# Behavioural Economics and the Benefits of Choice

March 2006

Prepared for the Financial Services Authority, London

**Volterra Consulting Ltd**

# Behavioural Economics and the Benefits of Choice


## Summary

- The aim of the project is to develop a model of consumer choice which addresses the question: does an increase in the number of products available to consumers lead to consumers feeling better or worse off?
- The research is mainly theoretical, aimed at guiding model calibration and empirical research.
- In standard economic theory (rational choice theory), consumers gather all relevant information about all available products, and each person chooses the one which most closely matches his or her preferences. So the more products are available, the more likely it is that consumers can find close matches to their preferences. Overall, consumers are unequivocally better off as the number of products increases.
- It is now well established that many of the assumptions underlying this rational choice theory are unrealistic, and that people routinely violate the principles of rational choice.
- We introduce three additional factors into the process of consumer choice which are well documented in the modern literature of the behavioural aspects of consumer choice:
  - costs of gathering and processing information. These rise with the number of products which are available
  - uncertainty about the attributes of products: consumers may make mistakes about the attributes of products such as the true APR
  - 'regret aversion': consumers may worry that, despite the time and resources they have invested in making a choice, they could nevertheless have chosen a better one.
- We also introduce two types of consumers: 'maximisers' and 'satisficers', which are again well documented in the literature. Maximisers behave in a traditional economic way and always try to make the best possible choice from the available alternatives. Satisficers examine only a limited set of alternatives, and choose the best between them.
- A key finding is that if the costs of gathering and processing information rise sufficiently quickly with the number of products, consumers can feel worse off as the number of products increases.
- For reasonable ranges of uncertainty about product attributes, consumers feel worse off than without uncertainty. But the direct impact of uncertainty is not dramatic.
- But regret aversion caused by uncertainty can make maximising consumers quite substantially worse off. By definition, satisficers do not experience this feeling.
- The results of course depend upon the particular ways in which these various factors are introduced and should be regarded as illustrative rather than definitive.
- However, they suggest that three important questions to research empirically are:

- What is the proportion of maximisers to satisficers amongst consumers?
- What are the costs (in time, money) of gathering and processing information and how do these change as the number of available products increases?
- Do consumers, or at least a proportion of them, experience 'regret aversion': in other words, do they worry that they have not made the best choice, regardless of whether or not they have actually done so?

## 1. Introduction

This project focuses on the impact on consumer utility of different amounts of choice made available to consumers. The key underlying question is: does an increase in the number of products available to consumers lead to an increase in consumer utility? The project takes into account findings in modern behavioural economics in addressing this question.

The research is mainly theoretical, aimed at guiding model calibration and empirical research. Section 2 sets the work in the context of empirical and theoretical developments in the economics of consumer choice. Sections 3 and 4 describe the theoretical model and how it is operationalised. Section 5 sets out a selection of the findings. A fuller set of results is available in Appendix 1.

## 2. Background

In much of economic theory, it is assumed that the product offer in any given market is homogenous. In other words, the products of the various firms in the market are identical in all respects except price. But even in very basic consumer markets, such as milk for example, this is self-evidently not true. Milk is available in bottles, in plastic containers, in cartons, full fat, semi-skimmed, skimmed, with added fish oil, with strawberry, banana and a whole host of flavours added. The multiplicity of the attributes of products in bread, another very basic market, is even more profuse.

Rational choice theory in principle offers a way of dealing with the heterogeneous nature of attributes of the products on offer in a single market. According to the rational choice framework[1], consumers have complete information about the costs and benefits associated with each choice. In the context of choosing between a variety of products in the same market, they have complete information about the attributes of the products.

Under this theory, the greater the choice of products available, the greater will be consumer welfare. The chances of any individual being able to choose a product whose attributes match his or her (fixed) preferences will in general increase with the number of products.

It is now well established that many of the psychological assumptions underlying rational choice theory are unrealistic, and that people routinely violate the principles of rational choice[2]. In this project, we focus upon four particular aspects of modern behavioural economics in terms of consumers making choices between sets of heterogeneous products:

- Rather than assuming that people possess all relevant information, information itself is treated as a commodity with a price[3]. In particular, as the number of possible choices increases, the cost of acquiring information and comparing them increases.
- There may be limitations to consumers' cognitive powers in gathering and processing information[4]. Simon introduced the concept of 'satisficing' rather than 'maximising' behaviour. A satisficer simply encounters and evaluates products until one is discovered which exceeds his or her acceptability threshold. That product is chosen. In other words, once a product is found which is sufficiently close to the consumer's preference across the attributes of the product, it is chosen. The costs of attempting to gather information and then to process it for large numbers of products are high for this type of consumer.
- Consumers may perceive information imperfectly. The point immediately above relates to limitations in gathering and processing information. This relates to the separate point that they may perceive the attributes of products with error.

---

[1] J von Neumann and O.Morgenstern, *Theory of Games and Economic Behavior*, Princeton, 1944
[2] D Kahneman and A Tversky, 'Prospect Theory: an Analysis of Decisions under Risk', *Econometrica*, 47, 263-291, 1979
[3] G.J.Stigler, 'The Economics of Information', *Journal of Political Economy*, 69, 213-225, 1961
[4] HA Simon, 'A Behavioral Model of Rational Choice', *Quarterly Journal of Economics*, 59, 99-118, 1955

- Consumers who attempt to maximise may experience subsequent regret once the choice has been made, because the maximiser is always conscious of the fact that he or she may not have made the best possible choice. This concept of regret aversion may be present even in consumer goods markets where re-purchase events are fairly frequent[5]. Clearly, in financial service markets, where decisions are often lumpy and may involve considerable costs to reverse, the concept is even more likely to exist.

We explore the implications for consumer welfare of increasing the number of products from which consumers can choose under the assumptions that gathering and processing information is not costless, that the cognitive powers of consumers may be limited, that the attributes of products may be perceived with error, and that consumers may experience regret aversion.

## 3. The theoretical model

We populate the model with N agents, who are consumers operating within a particular market. In the market, there are up to k products available. We assume that all consumers will each purchase one of the k products in this market. The products are differentiated on the basis of two attributes.

The consumers each have their own unique preference across the attributes, and their basic utility function is given by:

$$\log(U_i) = \alpha_i \log(A_1) - \beta_i \log(A_2) \qquad (1)$$

where $U_i$ is the utility of the ith consumer, the $A_j$ are the attributes of the product, each one normalised to lie in the range [0, 1] and where $\alpha_i$ and $\beta_I$ are the unique weights assigned to the i th consumer. Attribute $A_2$ can be thought of as the price of the product (such as the mortgage rate or the inverse of the savings rate), so that utility is lower the higher the value it takes

If information is costless to gather and process, if consumers perceive the attributes perfectly, if there are no constraints on their cognitive ability to process the information, and if there is no regret aversion – in other words if the assumptions of economic textbooks hold – then increasing k will in general lead to an increase in the utility of at least one consumer. Making heroic assumptions about interpersonal comparisons of utility, we can sum the individual utilities to obtain the total utility of consumers, Y.

Initially, we continue to posit that all consumers are maximisers. The first step in relaxing the assumptions made above is to introduce a price for gathering and/or processing information. We do this by making the utility function:

[5] for example, SS Iyengar and MR Lepper, 'When Choice is Demotivating', *Journal of Personality and Social Psychology*, 79, 995-1006, 2000

$$\log(U_i) = \alpha_i \log(A_1) - \beta_i \log(A_2) - \gamma_i \log(k) \qquad (2)$$

where k is the number of products which are available. We make the simple assumption that information costs rise linearly with the number of products from which a choice can be made.

We introduce next the possibility of error in the perception of the attributes. We are positing that $A_2$ is a measure of price, so it may be thought that it is difficult to get this wrong. However, there is certainly scope for misunderstanding APR or elements of transaction costs, say. We do not imagine that the error bands will be wide. The utility function becomes:

$$\log(U_i) = \alpha_i \log(A_1 + \varepsilon_i) - \beta_i \log(A_2 + \eta_i) - \gamma_i \log(k) \qquad (3)$$

where $\varepsilon$ and $\eta$ are random variables drawn from a uniform distribution on $[-\varphi, \varphi]$.

We now modify the maximisers' utility function to allow for the disutility of regret aversion. In other words, these agents worry after having made a choice that they have not made the correct one. The maximiser is always asking not 'was this a good choice' but 'was this the best choice'.

There are several ways in which the costs of regret aversion could be introduced. Schwartz et. al.[6] suggest that the more products are available, the higher the potential regret aversion to maximisers. Maximisers examine all available options, but they are never completely sure either that they have examined every possible one or that they have made the wrong choice. The more products they have been able to examine, the more they are inclined to worry. However, we make the level of regret aversion depend upon the range of uncertainty with which people perceive the attributes of the products: the more uncertain they are, the greater the level of subsequent worry about the choice which is made.

We introduce a value for regret aversion which depends upon $\varphi$. The beta distribution is by definition bounded in [0, 1] and has two parameters, $p_1$ and $p_2$. The mean is given by $p_1/(p_1 + p_2)$. In this case, the value of the regret aversion is drawn from a beta distribution with $p_1 = 1$ and $p_2 = 1/\varphi$ where $\varphi$ is the upper bound of the error range. Of 1000 consumers Figure 1 plots the typical number of consumers receiving each value of regret aversion when $\varphi$ is 0.1.

[6] B Schwartz, A Ward, J Monterosso, S Lyubomirsky, K White and DR Lehman, 'Maximizing versus Satisficing: Happiness is a Matter of Choice', *Journal of Personality and Social Psychology*, 83, 1178-1197, 2002

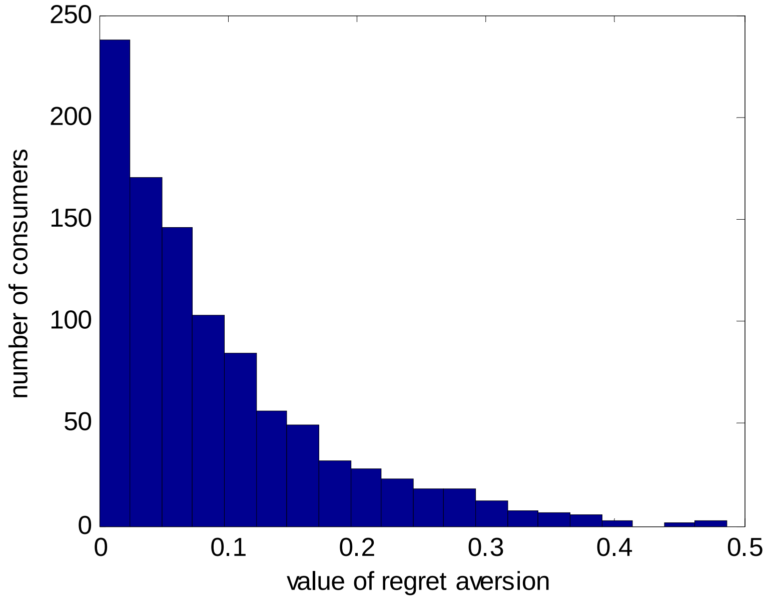



**Figure 1** *Number of consumers receiving each value of regret when maximum perception error is 0.1*

The utility of each consumer is reduced by the value drawn from the appropriate beta distribution, and total utility is reduced by the sum of the individual reductions. With the model populated by a large number of consumers, this will obviously be closely approximated by the mean value of regret across the total number of consumers, multiplied by the number of consumers, N/(1+ 1/ φ) making this sum over to the left-hand side, we can define $U_i = U'_i - \theta_i(\varphi)$, where $\theta_i(\varphi)$ is simply the reduction in utility for the ith consumer.

$$\log(U'_i) = \alpha_i \log(A_1 + \varepsilon_i) - \beta_i \log(A_2 + \eta_i) - \gamma_i \log(k)$$

The next step is to posit two different types of consumers, maximisers and satisficers, represented by the proportions π and (1 - π) in the total population of N consumers.

The development of the behaviour of satisficers follows the same steps as described above for maximisers.

However, there is a fundamental difference between the two types of behaviour. Regardless of the value of k, the total number of products on offer, each satisficer only examines a subset, m, of the k products (for very low values of k, m and k may coincide, but in general k > m). Each satisficer is presented with m of the k products, and chooses the one from the m which maximises his or her utility. The m are chosen at random, and are chosen separately for each agent.

## 4. Generating the results

The model above may appear fairly simple, but such models can be deceptive. The potential combination of parameters is large. We therefore proceed step by step, making the utility functions more complex at each step. This enables a better understanding to be obtained of the effect of each of the behavioural modifications to conventional economic theory.

We use numerical simulation of the system. In the results set out below and in Appendix 1, the model is populated by 1000 agents. The results are then averaged across 1000 separate solutions to the model. This number should be sufficient to capture accurately the properties of the model, allowing for its inherently stochastic nature.

In the first instance, imagine that there is only one product available, and the values of its attributes are each drawn at random from a normal distribution on [0,1]. Each consumer is assigned at random a value for his or her $\alpha_i$, $\beta_i$ The $A_j$ are drawn from a normal distribution with mean 0.5 and standard deviation 0.1 truncated to lie in [0,1][7].

We calculate for each consumer, for a given set of values of all the parameters, his or her utility, and we can sum these to obtain total utility, Y.

We then introduce a second product – which like all subsequent products also has its attributes drawn at random from a uniform distribution on [0,1] – and consumers choose the one which gives the highest utility.

We then proceed to add additional products one by one, and each time calculate Y. The attributes of the products which have already been introduced remain fixed, and it is the attributes of each additional product which are drawn at random.

Because both the $\alpha_i$, $\beta_i$ and the $A_j$ are drawn at random, each individual solution of the model as k is increased will be unique. In each case, we therefore solve the model 1000 times, say and use the average of Y across the 1000 solutions. In each individual solution, the $\alpha_I$ and $\beta_i$ are drawn at random at the outset, and remain fixed as k increases. But the $\alpha_I$ and $\beta_I$ for each individual are different in each solution.

Figure 2 plots the total utility of the 1000 consumers as the number of products is increased, to a maximum of k = 50.

For the avoidance of doubt, it is worth repeating the description of this chart. For each value of k, the total utility in any single solution is the total obtained across the 1000 consumers. The values of total utility in Figure 1 are the averages for each k across 1000 separate solutions of the sum across the consumers in each of these solutions.

The values of the total utility in Figure 2 represent a benchmark of utility under the assumptions that all consumers are maximisers, there are no information costs, there is no regret uncertainty, and there is no uncertainty about the attributes of the products.

[7] the chance of a value outside this range being drawn is less than 1 in 500,000

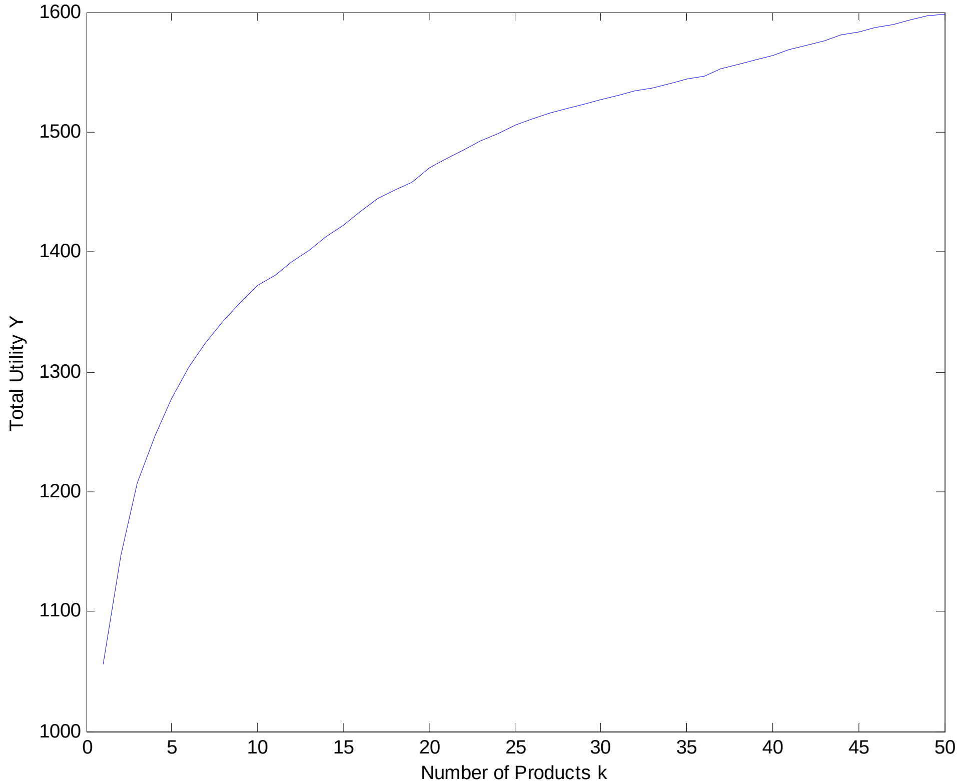



**Figure 2** *Average total utility: no information costs, no regret aversion, perfect perception of product attributes, all consumers act as maximisers. Utility averaged for 1000 consumers across 1000 separate solutions*

Below, we give a small selection which illustrate the main properties of the model, showing how total utility alters as the various assumptions made in the results in Figure 2 are relaxed. A much fuller selection of charts for various permutations of the model parameters is set out in Appendix 1.

In Figure 3, we plot total utility for different numbers of products, retaining the assumption that all consumers are maximisers, but introducing costs of gathering/processing information. We do not assign perfect foresight to consumers, so that they are not able to decide in advance whether the potential increases in utility from examining an additional product is outweighed by the costs of gathering and processing this information. The 'g' above each chart indicates the value of $\gamma$.

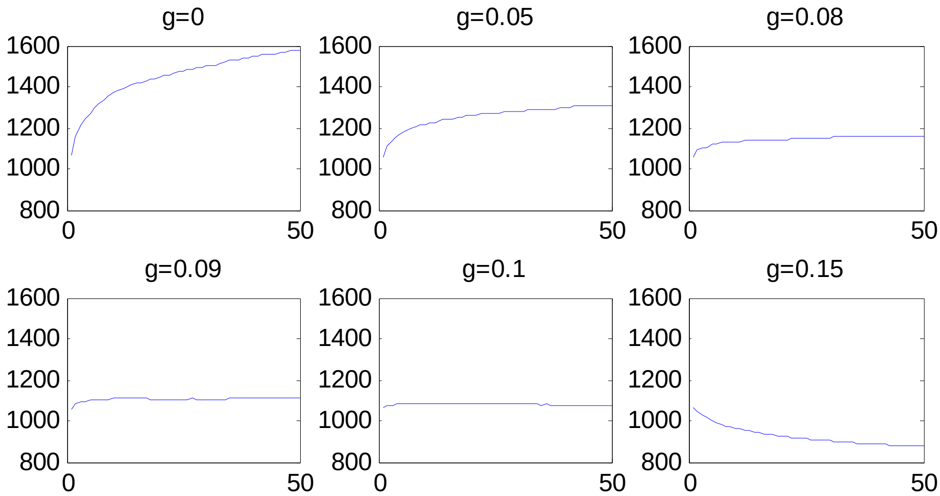



**Figure 3:** *Average total utility with information costs: no regret aversion, perfect perception of product attributes, all consumers act as maximisers. Utility averaged for 1000 consumers across 1000 separate solutions*

Obviously, introducing costs of gathering and/or processing information reduces total utility quite sharply. The top left-hand chart, with $\gamma = 0$, is the same[8] as that plotted in Figure 2.

Of course, we are not drawing on any evidence as to how $\gamma$ maps into the actual time and money costs which people incur in reality in evaluating products. But there appears to be a critical value around $\gamma = 0.09$. The scale on the left-hand axes of the charts is deliberately made the same, so that total utility for different values of $\gamma$ can be compared more readily. Figure 3a below zooms in, as it were, on the critical range, plotting results with $\gamma = 0.08$, 0.09 and 0.10.

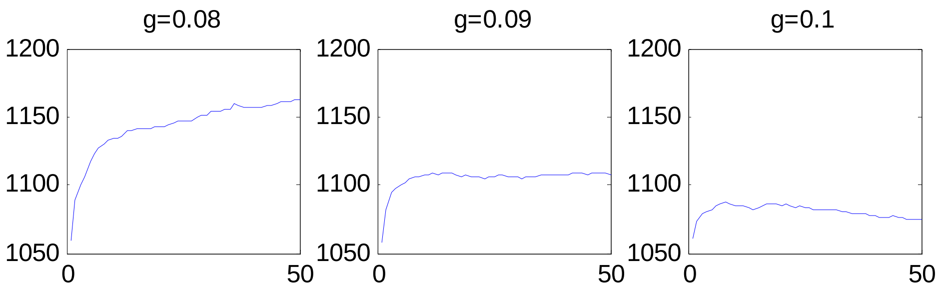



**Figure 3a:** *Average total utility with information costs: no regret aversion, perfect perception of product attributes, all consumers act as maximisers. Utility averaged for 1000 consumers across 1000 separate solutions, specific values of $\gamma$*

[8] subject to extremely minor differences between the averages of two separate sets of 1000 solutions, given the stochastic nature of the model

The charts in Figure 4 show the impact of introducing errors of perception about the attributes of each product. We do this for $\varphi = 0.1$. The mean value of $\alpha$ and $\beta$ is 0.5, with a standard deviation of 0.1. In other words, over 95 per cent of the values of all attributes will lie in the range [0.3, 0.7], which encompasses twice the standard deviation around the mean. So the range in which perception errors exist of [-0.1, 0.1] is reasonably substantial relative to the value of each attribute. However, it is not massive.

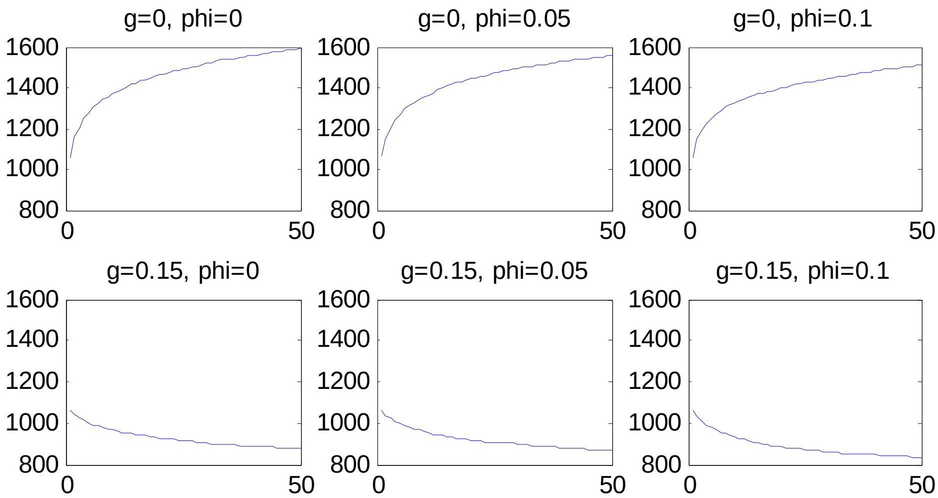



**Figure 4:** *Average total utility with information costs and imperfect perception of product attributes, no regret aversion, all consumers act as maximisers. Utility averaged for 1000 consumers across 1000 separate solutions*

Again, the top left hand chart with g = phi = 0 is the same as the benchmark chart in Figure 2. For this reasonable level of potential errors of perception of the true attributes of a product, there is some reduction in total utility, but it is by no means dramatic. An important reason for this result is that we do not assume any systematic bias in the perception of product attributes across consumers. On average, consumers perceive the attributes correctly.

The final step, still assuming that all consumers are maximisers, is to introduce regret aversion. The amount of disutility generated by regret depends upon the range of uncertainty with which the product attributes are perceived.

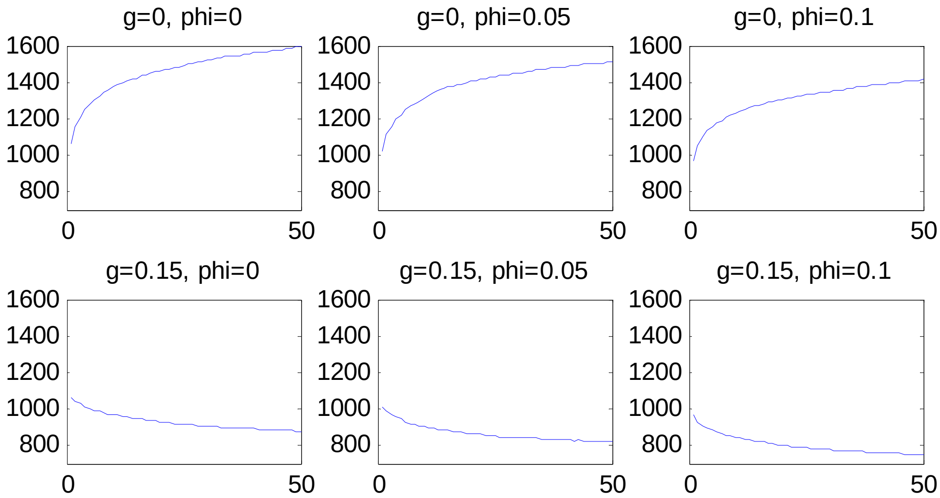



**Figure 5:** *Average total utility with information costs and imperfect perception of product attributes, regret aversion: all consumers act as maximisers. Utility averaged for 1000 consumers across 1000 separate solutions*

The possible permutations of parameter values are by now large and, as already noted, a fuller set of results is available in Appendix 1. Figure 5 shows illustrative results of the effect of regret aversion for solutions in which there are no information costs, and solutions in which information costs are high.

In the two left-hand charts of Figure 5, there is no uncertainty about attributes and so no regret aversion. Reading from left to right we can see the quantitative impact of regret aversion. A value of $\varphi = 0.1$ reduces total utility by around 200 points, so the impact is potentially substantial.

We now move to consider results in which by assumption all consumers are satisficers. There is no need to consider these in as much detail as the maximisers, because the relaxation of the various assumptions operates in a similar qualitative way as with maximisers. Note, however, that satisficers do not experience regret aversion, so that uncertainty about product attributes does not reduce their utility as much as it does with maximisers. Again a fuller set of results is in Appendix 1.

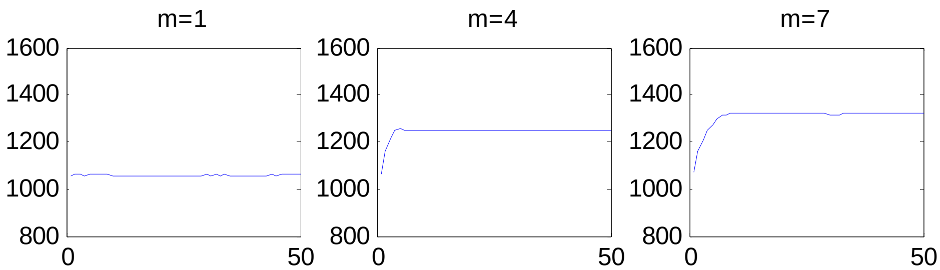



**Figure 6**: *Average total utility: no information costs, perfect perception of product attributes, all consumers act as satisficers. Utility averaged for 1000 consumers across 1000 separate solutions. Satisficers examine 1, 4 and 7 products*

In the first chart, satisficers examine only one product, which is selected at random, and choose it. So total utility is the same no matter how many products are introduced. The gains from introducing more products when consumers act as maximisers is seen by comparing this chart with the benchmark chart for maximisers in Figure 2. There, when k = 50, total utility is around 1600, whereas with only one product available ( k = 1) it is around 1100. Increasing the number of products available to 4 raises total utility above 1200, and with 7 it is over 1300. So even a small element of choice has a strong impact on total utility.

We can go straight to the results with information costs and product uncertainty to make comparisons with the results when all consumers are assumed to be maximisers.

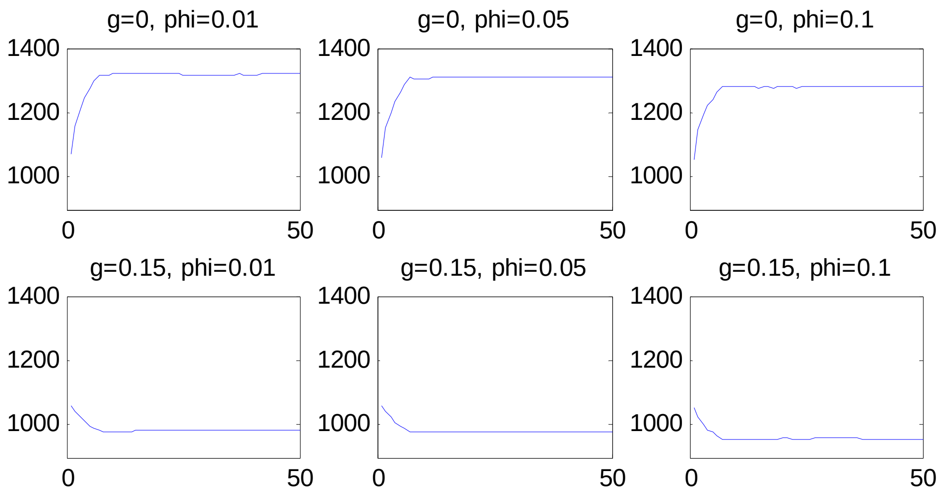



**Figure 7:** *Average total utility, information costs, imperfect perception of product attributes, all consumers act as satisficers. Utility averaged for 1000 consumers across 1000 separate solutions. Satisficers examine 7 products*

The top three charts have no information costs but product uncertainty. They can be compared to the results in the top line of Figure 5. With no information costs and all 50 products available, the total utility of consumers is higher when consumers are maximisers, even allowing for regret aversion. But when information costs are introduced and are high, the costs of gathering and processing information by maximisers leads to total utility being less than when all consumers are satisficers.

Finally we give a small selection of results when the population of consumers is mixed, in other words contains both maximisers and satisficers. As a benchmark, Figure 8 plots total utility with no information costs, no product uncertainty, and no regret aversion.

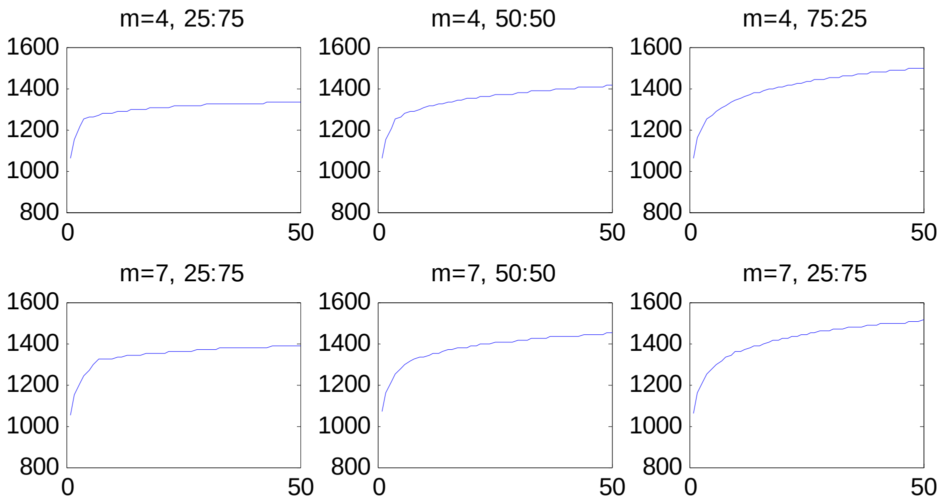



**Figure 8:** *Average total utility, no information costs, perfect perception of product attributes. Utility averaged for 1000 consumers across 1000 separate solutions. Satisficers examine 4 products in the top line and 7 in the bottom. The ratios '25:75' show the proportions of maximisers and satisficers*

Moving from left to right across the charts, the proportion of maximisers increases from 25 to 75 per cent. So under these assumptions, total utility increases as this happens.

Finally, Figures 9a and b show results with product uncertainty and regret aversion (for maximisers). With 9a having no information costs and 9b having such costs.

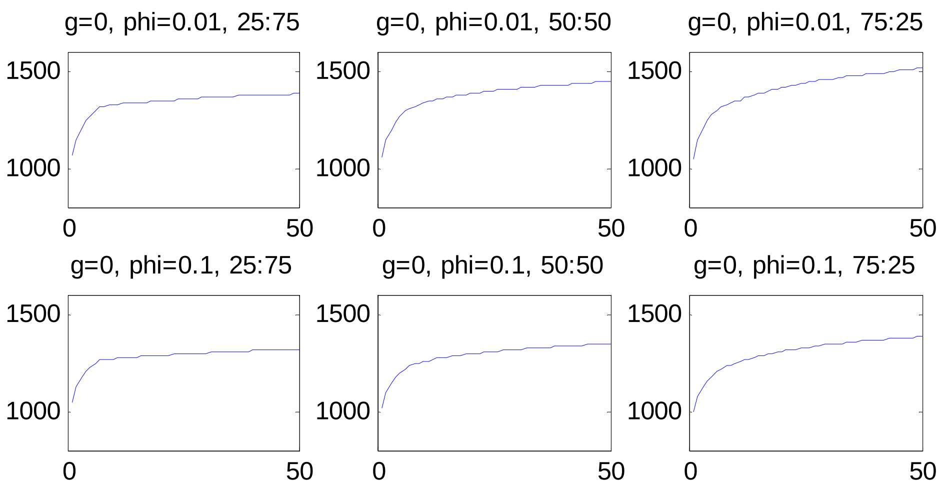



**Figure 9a:** *Average total utility, no information costs, imperfect perception of product attributes, regret aversion for maximisers. Utility averaged for 1000 consumers across 1000 separate solutions. Satisficers examine 7 products. The ratios '25:75' show the proportions of maximisers and satisficers*

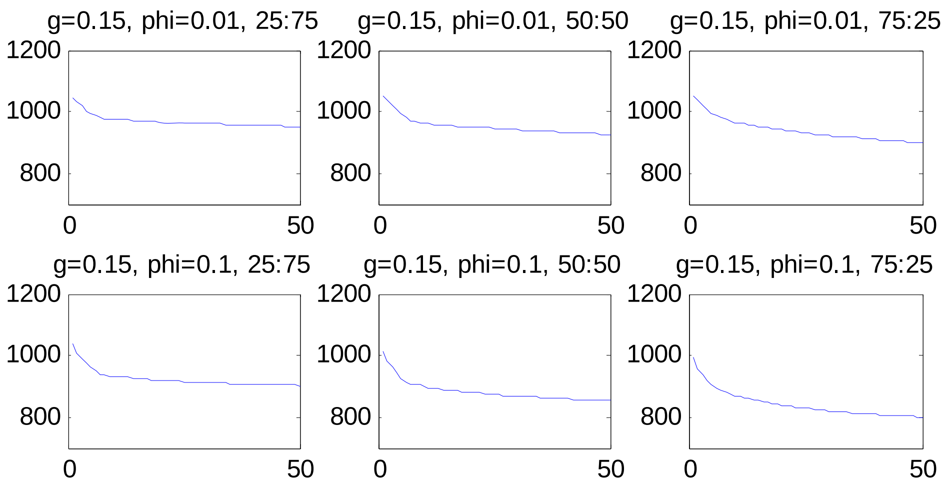



**Figure 9b:** *Average total utility, information costs, imperfect perception of product attributes, regret aversion for maximisers. Utility averaged for 1000 consumers across 1000 separate solutions. Satisficers examine 7 products. The ratios '25:75' show the proportions of maximisers and satisficers*

# Appendix 1: Detailed Results

## Maximisers

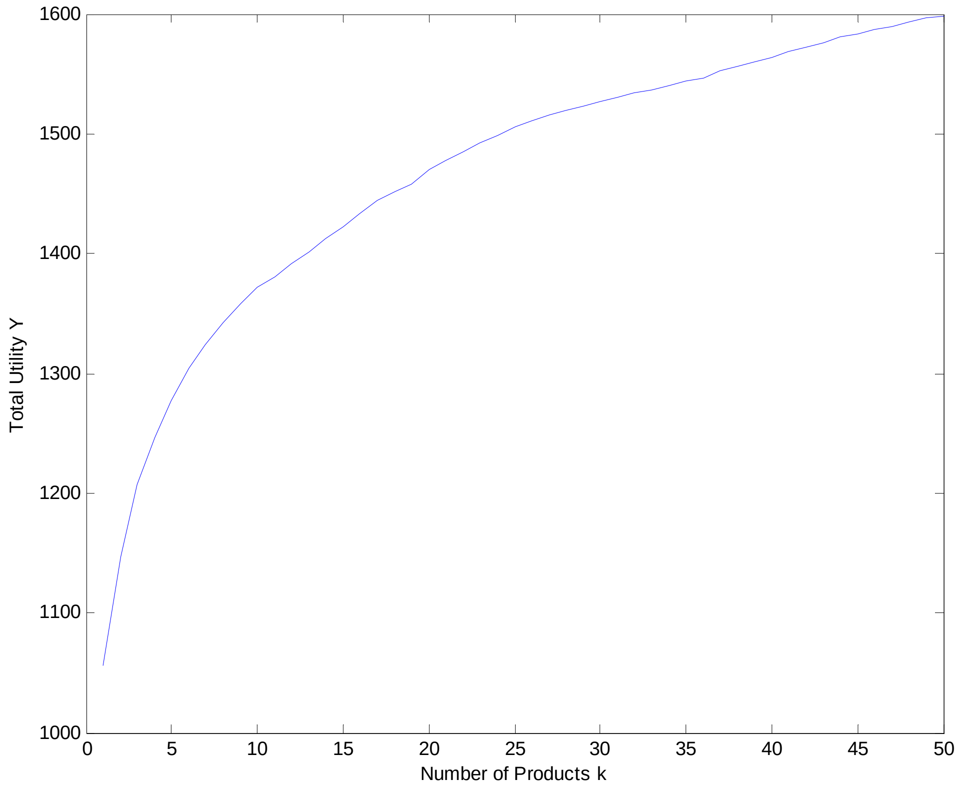
### (M1) $\log(U_i) = \alpha_i \log(A_1) - \beta_i \log(A_2)$

Standard utility function

Agent preferences α and β are drawn from a uniform distribution. Product attributes $A_1$ and $A_2$ drawn from normal distribution (0.5,0.1). Each agent picks the product that maximises his or her utility from the first k available products. We sum across the utilities of the agents and then average across results from 1000 runs to get the average total utility.

Runs=1000, Agents=1000, k<=50

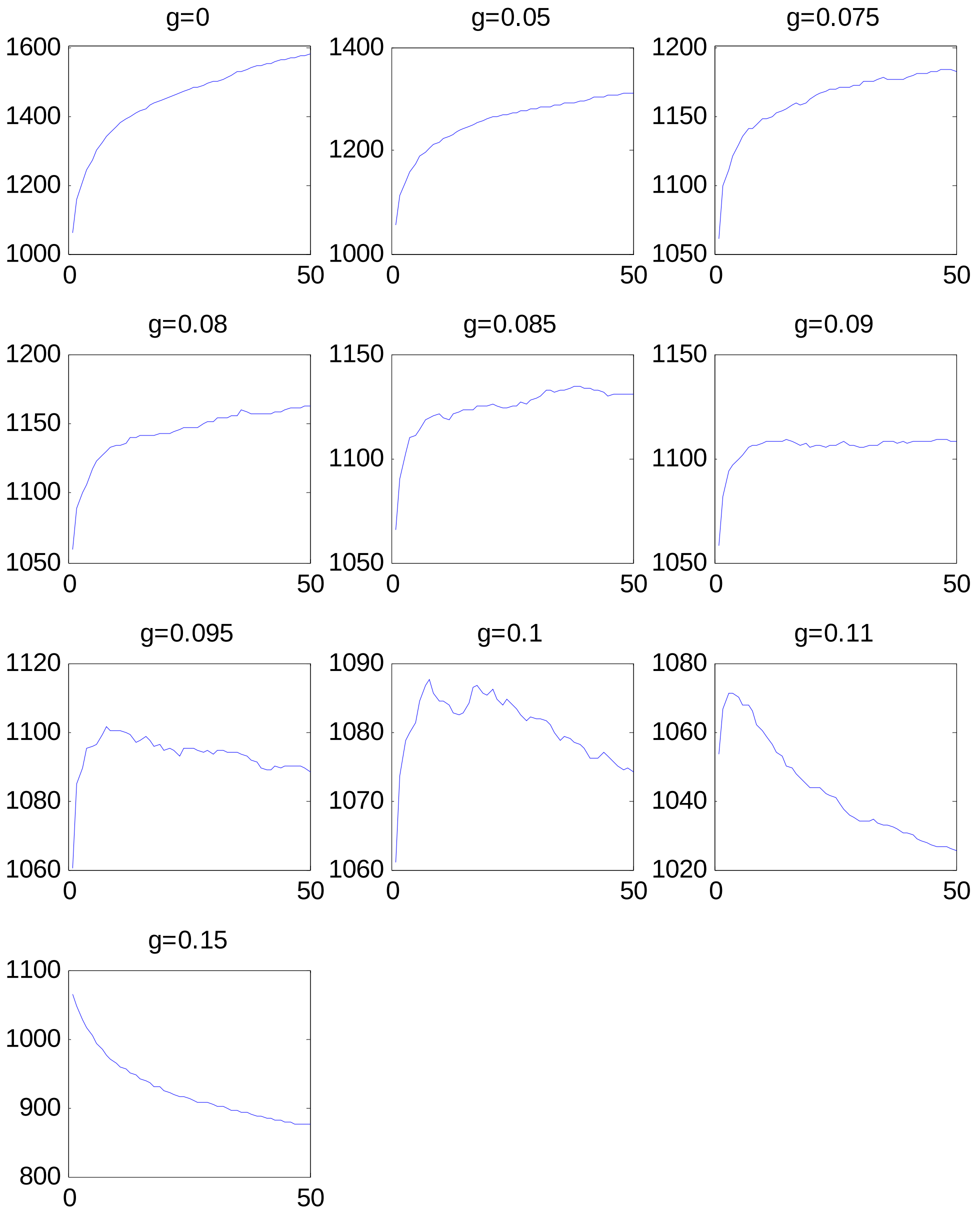
*Graph of k against average total utility Y*



## (M2) $\log(U_i) = \alpha_i \log(A_1) - \beta_i \log(A_2) - \gamma \log(k)$

Utility function with information costs

*Graphs of k against average total utility Y for different values of $\gamma = g$*

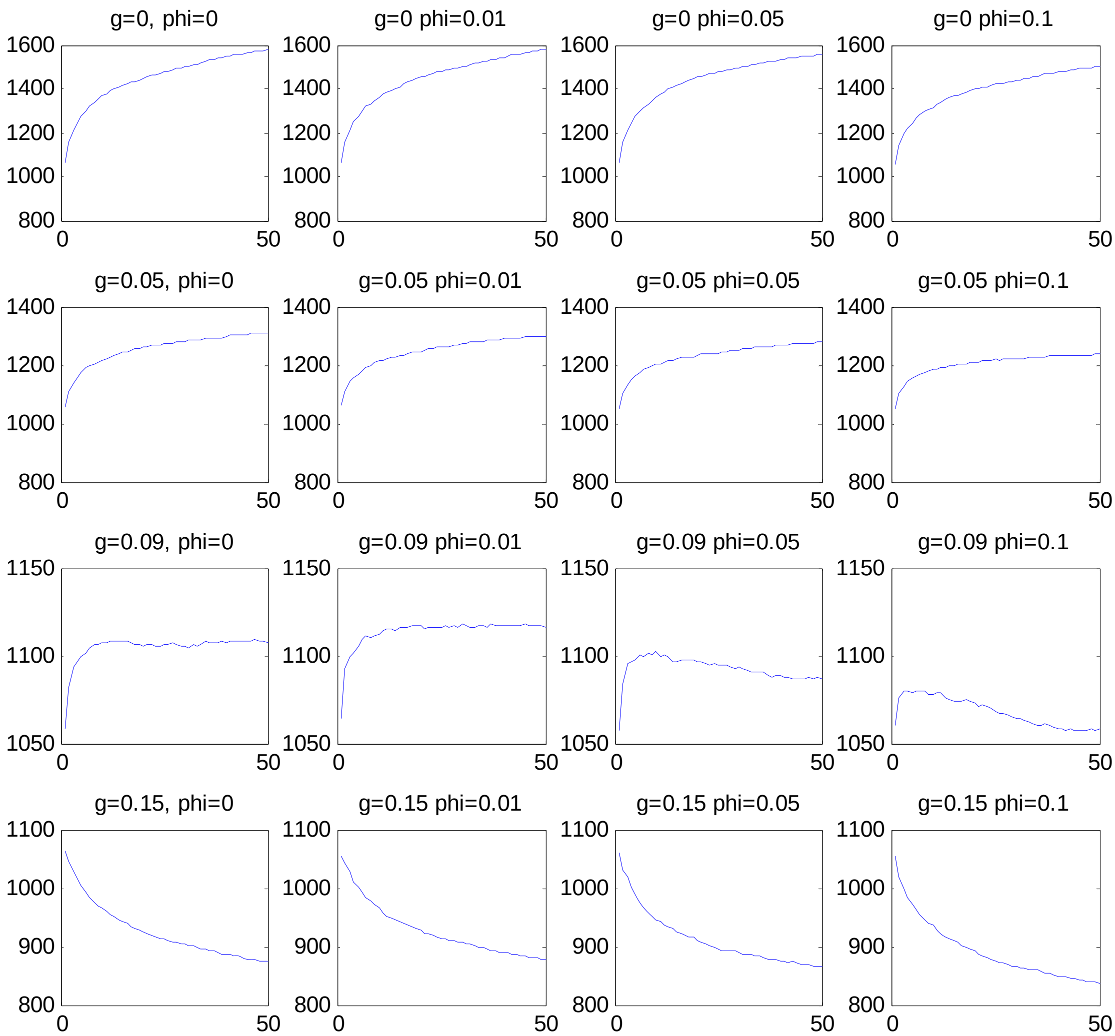


## (M3) $\log(U_i) = \alpha_i \log(A_1 + \varepsilon_i) - \beta_i \log(A_2 + \eta_i) - \gamma \log(k)$

Utility function with information costs and imperfect perception

$\varepsilon_i$ and $\eta_i$ are drawn from a uniform distribution on $[-\varphi, +\varphi]$

*Graphs of k against average total utility Y for different values of $\gamma$ =g and $\varphi$ = phi*

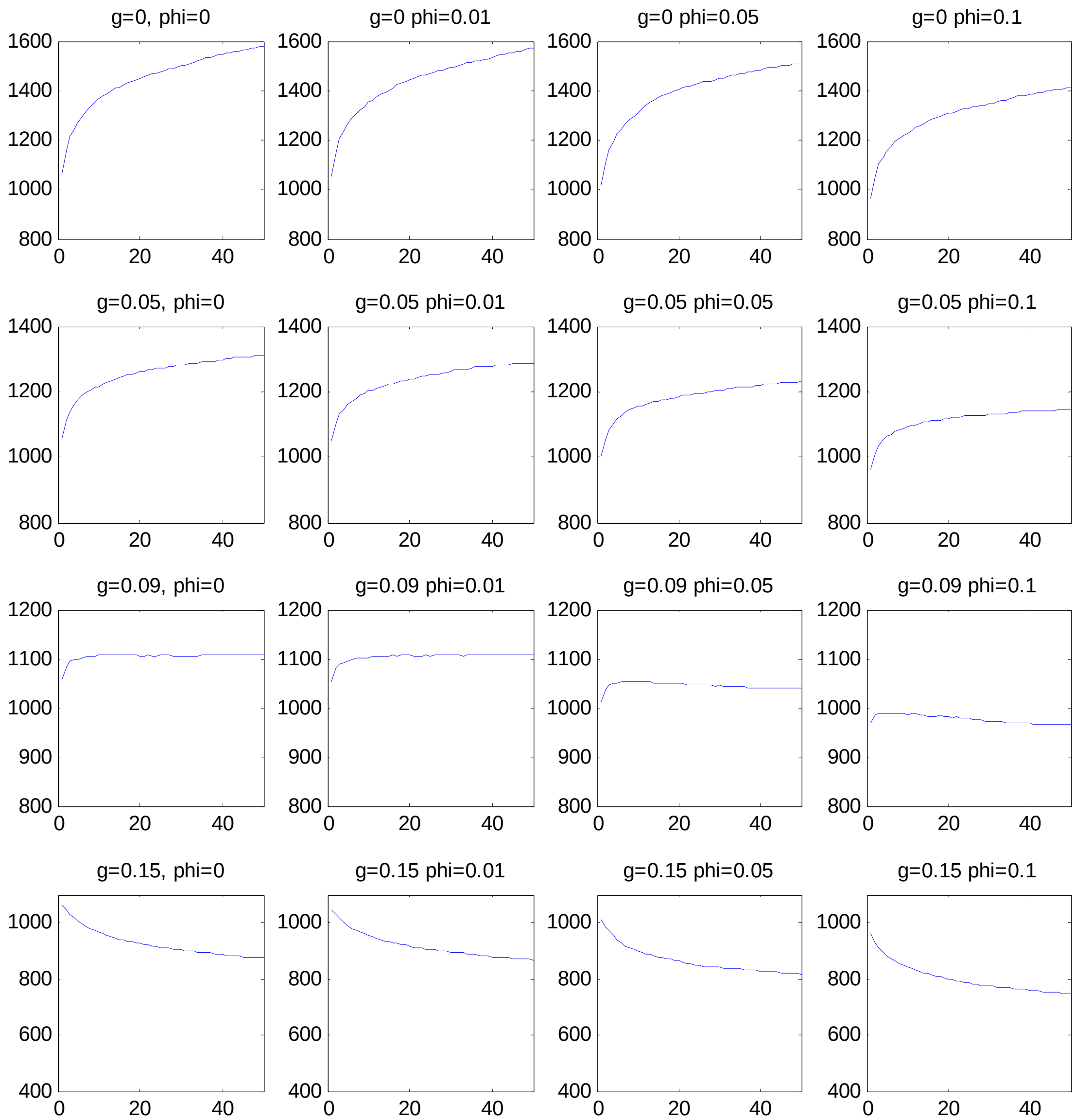


(M4) $U_i = U^*_i - \theta_i$,
where $\log(U^*_i) = \alpha_i \log(A_1 + \varepsilon_i) - \beta_i \log(A_2 + \eta_i) - \gamma \log(k)$

Utility Function with information costs, imperfect perception and regret

$\theta$ is a random variable drawn from a beta distribution $(1, 1/\varphi)$

*Graphs of k against average total utility Y for different values of $\gamma$ =g and $\varphi$ = phi*



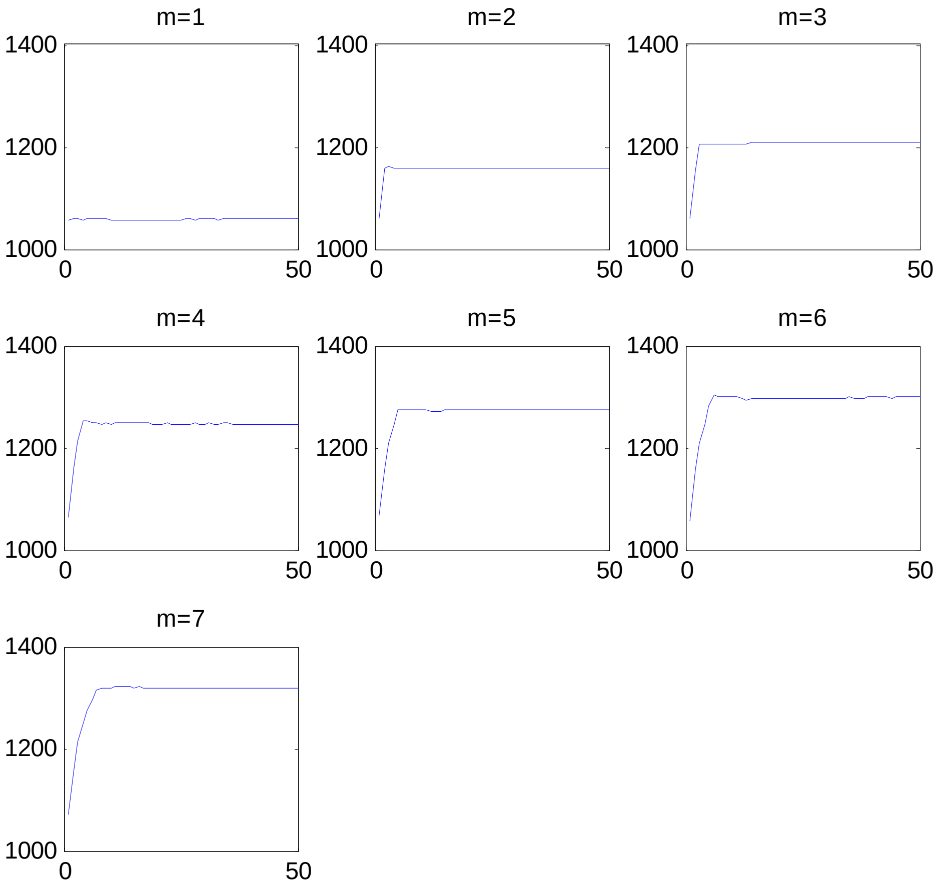
# Satisficers

(S1) $\log(U_i) = \alpha_i \log(A_1) - \beta_i \log(A_2)$

Standard Utility Function

Satisficers only consider up to m products. These products are randomly chosen for each agent from the available products. Total utility is summed across all agents and then averaged across each run.

*Graphs of k against average total utility Y for different values of m*

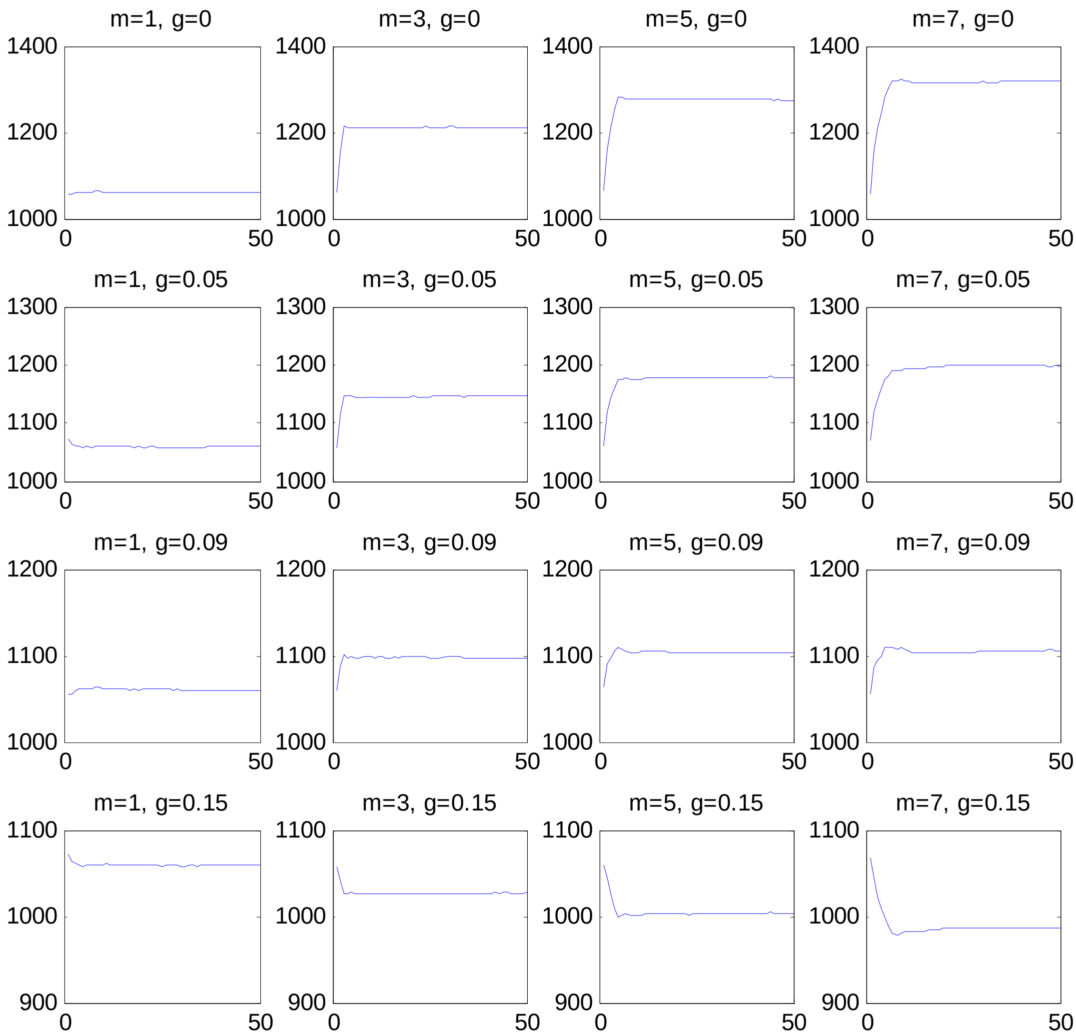


## (S2) $\log(U_i) = \alpha_i \log(A_1) - \beta_i \log(A_2) - \gamma \log(m)$

Utility Function with information costs

The information cost is a function of the number of products considered.

*Graphs of k against average total utility Y for different values of γ = g and m*

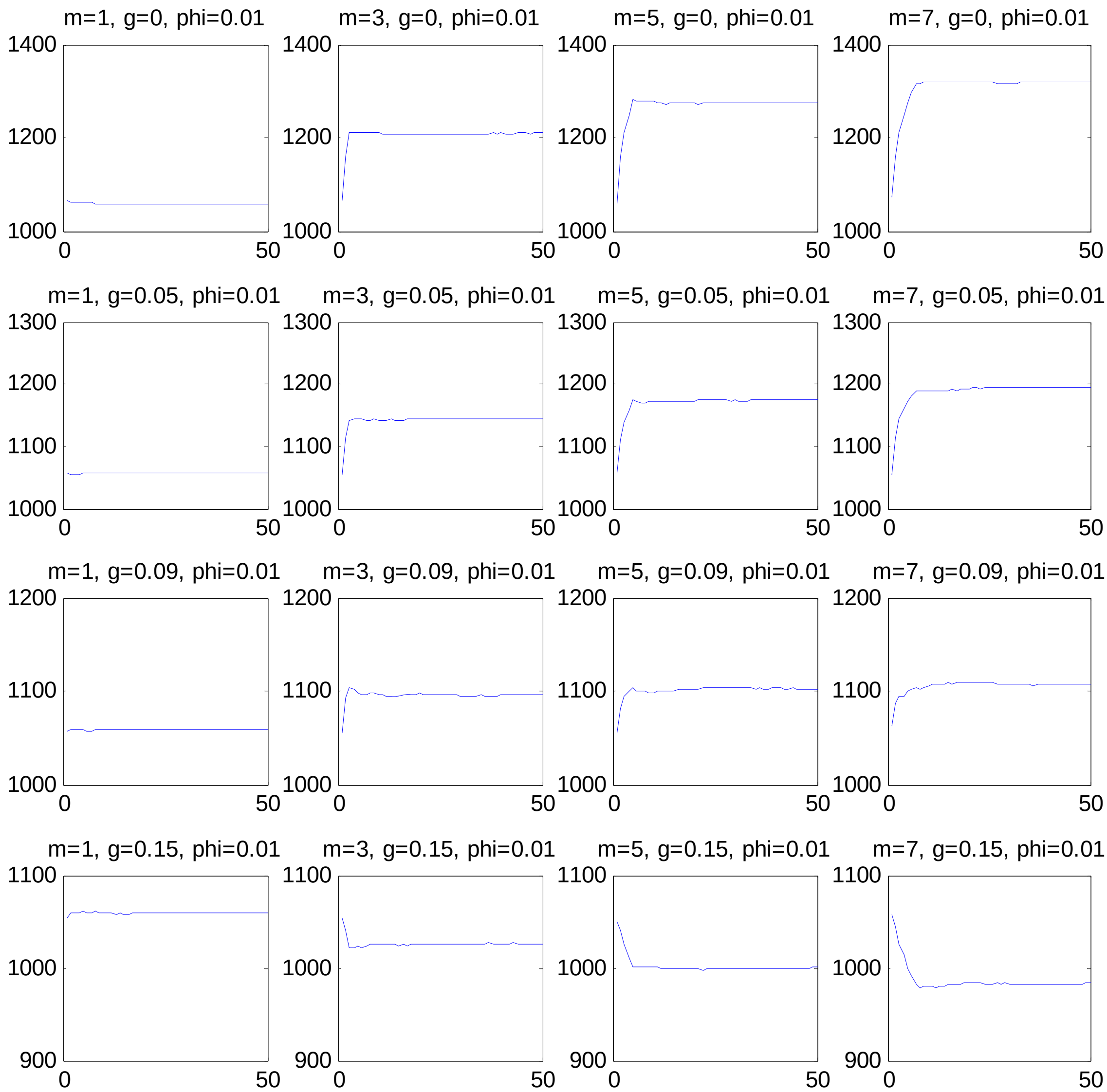


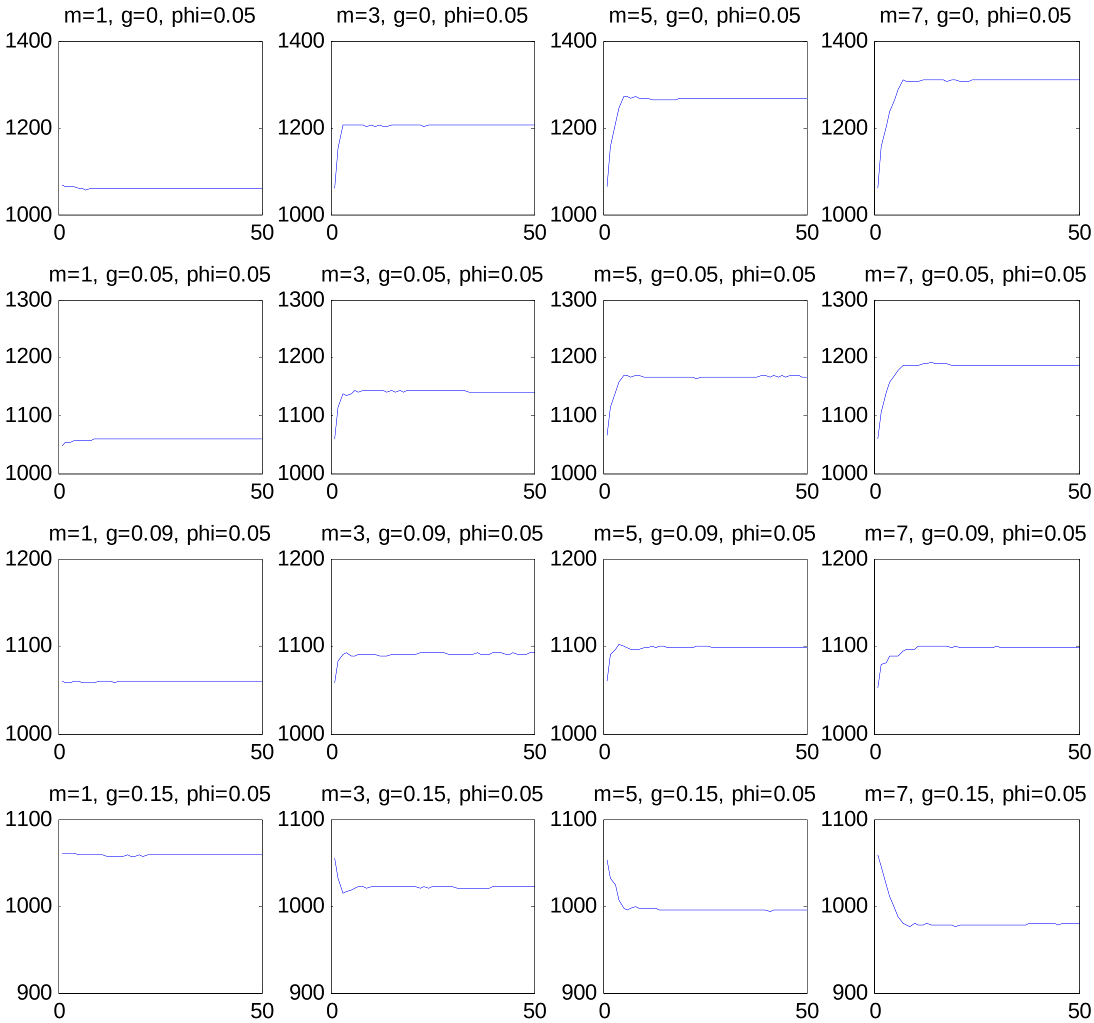
## (S3) $\log(U_i) = \alpha_i \log(A_1 + \varepsilon_i) - \beta_i \log(A_2 + \eta_i) - \gamma \log(m)$

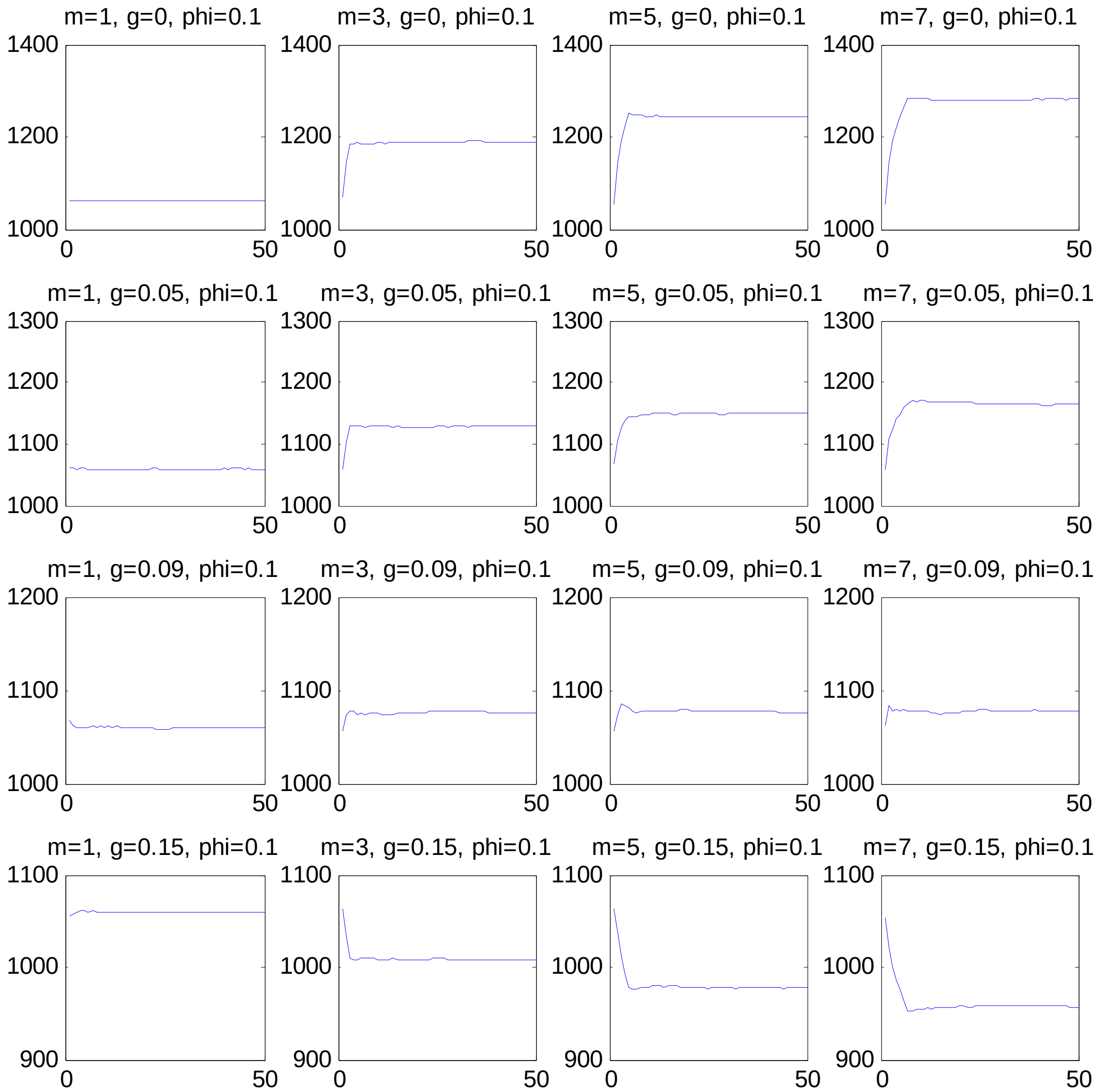
Utility function with information costs and imperfect perception

$\varepsilon_i$ and $\eta_i$ are drawn from a uniform distribution on $[-\varphi, +\varphi]$

*Graphs of k against average total utility Y for different values of $\gamma$ = g, m and $\varphi$ = phi*

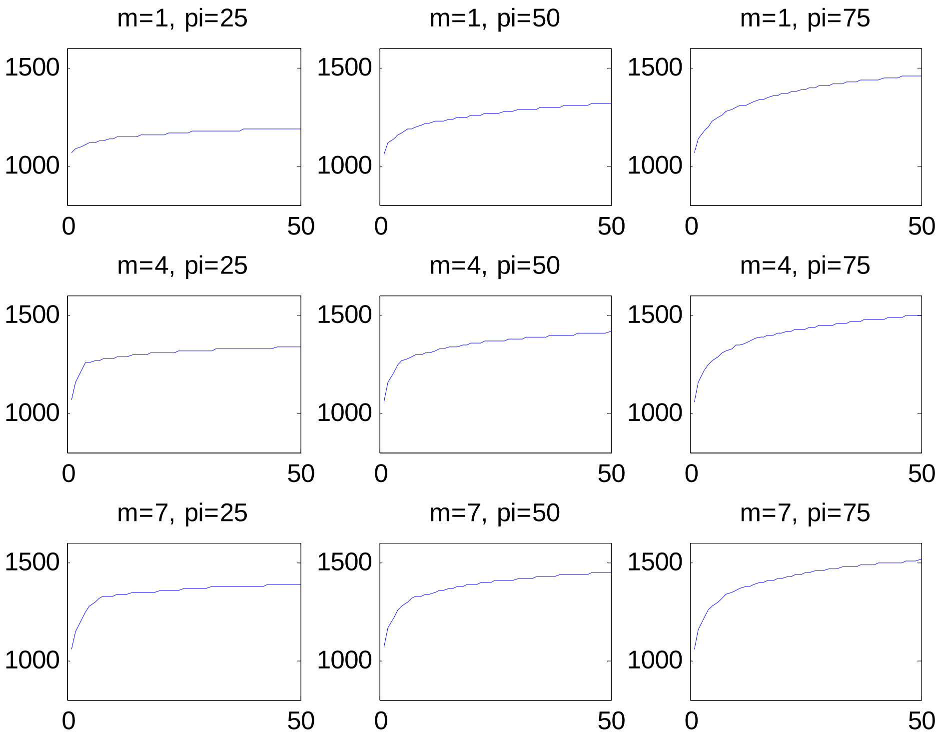



m=1, g=0, phi=0.05
m=3, g=0, phi=0.05
m=5, g=0, phi=0.05
m=7, g=0, phi=0.05
m=1, g=0.05, phi=0.05
m=3, g=0.05, phi=0.05
m=5, g=0.05, phi=0.05
m=7, g=0.05, phi=0.05
m=1, g=0.09, phi=0.05
m=3, g=0.09, phi=0.05
m=5, g=0.09, phi=0.05
m=7, g=0.09, phi=0.05
m=1, g=0.15, phi=0.05
m=3, g=0.15, phi=0.05
m=5, g=0.15, phi=0.05
m=7, g=0.15, phi=0.05


m=1, g=0, phi=0.1
m=3, g=0, phi=0.1
m=5, g=0, phi=0.1
m=7, g=0, phi=0.1
1400
1200
1000
0
50
m=1, g=0.05, phi=0.1
m=3, g=0.05, phi=0.1
m=5, g=0.05, phi=0.1
m=7, g=0.05, phi=0.1
1300
1200
1100
1000
0
50
m=1, g=0.09, phi=0.1
m=3, g=0.09, phi=0.1
m=5, g=0.09, phi=0.1
m=7, g=0.09, phi=0.1
1200
1100
1000
0
50
m=1, g=0.15, phi=0.1
m=3, g=0.15, phi=0.1
m=5, g=0.15, phi=0.1
m=7, g=0.15, phi=0.1
1100
1000
900
0
50

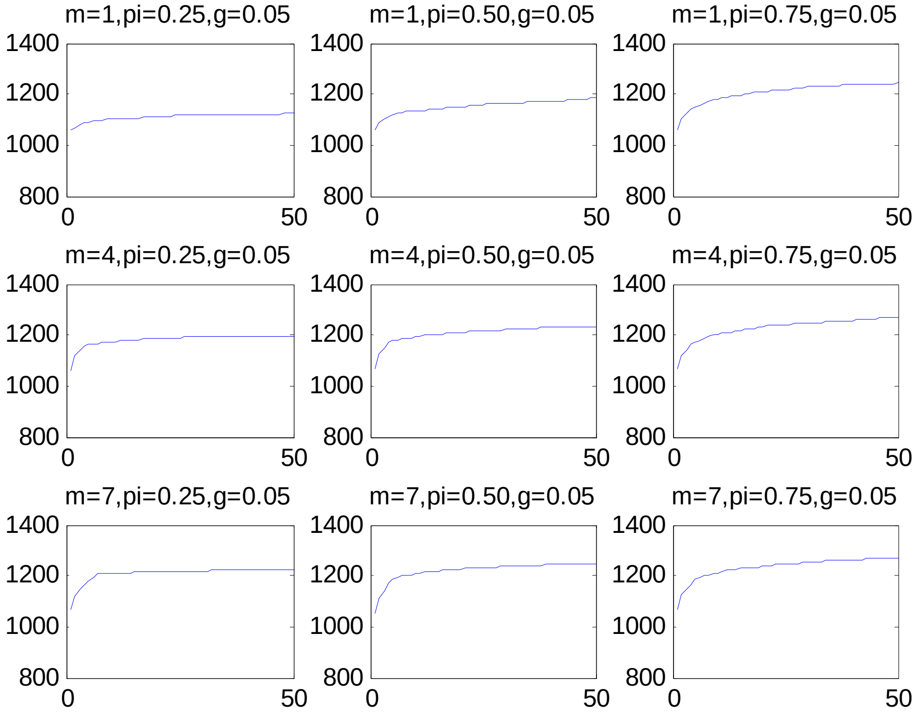
## Mixed Society: pi=proportion of maximisers
## (1-pi)=proportion of satisficers

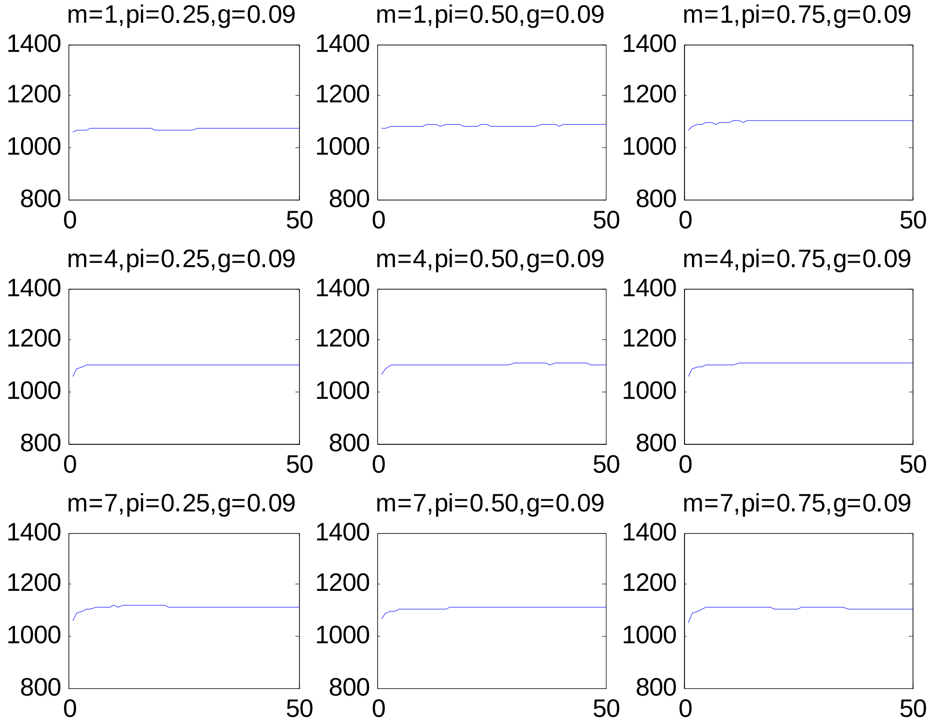
(B1) $\log(U_i) = \alpha_i \log(A_1) - \beta_i \log(A_2)$

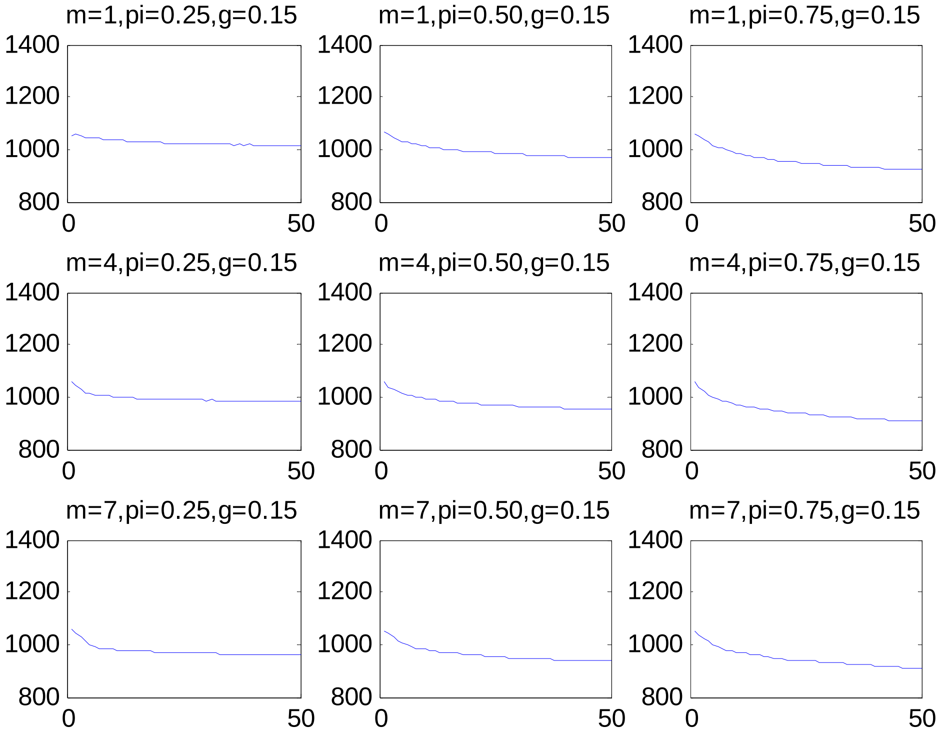


## (B2) $\log(U_i) = \alpha_i \log(A_1) - \beta_i \log(A_2) - \gamma \log(k^*)$

($k^*=k$ for maximisers and $k^*=m$ for satisficers) $m=7$

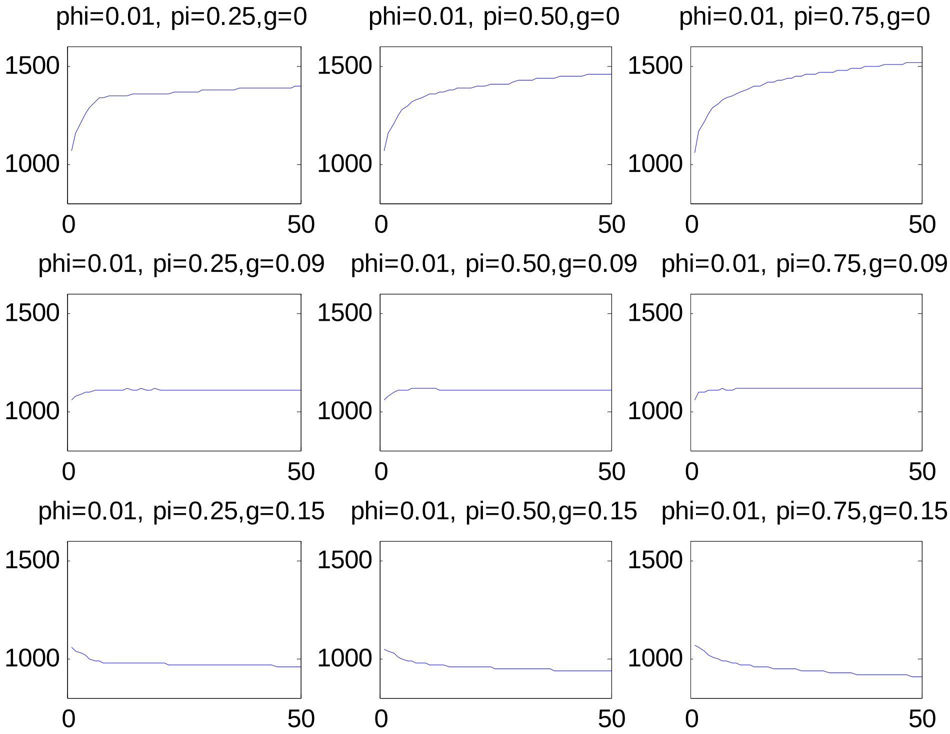


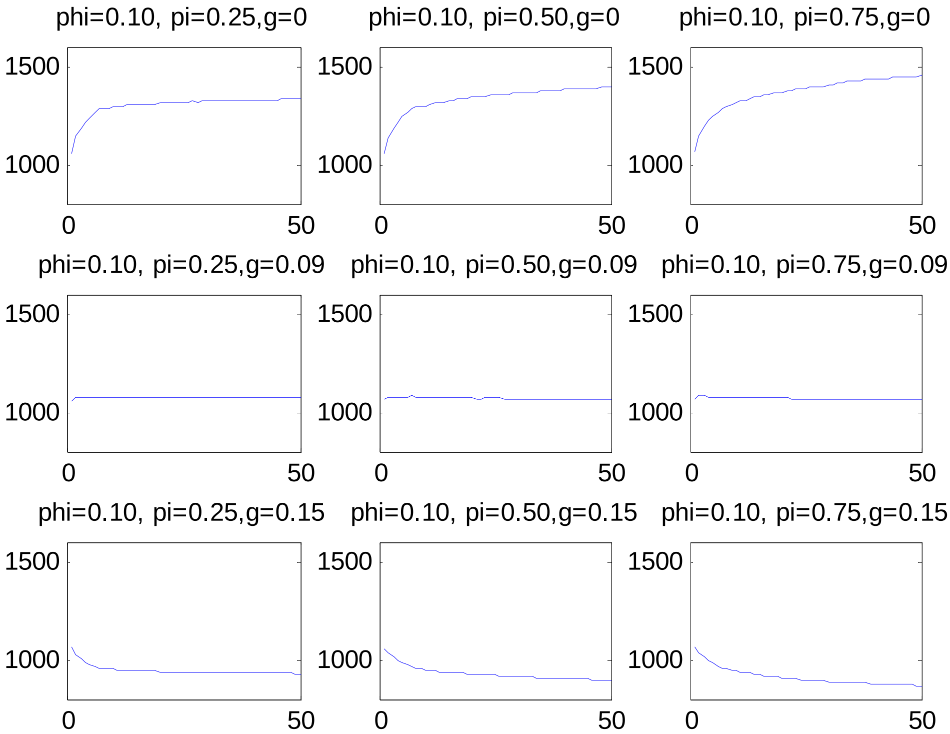




m=1,pi=0.25,g=0.15
m=1,pi=0.50,g=0.15
m=1,pi=0.75,g=0.15
m=4,pi=0.25,g=0.15
m=4,pi=0.50,g=0.15
m=4,pi=0.75,g=0.15
m=7,pi=0.25,g=0.15
m=7,pi=0.50,g=0.15
m=7,pi=0.75,g=0.15
1400
1200
1000
800
0
50

## (B3) $\log(U_i) = \alpha_i \log(A_1 + \varepsilon_i) - \beta_i \log(A_2 + \eta_i) - \gamma \log(k^*)$

($k^* = k$ for maximisers and $k^* = m$ for satisficers) $m=7$



(B4) $U_i = U^*_i - \theta_i$,

where $\log(U^*_i) = \alpha_i \log(A_1 + \varepsilon_i) - \beta_i \log(A_2 + \eta_i) - \gamma \log(k^*)$

($k^*=k$ for maximisers and $k^*=m$ for satisficers, $\theta=0$ for satisficers) $m=7$