3.149471</b>	<b>.9480824</b>	<b>3.32</b>	<b>0.001</b>	<b>1.291263</b>	<b>5.007678</b>
compusagem~c	<b>3.434357</b>	<b>1.086934</b>	<b>3.16</b>	<b>0.002</b>	<b>1.304006</b>	<b>5.564707</b>
winmxtime	<b>2.053264</b>	<b>.8349917</b>	<b>2.46</b>	<b>0.014</b>	<b>.4167104</b>	<b>3.689818</b>
winmxusage~c	<b>.0115512</b>	<b>.003223</b>	<b>3.58</b>	<b>0.000</b>	<b>.0052343</b>	<b>.0178682</b>
winmxrecip~y	<b>-2.019778</b>	<b>.8070104</b>	<b>-2.50</b>	<b>0.012</b>	<b>-3.601489</b>	<b>-.4380667</b>
winmxincen~e	.7753566	.7002269	1.11	0.268	-.597063	2.147776
winmxlegal~c	.7217748	.7351804	0.98	0.326	-.7191523	2.162702
fairness	-.0524392	.5147631	-0.10	0.919	-1.061356	.9564781
morals	1.233844	.7907834	1.56	0.119	-.3160628	2.783751
coolfactor	<b>1.142842</b>	<b>.5326844</b>	<b>2.15</b>	<b>0.032</b>	<b>.0987999</b>	<b>2.186884</b>
fairness2	-1.029793	.7077542	-1.46	0.146	-2.416966	.3573793
countryUS	-1.424099	1.311985	-1.09	0.278	-3.995542	1.147345
countryOther	<b>-2.815443</b>	<b>1.275816</b>	<b>-2.21</b>	<b>0.027</b>	<b>-5.315996</b>	<b>-.3148906</b>
connection1	<b>6.688054</b>	<b>3.07034</b>	<b>2.18</b>	<b>0.029</b>	<b>.6702979</b>	<b>12.70581</b>
connection3	-2.466314	1.846941	-1.34	0.182	-6.086251	1.153623
status1	<b>6.942575</b>	<b>2.63239</b>	<b>2.64</b>	<b>0.008</b>	<b>1.783185</b>	<b>12.10197</b>
status2	<b>8.38897</b>	<b>3.224728</b>	<b>2.60</b>	<b>0.009</b>	<b>2.068619</b>	<b>14.70932</b>
status3	.3975411	1.640739	0.24	0.809	-2.818248	3.61333
status5	2.270877	4.519582	0.50	0.615	-6.587341	11.1291
(Ancillary parameters)						
_cut1	12.91568	4.95002				
_cut2	14.90859	5.111337				
_cut3	17.4171	5.44328				
_cut4	21.06695	5.853913				

note: 2 observations completely determined. Standard errors questionable.

**Regression A3.9, Music Sharing on FastTrack (2)**

Ordered logit estimates Number of obs = 92  
LR chi2(13) = 99.48  
Prob > chi2 = 0.0000  
Pseudo R2 = 0.3400

Log likelihood = -96.542562

fasttracks~c	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
gender	-1.630843	.6503164	-2.51	0.012	-2.90544	-.3562467
age	1.49849	.4360804	3.44	0.001	.643788	2.353192
harddisk5	2.774677	1.001961	2.77	0.006	.8108689	4.738485
compusagew~3	1.947341	.6110949	3.19	0.001	.7496174	3.145065
compusagew~4	-1.787857	.7240513	-2.47	0.014	-3.206972	-.3687426
compusagem~c	2.232428	.5101585	4.38	0.000	1.232535	3.23232
fasttracku~c	.0038634	.0010469	3.69	0.000	.0018116	.0059153
fasttracki~e	-.4400508	.183994	-2.39	0.017	-.8006725	-.0794292
fairness2	1.598348	.5981166	2.67	0.008	.4260607	2.770635
morals	1.251694	.2695963	4.64	0.000	.7232952	1.780093
connection1	2.853618	1.35854	2.10	0.036	.1909279	5.516308
status1	-2.699592	1.091329	-2.47	0.013	-4.838557	-.5606272
status2	-4.990834	1.612557	-3.09	0.002	-8.151387	-1.830281
(Ancillary parameters)						
_cut1	12.82573	2.618842				
_cut2	14.6184	2.722622				
_cut3	16.22524	2.829078				
_cut4	17.66946	2.933674				

note: 2 observations completely determined. Standard errors questionable.



**Table A3.2, Test of Aggregation**

	<b>Unrestricted Log L</b>	<b>Unrestricted Obs</b>	<b>Unrestricted Vars</b>
FastTrack	-107.191680	92	25
Edonkey	-55.618236	58	25
Gnutella	-40.249703	45	25
DirectConnect	-158.171330	133	25
WinMX	-34.143413	41	25
<b>Total</b>	<b>-395.374362</b>	<b>369</b>	<b>125</b>
<b>Restricted</b>	<b>-495.498960</b>	<b>369</b>	<b>25</b>

Likelihood Ratio Test:  $-2(LR - LU) = -2(-495.498960 - (-395.37436)) = 200.249196$

Chi2(df=100,5%) = 124.342

Reject hypothesis that there are no differences between networks.

**Regression A3.12, Aggregate Music Sharing**

Ordered logit estimates	Number of obs	=	401
	LR chi2(73)	=	274.05
	Prob > chi2	=	0.0000
Log likelihood = -490.84672	Pseudo R2	=	0.2182

sharemusic	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
gender	-.4355158	.396662	-1.10	0.272	-1.212959 .3419274
charity	.1563831	.3009701	0.52	0.603	-.4335075 .7462738
community	-.1345782	.5842713	-0.23	0.818	-1.279729 1.010572
usagemusic	.00057	.0001389	4.10	0.000	.0002978 .0008422
network1	-.7153159	.5777362	-1.24	0.216	-1.847658 .4170264
network2	-1.546117	.5693189	-2.72	0.007	-2.661961 -.4302723
network3	-1.086602	.5764596	-1.88	0.059	-2.216442 .043238
network6	-.6432986	.5919184	-1.09	0.277	-1.803437 .51684
network7	-.044556	.6418389	-0.07	0.945	-1.302537 1.213425
income2	.472527	.3853869	1.23	0.220	-.2828174 1.227871
income3	-.2812732	.3780945	-0.74	0.457	-1.022325 .4597785
income4	-.3354107	.3727174	-0.90	0.368	-1.065923 .3951021
income5	.0896924	.3602638	0.25	0.803	-.6164118 .7957965
age2	-.6622248	.3523816	-1.88	0.060	-1.35288 .0284305
age4	.5656062	.5202392	1.09	0.277	-.4540439 1.585256
age5	.8643652	.7101451	1.22	0.224	-.5274935 2.256224
age6	2.06216	.9513788	2.17	0.030	.1974923 3.926829
status1	-.4580899	.5576583	-0.82	0.411	-1.55108 .6349002
status2	-1.155852	.7184715	-1.61	0.108	-2.564031 .2523261
status3	.1310834	.6216567	0.21	0.833	-1.087341 1.349508
status5	-.2255928	1.340845	-0.17	0.866	-2.853601 2.402415
connection1	2.263912	.8754775	2.59	0.010	.5480073 3.979816
connection3	.7146405	.3610274	1.98	0.048	.0070398 1.422241
countryUS	-.0132497	.4479037	-0.03	0.976	-.8911249 .8646254
countryOther	.6844839	.3570829	1.92	0.055	-.0153858 1.384354
harddisk1	-2.68111	1.440253	-1.86	0.063	-5.503954 .1417342
harddisk2	-.939865	.5142482	-1.83	0.068	-1.947773 .068043
harddisk3	-.5335988	.3864618	-1.38	0.167	-1.29105 .2238524
harddisk4	.4620846	.4623579	1.00	0.318	-.4441203 1.368289
harddisk5	1.471415	.4874339	3.02	0.003	.5160626 2.426768
harddisk6	.29593	.4076162	0.73	0.468	-.502983 1.094843
morals1	-6.519593	1.45732	-4.47	0.000	-9.375889 -3.663298
morals2	-1.848406	.5527217	-3.34	0.001	-2.931721 -.7650918
morals3	-1.64392	.4272067	-3.85	0.000	-2.48123 -.8066105
morals4	-.7285267	.3041651	-2.40	0.017	-1.324679 -.1323741
coolfactor2	.0368221	.3864298	0.10	0.924	-.7205664 .7942106
coolfactor3	.4624528	.3866912	1.20	0.232	-.295448 1.220353
coolfactor4	1.244732	.4230778	2.94	0.003	.4155145 2.073949
coolfactor5	.5246495	.4588939	1.14	0.253	-.3747661 1.424065
compusage~c2	-5.521935	1.389569	-3.97	0.000	-8.245441 -2.79843
compusage~c3	-1.863255	.4355205	-4.28	0.000	-2.716859 -1.00965
compusage~c4	-1.452104	.3463589	-4.19	0.000	-2.130955 -.7732532
compusageh~1	3.845823	1.859359	2.07	0.039	.2015468 7.4901
compusageh~2	-.0545923	.3401369	-0.16	0.872	-.7212484 .6120637
compusageh~4	.2965054	.3423385	0.87	0.386	-.3744657 .9674766

compusageh~5		.4567019	.4316943	1.06	0.290	-.3894033	1.302807
compusagew~1		-.0053406	.4430711	-0.01	0.990	-.8737439	.8630628
compusagew~3		.4639004	.3692452	1.26	0.209	-.2598069	1.187608
compusagew~4		-.5539148	.4178892	-1.33	0.185	-1.372962	.2651329
compusagew~5		.9414023	.567004	1.66	0.097	-.1699051	2.05271
fairness1		.1000022	.4491735	0.22	0.824	-.7803617	.980366
fairness2		.0872139	.404285	0.22	0.829	-.7051702	.879598
fairness3		.3977651	.3979642	1.00	0.318	-.3822304	1.177761
fairness4		-.1950841	.3341933	-0.58	0.559	-.8500909	.4599227
fairnesstwo2		.3963484	.2964512	1.34	0.181	-.1846853	.9773821
fairnesstwo3		.7448958	.3698284	2.01	0.044	.0200455	1.469746
fairnesstwo4		.7553846	.6494189	1.16	0.245	-.5174531	2.028222
fairnesstwo5		-1.062281	.8131757	-1.31	0.191	-2.656076	.5315142
reciprocity1		.3930313	.4070599	0.97	0.334	-.4047914	1.190854
reciprocity2		.1603836	.3720975	0.43	0.666	-.5689141	.8896812
reciprocity3		-.6610325	.2946753	-2.24	0.025	-1.238586	-.0834794
reciprocity5		-.5356965	.3507089	-1.53	0.127	-1.223073	.1516804
legalmusic2		.0832802	.2989309	0.28	0.781	-.5026135	.669174
legalmusic3		-.5773931	.3684909	-1.57	0.117	-1.299622	.1448358
legalmusic4		.4678094	.4599572	1.02	0.309	-.4336902	1.369309
legalmusic5		-1.178891	.8187364	-1.44	0.150	-2.783585	.4258024
incentive2		.4376058	.340411	1.29	0.199	-.2295875	1.104799
incentive3		.3640038	.3301695	1.10	0.270	-.2831165	1.011124
incentive4		.0626183	.3476838	0.18	0.857	-.6188294	.744066
incentive5		.5304064	.444569	1.19	0.233	-.3409329	1.401746
time1		-.1724381	.3576153	-0.48	0.630	-.8733511	.5284749
time2		.403907	.3297044	1.23	0.221	-.2423017	1.050116
time3		-.4066958	.3041565	-1.34	0.181	-1.002832	.1894399
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_cut1		-2.296182	.8927153				(Ancillary parameters)
_cut2		-1.108195	.8882177				
_cut3		.2260671	.8903072				
_cut4		1.201556	.8919275				

note: 3 observations completely determined. Standard errors questionable.

### Regression A3.13, Aggregate Music Sharing (Sig. Variables Only)

Ordered logit estimates	Number of obs	=	401
	LR chi2(23)	=	221.18
	Prob > chi2	=	0.0000
Log likelihood = -517.28373	Pseudo R2	=	0.1761

sharemusic	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]		
usagemusic		.0005144	.0001244	4.14	0.000	.0002706	.0007582
network2		-1.05685	.3095895	-3.41	0.001	-1.663634	-.4500659
network3		-.7538921	.3208511	-2.35	0.019	-1.382749	-.1250355
age2		-.647842	.2552849	-2.54	0.011	-1.148191	-.1474928
age6		1.377276	.7377111	1.87	0.062	-.0686114	2.823163
connection3		.6951165	.226598	3.07	0.002	.2509926	1.13924
countryOther		.7078916	.2670272	2.65	0.008	.184528	1.231255
harddisk2		-1.108628	.3864243	-2.87	0.004	-1.866006	-.3512504
harddisk3		-.7993752	.2401825	-3.33	0.001	-1.270124	-.3286262
harddisk5		1.037756	.36543	2.84	0.005	.3215264	1.753985
morals1		-5.576921	1.189559	-4.69	0.000	-7.908414	-3.245428
morals2		-2.175712	.4380149	-4.97	0.000	-3.034206	-1.317219
morals3		-1.558146	.3222078	-4.84	0.000	-2.189662	-.9266305
morals4		-1.005196	.2341281	-4.29	0.000	-1.464079	-.5463135
coolfactor4		.9025656	.2707352	3.33	0.001	.3719343	1.433197
compusage~c2		-4.381432	1.187324	-3.69	0.000	-6.708545	-2.054319
compusage~c3		-1.677464	.3647744	-4.60	0.000	-2.392409	-.9625196
compusage~4		-1.639268	.2740496	-5.98	0.000	-2.176395	-1.10214
compusageh~1		2.980292	1.602532	1.86	0.063	-.1606129	6.121196
compusagew~4		-.7358662	.3064514	-2.40	0.016	-1.3365	-.1352326
reciprocity3		-.4779362	.2254989	-2.12	0.034	-.9199059	-.0359666
legalmusic5		-1.192144	.7234808	-1.65	0.099	-2.610141	.225852
time2		.5835251	.2454035	2.38	0.017	.1025431	1.064507
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_cut1		-3.01235	.3157648				(Ancillary parameters)
_cut2		-1.92329	.2942933				
_cut3		-.731686	.2779444				
_cut4		.1458539	.2740421				

note: 3 observations completely determined. Standard errors questionable.

**Regression A3.14, Aggregate Film Sharing**

Ordered logit estimates

Number of obs = 284  
 LR chi2(73) = 239.11  
 Prob > chi2 = 0.0000  
 Pseudo R2 = 0.3700

Log likelihood = -203.52338

sharefilm	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
gender	.5787945	.8483742	0.68	0.495	-1.083988 2.241577
charity	-.9239409	.4773801	-1.94	0.053	-1.859589 .0117068
community	-2.237907	.8500855	-2.63	0.008	-3.904043 -.5717696
usagefilm	.014223	.004588	3.10	0.002	.0052306 .0232153
network1	-3.406006	.8201095	-4.15	0.000	-5.013391 -1.79862
network2	-3.242414	.7302522	-4.44	0.000	-4.673682 -1.811146
network3	-2.321901	.8180262	-2.84	0.005	-3.925203 -.7185993
network6	-.9776239	.8510168	-1.15	0.251	-2.645586 .6903384
network7	-1.076224	1.355755	-0.79	0.427	-3.733455 1.581007
income2	-.1834931	.6897407	-0.27	0.790	-1.53536 1.168374
income3	.5230761	.5881417	0.89	0.374	-.6296604 1.675813
income4	.8088823	.5786057	1.40	0.162	-.3251641 1.942929
income5	.8439107	.6086949	1.39	0.166	-.3491094 2.036931
age2	-.0220484	.5075526	-0.04	0.965	-1.016833 .9727365
age4	-1.322951	.8460864	-1.56	0.118	-2.98125 .3353477
age5	.3531271	1.19809	0.29	0.768	-1.995086 2.701341
age6	-27.53363	5.21e+07	-0.00	1.000	-1.02e+08 1.02e+08
status1	-.0601667	.9801879	-0.06	0.951	-1.9813 1.860966
status2	.7572724	1.123898	0.67	0.500	-1.445527 2.960071
status3	.7386532	1.184319	0.62	0.533	-1.58257 3.059877
status5	-2.849912	1.953918	-1.46	0.145	-6.679522 .9796978
connection1	-1.467973	2.031557	-0.72	0.470	-5.449751 2.513804
connection3	1.18852	.7350183	1.62	0.106	-.252089 2.62913
countryUS	-.1332611	.7164998	-0.19	0.852	-1.537575 1.271053
countryOther	-.0975163	.6273213	-0.16	0.876	-1.327043 1.132011
harddisk1	-38.12328	3.18e+07	-0.00	1.000	-6.24e+07 6.24e+07
harddisk2	-4.412228	1.046446	-4.22	0.000	-6.463225 -2.361232
harddisk3	-5.26629	.9018417	-5.84	0.000	-7.033867 -3.498713
harddisk4	-1.972226	.7009587	-2.81	0.005	-3.346079 -.5983718
harddisk5	-1.149653	.6879544	-1.67	0.095	-2.498018 .987132
harddisk6	-.4922077	.5445099	-0.90	0.366	-1.559428 .5750121
morals1	-37.67653	3.48e+07	-0.00	1.000	-6.83e+07 6.83e+07
morals2	-1.444237	1.231098	-1.17	0.241	-3.857146 .9686717
morals3	-.3386465	.7135249	-0.47	0.635	-1.73713 1.059837
morals4	-.0252428	.4702567	-0.05	0.957	-.946929 .8964433
coolfactor2	-1.794761	.7583903	-2.37	0.018	-3.281179 -.3083435
coolfactor3	-.6792431	.6283805	-1.08	0.280	-1.910846 .55236
coolfactor4	.0613176	.7100853	0.09	0.931	-1.330424 1.453059
coolfactor5	-.8904831	.7359264	-1.21	0.226	-2.332872 .5519062
compusagef~1	.8069834	1.387976	0.58	0.561	-1.913399 3.527366
compusagef~2	-2.044484	1.010373	-2.02	0.043	-4.024779 -.0641891
compusagef~4	1.464402	.5369299	2.73	0.006	.412039 2.516765
compusagef~5	1.067599	.5743569	1.86	0.063	-.0581198 2.193318
compusageh~2	-.2180358	.7034172	-0.31	0.757	-1.596708 1.160637
compusageh~4	-.5968034	.5147524	-1.16	0.246	-1.605699 .4120927
compusageh~5	.7752759	.6630223	1.17	0.242	-.5242239 2.074776
compusagew~1	.5682173	.6865491	0.83	0.408	-.7773942 1.913829
compusagew~3	-.29455	.5389955	-0.55	0.585	-1.350962 .7618617
compusagew~4	.1784071	.7176892	0.25	0.804	-1.228238 1.585052
compusagew~5	-.2417992	.9230524	-0.26	0.793	-2.050949 1.56735
fairness1	-.2578025	.6467305	-0.40	0.690	-1.525371 1.009766
fairness2	-1.506417	.712367	-2.11	0.034	-2.902631 -.1102036
fairness3	-.3070602	.6311878	-0.49	0.627	-1.544166 .9300451
fairness4	.5686594	.5125118	1.11	0.267	-.4358453 1.573164
fairnesstwo2	.356562	.5027087	0.71	0.478	-.628729 1.341853
fairnesstwo3	-.0448995	.6852481	-0.07	0.948	-1.387961 1.298162
fairnesstwo4	2.414041	1.06355	2.27	0.023	.3295206 4.498562
fairnesstwo5	-1.236862	1.188547	-1.04	0.298	-3.566372 1.092648
reciprocity1	.9717635	.7262784	1.34	0.181	-.4517159 2.395243
reciprocity2	-.416328	.6311482	-0.66	0.509	-1.653356 .8206997
reciprocity3	.8517314	.4939196	1.72	0.085	-.1163332 1.819796
reciprocity5	-.2483497	.5726694	-0.43	0.665	-1.370761 .8740618
legalfilm2	-.5159139	.4689354	-1.10	0.271	-1.43501 .4031826
legalfilm3	.4044452	.6399684	0.63	0.527	-.8498698 1.65876
legalfilm4	.9732253	.7842227	1.24	0.215	-.563823 2.510274
legalfilm5	-31.53052	7.48e+07	-0.00	1.000	-1.47e+08 1.47e+08
incentive2	.5995653	.5706452	1.05	0.293	-.5188788 1.718009
incentive3	1.448456	.6020029	2.41	0.016	.2685526 2.62836
incentive4	1.778202	.5475474	3.25	0.001	.7050291 2.851375
incentive5	1.356274	.69511	1.95	0.051	-.0061169 2.718664
time1	.3043951	.5363582	0.57	0.570	-.7468477 1.355638
time2	-.5269411	.5816284	-0.91	0.365	-1.666912 .6130296
time3	-.8190873	.5522536	-1.48	0.138	-1.901485 .2633099
_cut1	-2.128421	1.396893			(Ancillary parameters)

_cut2		-.1206228	1.389594
_cut3		1.719113	1.399319
_cut4		2.566606	1.408194

note: 9 observations completely determined. Standard errors questionable.

**Regression A3.15, Aggregate Film Sharing (Significant variables only)**

Ordered logit estimates	Number of obs	=	284
	LR chi2(17)	=	177.69
	Prob > chi2	=	0.0000
Log likelihood = -234.2306	Pseudo R2	=	0.2750

sharefilm	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
charity	-.68678	.320843	-2.14	0.032	-1.315621 -.0579392
community	-1.132353	.4355866	-2.60	0.009	-1.986087 -.2786191
usagefilm	.0145067	.0036091	4.02	0.000	.0074331 .0215804
network1	-2.156814	.4808002	-4.49	0.000	-3.099165 -1.214463
network2	-1.772787	.4690288	-3.78	0.000	-2.692066 -.8535072
network3	-1.720935	.6159758	-2.79	0.005	-2.928225 -.5136443
age4	-.9121482	.4764932	-1.91	0.056	-1.846058 .0217613
harddisk2	-2.516525	.8213991	-3.06	0.002	-4.126438 -.9066125
harddisk3	-3.620106	.6128331	-5.91	0.000	-4.821236 -2.418975
harddisk4	-.9889183	.4503098	-2.20	0.028	-1.871509 -.1063272
coolfactor2	-.979414	.4064391	-2.41	0.016	-1.77602 -.182808
compusagef~2	-1.842827	.7709401	-2.39	0.017	-3.353842 -.3318124
compusagef~4	1.461703	.3846946	3.80	0.000	.7077153 2.215691
compusagef~5	1.22771	.399163	3.08	0.002	.4453649 2.010055
fairness2	-1.134195	.4734957	-2.40	0.017	-2.06223 -.2061606
fairness4	.6235656	.3299254	1.89	0.059	-.0230764 1.270208
fairness2wo4	2.274273	.7331624	3.10	0.002	.8373007 3.711245
(Ancillary parameters)					
_cut1	-1.349017	.4529757			
_cut2	.2773734	.4463313			
_cut3	1.779586	.4725726			
_cut4	2.477873	.5094053			

**Regression A3.16, Aggregate TV Sharing**

Ordered logit estimates	Number of obs	=	242
	LR chi2(72)	=	229.30
	Prob > chi2	=	0.0000
Log likelihood = -216.34509	Pseudo R2	=	0.3464

sharetv	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
gender	-.6721404	.7137008	-0.94	0.346	-2.070968 .7266874
charity	-.3953788	.4676617	-0.85	0.398	-1.311979 .5212213
community	-1.500136	.7822811	-1.92	0.055	-3.033379 .033107
usagetv	.009527	.0019493	4.89	0.000	.0057065 .0133475
network1	-1.271563	.7767165	-1.64	0.102	-2.793899 .2507734
network2	-1.901265	.7331444	-2.59	0.010	-3.338202 -.4643283
network3	-1.406409	.8199749	-1.72	0.086	-3.01353 .2007123
network6	-1.01921	.962743	-1.06	0.290	-2.906151 .8677319
network7	-.3224782	1.228961	-0.26	0.793	-2.731197 2.086241
income2	.5424583	.6126213	0.89	0.376	-.6582575 1.743174
income3	1.25399	.5786221	2.17	0.030	.1199117 2.388069
income4	1.121792	.6034387	1.86	0.063	-.0609259 2.30451
income5	.302335	.6134119	0.49	0.622	-.8999301 1.5046
age2	.2428132	.5095456	0.48	0.634	-.7558778 1.241504
age4	-2.427038	.9340656	-2.60	0.009	-4.257773 -.5963034
age5	-36.71322	7.32e+07	-0.00	1.000	-1.43e+08 1.43e+08
status1	.1876203	.9680345	0.19	0.846	-1.709693 2.084933
status2	1.932677	1.079018	1.79	0.073	-.1821595 4.047513
status3	-.1490159	1.035059	-0.14	0.886	-2.177695 1.879663
status5	-.1261431	8.86e+07	-0.00	1.000	-1.74e+08 1.74e+08
connection1	.2384557	2.310071	0.10	0.918	-4.289201 4.766112
connection3	-.3324458	.63351	-0.52	0.600	-1.574103 .909211
countryUS	-1.554802	.7818814	-1.99	0.047	-3.087261 -.0223424
countryOther	.3723538	.5681199	0.66	0.512	-.7411408 1.485848
harddisk1	-39.64054	5.15e+07	-0.00	1.000	-1.01e+08 1.01e+08
harddisk2	-5.274464	.9503745	-5.55	0.000	-7.137164 -3.411765
harddisk3	-4.189465	.7510975	-5.58	0.000	-5.661589 -2.717341
harddisk4	-4.442881	.8403267	-5.29	0.000	-6.089891 -2.795871
harddisk5	-1.500405	.7168319	-2.09	0.036	-2.905369 -.0954398
harddisk6	-2.665584	.5612055	-4.75	0.000	-3.765527 -1.565642
morals1	-1.44668	1.789324	-0.81	0.419	-4.953691 2.060332
morals2	-.1395849	1.192631	-0.12	0.907	-2.477098 2.197928
morals3	-.5968558	.6321536	-0.94	0.345	-1.835854 .6421426
morals4	-.8938607	.4671092	-1.91	0.056	-1.809378 .0216564

coolfactor2		-.3279004	.6424783	-0.51	0.610	-1.587135	.931334
coolfactor3		-.2277821	.6153238	-0.37	0.711	-1.433795	.9782304
coolfactor4		.7324943	.6219579	1.18	0.239	-.4865208	1.951509
coolfactor5		-1.166588	.7754164	-1.50	0.132	-2.686376	.3532004
compusagetv1		3.090963	1.332034	2.32	0.020	.4802235	5.701702
compusagetv2		-1.544935	1.056309	-1.46	0.144	-3.615262	.5253922
compusagetv4		2.273304	.5643779	4.03	0.000	1.167144	3.379465
compusagetv5		2.200987	.6147029	3.58	0.000	.9961912	3.405782
compusageh~1		3.528648	2.358492	1.50	0.135	-1.09391	8.151207
compusageh~2		1.045706	.5379161	1.94	0.052	-.0085902	2.100002
compusageh~4		-.9841575	.5153677	-1.91	0.056	-1.99426	.0259446
compusageh~5		-.5182377	.6486161	-0.80	0.424	-1.789502	.7530266
compusagew~1		-.8567974	.6928957	-1.24	0.216	-2.214848	.5012532
compusagew~3		.1785681	.5029445	0.36	0.723	-.8071851	1.164321
compusagew~4		-.0883731	.6408435	-0.14	0.890	-1.344403	1.167657
compusagew~5		-1.02188	.8847403	-1.16	0.248	-2.755939	.7121795
fairness1		-.702038	.7307452	-0.96	0.337	-2.134272	.7301963
fairness2		-1.307201	.6619136	-1.97	0.048	-2.604527	-.0098737
fairness3		.1159981	.5387675	0.22	0.830	-.9399669	1.171963
fairness4		.4175798	.4827691	0.86	0.387	-.5286302	1.36379
fairnesstwo2		.404868	.4653342	0.87	0.384	-.5071703	1.316906
fairnesstwo3		1.36946	.6053644	2.26	0.024	.182968	2.555953
fairnesstwo4		.7606098	.8572955	0.89	0.375	-.9196585	2.440878
fairnesstwo5		.4380802	1.408847	0.31	0.756	-2.32321	3.19937
reciprocity1		1.198547	.6536712	1.83	0.067	-.0826248	2.479719
reciprocity2		.0709515	.5945465	0.12	0.905	-1.094338	1.236241
reciprocity3		.1260057	.4597193	0.27	0.784	-.7750276	1.027039
reciprocity5		.3195914	.535456	0.60	0.551	-.7298831	1.369066
legaltv2		-1.270379	.4694508	-2.71	0.007	-2.190486	-.3502725
legaltv3		-.7182151	.6355969	-1.13	0.258	-1.963962	.527532
legaltv4		-1.059118	.9846098	-1.08	0.282	-2.988917	.8706822
incentive2		.2352485	.5070169	0.46	0.643	-.7584864	1.228983
incentive3		-.082928	.5648477	-0.15	0.883	-1.190009	1.024153
incentive4		.5618151	.5125877	1.10	0.273	-.4428384	1.566469
incentive5		-.9065403	.7313386	-1.24	0.215	-2.339938	.526857
time1		.1230776	.5276044	0.23	0.816	-.911008	1.157163
time2		.0694413	.5460315	0.13	0.899	-1.000761	1.139643
time3		-.795904	.498604	-1.60	0.110	-1.77315	.181342
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_cut1		-3.524717	1.362699			(Ancillary parameters)	
_cut2		-1.474934	1.354403				
_cut3		.4866491	1.343888				
_cut4		1.892021	1.343524				

note: 6 observations completely determined. Standard errors questionable.

### Regression A3.17, Aggregate TV Sharing (Significant variables only)

Ordered logit estimates	Number of obs	=	242
	LR chi2(13)	=	163.48
	Prob > chi2	=	0.0000
Log likelihood = -249.25237	Pseudo R2	=	0.2470

sharetv		Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
usagetv		.0087182	.0015397	5.66	0.000	.0057004 .011736	
age4		-1.157029	.5269099	-2.20	0.028	-2.189753 -.1243041	
harddisk2		-3.335927	.7135081	-4.68	0.000	-4.734377 -1.937476	
harddisk3		-2.125673	.4241068	-5.01	0.000	-2.956907 -1.294439	
harddisk4		-3.018484	.5845261	-5.16	0.000	-4.164134 -1.872834	
harddisk6		-1.267124	.3542484	-3.58	0.000	-1.961438 -.5728097	
morals4		-.6505941	.2876663	-2.26	0.024	-1.21441 -.0867786	
compusagetv1		2.364104	1.185847	1.99	0.046	.0398863 4.688322	
compusagetv2		-1.21756	.6266509	-1.94	0.052	-2.445774 .010653	
compusagetv4		1.289918	.4171743	3.09	0.002	.4722711 2.107564	
compusagetv5		1.248414	.4145614	3.01	0.003	.435889 2.06094	
compusageh~2		.9006824	.4024474	2.24	0.025	.1119 1.689465	
legaltv2		-.6760233	.3194835	-2.12	0.034	-1.302199 -.049847	
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_cut1		-.7479543	.4005008			(Ancillary parameters)	
_cut2		.9340917	.4076228				
_cut3		2.588802	.4521604				
_cut4		3.755974	.5141634				

note: 1 observation completely determined. Standard errors questionable.

**Regression A3.18, Aggregate Games Sharing**

Ordered logit estimates Number of obs = 145  
 LR chi2(40) = 112.47  
 Prob > chi2 = 0.0000  
 Log likelihood = -80.401999 Pseudo R2 = 0.4116

sharegames	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
gender	-38.0012	4.28e+07	-0.00	1.000	-8.39e+07 8.39e+07
charity	.6874349	.7567378	0.91	0.364	-.795744 2.170614
community	-2.182649	1.276772	-1.71	0.087	-4.685077 .3197792
usagegames	.1052293	.0247918	4.24	0.000	.0566382 .1538204
network1	-1.175327	1.159392	-1.01	0.311	-3.447693 1.097039
network2	-3.937381	1.157418	-3.40	0.001	-6.205879 -1.668883
network3	-5.109581	1.526889	-3.35	0.001	-8.102228 -2.116934
network6	-.7412597	1.236932	-0.60	0.549	-3.165602 1.683082
network7	-1.110559	1.522009	-0.73	0.466	-4.093641 1.872524
income	.5054119	.2625951	1.92	0.054	-.0092651 1.020089
age	.4468957	.5461022	0.82	0.413	-.6234449 1.517236
status1	3.894328	1.73417	2.25	0.025	.4954175 7.293239
status2	2.573672	1.637707	1.57	0.116	-.6361745 5.783519
status3	2.041452	1.822736	1.12	0.263	-1.531044 5.613948
connection1	4.915983	2.187638	2.25	0.025	.628292 9.203675
connection3	3.381848	1.403414	2.41	0.016	.6312067 6.132489
countryUS	-.1129857	1.113264	-0.10	0.919	-2.294943 2.068971
countryOther	1.960525	1.071973	1.83	0.067	-.1405042 4.061554
harddisk1	-35.41151	9.04e+07	-0.00	1.000	-1.77e+08 1.77e+08
harddisk2	.4148861	1.363549	0.30	0.761	-2.257621 3.087394
harddisk3	-3.309383	1.463076	-2.26	0.024	-6.17696 -1.4418066
harddisk4	-2.503398	1.720047	-1.46	0.146	-5.874629 .8678324
harddisk5	-.0306963	.9497471	-0.03	0.974	-1.892166 1.830774
harddisk6	-1.1796772	.7210318	-0.25	0.803	-1.592874 1.233519
morals	-.537643	.4801659	-1.12	0.263	-1.478751 .4034649
coolfactor	.7740161	.3028804	2.56	0.011	.1803814 1.367651
fairnesstwo	-.5633319	.3096181	-1.82	0.069	-1.170172 .0435084
fairness	-.4114703	.2851008	-1.44	0.149	-.9702576 .147317
reciprocity	-.5061515	.255957	-1.98	0.048	-1.007818 -.0044849
incentive	.1417734	.2552411	0.56	0.579	-.35849 .6420367
time1	-.6917087	.9306563	-0.74	0.457	-2.515762 1.132344
time2	-.1710746	.9814576	-0.17	0.862	-2.094696 1.752547
time3	-2.20404	1.009534	-2.18	0.029	-4.182691 -.2253885
compusage~s	.3705576	.3054551	1.21	0.225	-.2281233 .9692386
compusage~e	.485096	.3442026	1.41	0.159	-.1895286 1.159721
compusage~k	-.6914609	.3087647	-2.24	0.025	-1.296629 -.0862932
legalgames2	.9806157	.8103043	1.21	0.226	-.6075515 2.568783
legalgames3	1.529575	1.174302	1.30	0.193	-.7720147 3.831165
legalgames4	-34.71723	4.60e+07	-0.00	1.000	-9.01e+07 9.01e+07
legalgames5	-35.65375	6.91e+07	-0.00	1.000	-1.35e+08 1.35e+08
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_cut1	2.039908	3.429741			(Ancillary parameters)
_cut2	4.648321	3.441456			
_cut3	6.510581	3.551599			
_cut4	7.202186	3.59431			

note: 15 observations completely determined. Standard errors questionable.

**Regression A3.19, Aggregate Games Sharing (Significant Variables Only)**

Ordered logit estimates Number of obs = 145  
 LR chi2(30) = 144.00  
 Prob > chi2 = 0.0000  
 Log likelihood = -64.63984 Pseudo R2 = 0.5269

sharegames	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
usagegames	.1110909	.024884	4.46	0.000	.0623191 .1598627
network2	-4.213579	1.078262	-3.91	0.000	-6.326933 -2.100224
network3	-6.36614	1.660258	-3.83	0.000	-9.620186 -3.112095
income2	-2.515724	1.142176	-2.20	0.028	-4.754347 -1.2771006
income4	-3.905613	1.180631	-3.31	0.001	-6.219608 -1.591618
age2	-4.241961	1.102264	-3.85	0.000	-6.402359 -2.081562
status1	2.249512	.965575	2.33	0.020	.3570198 4.142004
connection1	3.849515	1.881135	2.05	0.041	.162559 7.536471
countryOther	2.526224	.9379523	2.69	0.007	.6878709 4.364576
harddisk3	-6.351512	1.925868	-3.30	0.001	-10.12614 -2.576881
harddisk4	-6.425334	2.587754	-2.48	0.013	-11.49724 -1.35343
morals2	-5.415542	2.269255	-2.39	0.017	-9.8632 -1.967884
morals3	-3.722471	1.064821	-3.50	0.000	-5.809483 -1.63546
coolfactor1	2.016639	1.15241	1.75	0.080	-.2420424 4.27532
coolfactor3	3.290732	1.035422	3.18	0.001	1.261343 5.320122

coolfactor4		3.052807	.9614281	3.18	0.001	1.168442	4.937171
fairness1		3.426026	1.008615	3.40	0.001	1.449177	5.402875
reciprocity1		3.704334	1.030915	3.59	0.000	1.683778	5.72489
reciprocity2		2.20082	.934517	2.36	0.019	.3692003	4.03244
reciprocity3		3.202652	.8420888	3.80	0.000	1.552188	4.853116
time3		-2.840768	.8641239	-3.29	0.001	-4.53442	-1.147116
compusageg~1		-4.507914	2.201329	-2.05	0.041	-8.822441	-.1933882
compusageg~2		-2.406131	1.171254	-2.05	0.040	-4.701746	-.1105156
compusageg~3		-2.526183	.9127157	-2.77	0.006	-4.315073	-.7372934
compusageg~4		-4.217128	1.232182	-3.42	0.001	-6.63216	-1.802096
compusageh~2		4.787382	2.004951	2.39	0.017	.8577492	8.717014
compusageh~5		1.914444	.8288339	2.31	0.021	.2899598	3.538929
compusagew~4		2.979795	1.037358	2.87	0.004	.9466109	5.012979
compusagew~5		-2.717395	.9620962	-2.82	0.005	-4.603068	-.8317209
legalgames3		4.384422	1.128702	3.88	0.000	2.172205	6.596638
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_cut1		1.577983	.7999496			(Ancillary parameters)	
_cut2		5.168768	1.048076				
_cut3		7.424122	1.297833				
_cut4		8.331492	1.425075				
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note: 7 observations completely determined. Standard errors questionable.