

Siebert, Jan

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## Are the poor more impatient than the rich? Experimental evidence on the effect of (lab) wealth on intertemporal preferences

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Jan Siebert

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**Experimental Evidence on the Effect of  
(Lab) Wealth on Intertemporal Preferences**

# Imprint

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Ruhr-Universität Bochum (RUB), Department of Economics  
Universitätsstr. 150, 44801 Bochum, Germany

Technische Universität Dortmund, Department of Economic and Social Sciences  
Vogelpothsweg 87, 44227 Dortmund, Germany

Universität Duisburg-Essen, Department of Economics  
Universitätsstr. 12, 45117 Essen, Germany

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Jan Siebert<sup>1</sup>

## Are the Poor More Impatient Than the Rich?

### Experimental Evidence on the Effect of (Lab) Wealth on Intertemporal Preferences

#### Abstract

*Poor people have, on average, a higher marginal propensity to consume. One (out of many) possible explanations for this is that poverty affects impatience. This would have important implications for monetary and fiscal policy. While some macroeconomists simply assume lower individual discount factors for poorer households, little is known about this phenomenon from a behavioural point of view. This paper presents a laboratory experiment to test whether the poor show more impatient behaviour. In the experiment, half of the participants gets a high participation fee, while the other half gets a low participation fee. All participants perform an intertemporal multiple price list task. The participation fee has a significant effect. Surprisingly, participants with a lower participation fee are less impatient.*

JEL-Code: C9, D9, E2

Keywords: Intertemporal preferences, patience, saving, consumption, experiments

April 2020

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<sup>1</sup> Jan Siebert, Chair for Economic Policy, Faculty of Economics and Business Administration, University of Duisburg-Essen - This study was generously financed by the Chair of Economic Policy at the University of Duisburg-Essen. - All correspondence to: Jan Siebert, Chair for Economic Policy, Faculty of Economics and Business Administration, University of Duisburg-Essen, Universitätsstraße 12, 45141 Essen, Germany, Tel.: +49201-183-4717 e-mail: jan.siebert@uni-due.de

“A poor man is more impatient than a rich man of the same personal characteristics.”  
(Fisher, 1930, p.83)

## 1 Introduction

A good understanding of intertemporal preferences is indispensable for monetary and fiscal policy. Numerous studies show that poor people spend a greater proportion of an income shock than rich people (see e.g. Jappelli and Pistaferri, 2010; Lawrance, 1991). Theories to explain that frequent observation are diverse. Different explanations reach from liquidity constraints in combination with high impatience (see e.g. Deaton, 1991), or selection effects, i.e., impatient people become poor (see e.g. Golsteyn et al., 2014), or low possibilities for self-punishment (Bernheim et al., 2015), to over-proportional consumption of temptation goods like alcohol and fat (Banerjee and Mullainathan, 2010). One possible further explanation is that poverty affects intertemporal preferences (see e.g. Fisher, 1930).

The last explanation would have important implications for monetary and fiscal policy. In reality, it is difficult to distinguish between causal effects and selection effects. Therefore, a laboratory experiment under controlled conditions is a good way to test whether the poor show more impatient behaviour. A simple laboratory experiment is also a good starting point before testing this question in more complex experiments in the field.

A few earlier experiments, which actually had a different intention, paid different amounts to participants and then measured their intertemporal preferences. These data can be used to examine whether the poor (participants who earned less in the previous experiment) show more impatient behaviour than the rich (participants who earned more). Analysing data of different experiments reported in Andersen et al. (2006, 2008, 2014)<sup>1</sup> and comparing the intertemporal individual discount rate of the poor to that of the rich, reveals no significant difference between the two (See Appendix A). However, the participants in these experiments have to perform a variety of tasks whose effects may outweigh the effect of the payments.

This paper presents a laboratory experiment to test solely whether the poor show more impatient behaviour. Participants receive different amounts of participation fees and perform an intertemporal allocation task. Different participation fees are an external random microscopic change in participants real life wealth. The complex social, physical and psychological conditions of being poor are not reproduced in the laboratory. This study examines only the effect of a microscopic change in wealth. Earlier experiments use small payments to test their effects on risk aversion under different conditions and establish the term

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<sup>1</sup>Andersen et al. (2006) and Andersen et al. (2008) describe two parts of the same experiment. The first part (described in Andersen et al. (2006)) was conducted in laboratories, the second part (described in Andersen et al. (2008)) was a field experiment.

'lab wealth' (see e.g. Cox and Sadiraj, 2009; Cox et al., 2013; Harrison et al., 2017; Andersen et al., 2018). To measure intertemporal preferences, this study uses a simple version of the multiple price list task designed amongst others by Andersen et al. (2008). Participants must decide between an earlier (three months after the experiment) lower payment or a higher later payment (six months after the experiment). This design gives a good comparison value for their impatience.

The results of this experiment contradict the above-mentioned theory. Participants with lower lab wealth show less impatient behaviour. The difference between both groups is significant. The rest of this paper is as follows. Section 2 explains the experimental design. Section 3 presents the results and section 4 discusses the results in context of previous research.

## 2 Experimental Design

The experiment was conducted in the Essen Laboratory for Experimental Economics (elfe), using zTree (Fischbacher, 2007) and ORSEE (Greiner, 2015). The participants were 59 students of the University of Duisburg-Essen from different subjects (average age 23.9, 20 men and 39 women). The experiment lasted less than 60 minutes. The average earning was 16 Euros. One half of the participants of each session received high lab wealth, while the other half received low lab wealth.

The course of events was as follows: After entering the laboratory, the participants were randomly assigned to separate computer workstations. Then, they read instructions, which were placed in the workstations (see Appendix B for a translated version of the instructions). Participants' questions were answered in private. The instructions begin with information about the participation fee. The participation fee was either 5 Euro (lower lab wealth), or 20 Euro (higher lab wealth). This was determined by the random draw of the workstation at the beginning of the experiment. Each participant was just informed about their own participation fee. In order to make sure that participants were aware of the amount of their participation fees, they were asked explicitly for it, as the first and the last of eight comprehension questions. The other six questions were about the intertemporal multiple price list task. A participant could start the experiment only after they answered all questions correctly (see Appendix C for all questions). The evaluation of the intertemporal preferences followed. A simple version of the multiple price list task was used. Participants had to choose between two payment options in ten different decision rows. Option A was a payment of 35 Euros in three months after the experiment in each decision row. Option B was a payment of 35 Euros in six months after the experiment in the first row and increased by 3.5 Euros per decision row. The relatively long front-end delay of three months has the following reason. It is to avoid measuring time inconsistency instead of impatience. See Figure 1 for a screenshot of the multiple price list task. Only one switching point between Option A and Option B was allowed.

FIGURE 1: Screen Shot of the Intertemporal Multiple Price List Task

Main Part			
Option A: amount in three month 18th of March 2018 (+- 5 workingdays)	Please, choose one option in each row and press OK afterwards.		Option B: amount in six month 18th of June 2018 (+-5 workingdays)
	<input type="button" value="OK"/>		
35.0 €	A	B	35.0 €
35.0 €	A	B	38.5 €
35.0 €	A	B	42.0 €
35.0 €	A	B	45.5 €
35.0 €	A	B	49.0 €
35.0 €	A	B	52.5 €
35.0 €	A	B	56.0 €
35.0 €	A	B	59.5 €
35.0 €	A	B	63.0 €
35.0 €	A	B	66.5 €

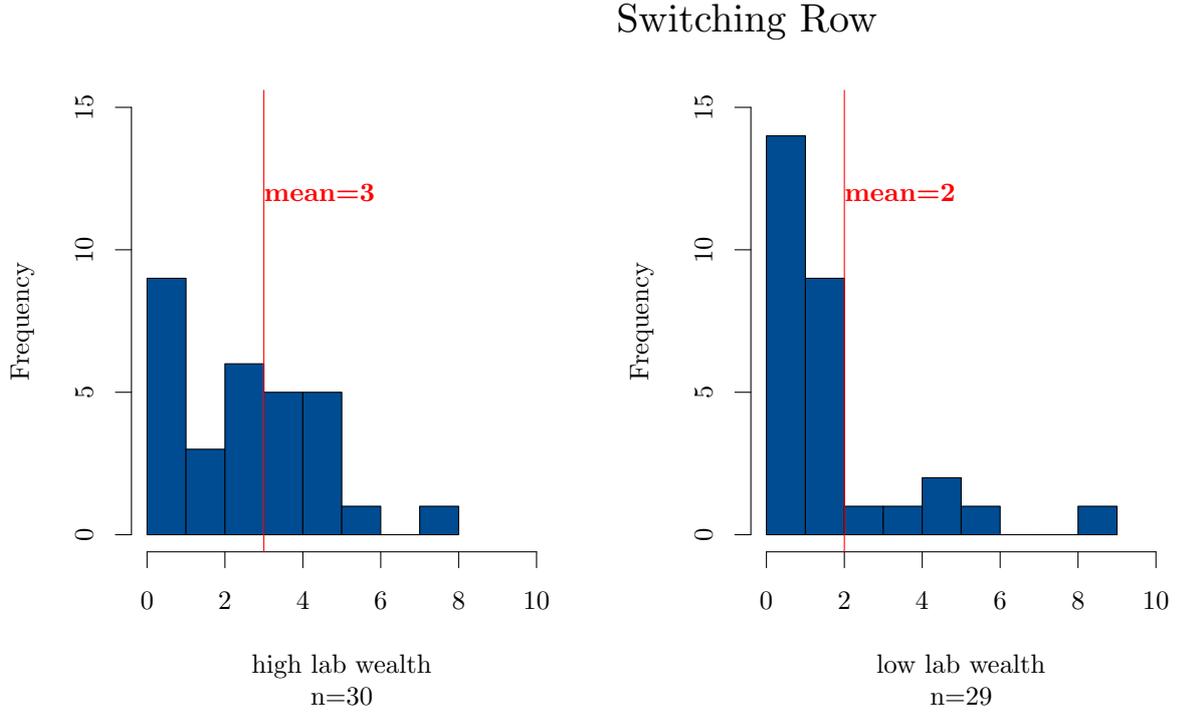
The experiment took place in December, so future payments were either in March or in June (not in high consumption Christmas season). As a test before the actual task, the participants could play one-time payment irrelevant through the task. A first random draw decided *which* decision row would be realized (each row had a 10 percent chance) and a second random draw decided *if* the payment was realized (each participant had an independent chance of  $1/16 = 6.25$  percent that any future payment was realized). Participants that were chosen by the random draw to receive a future payment (in fact four participants) were asked for information about their banking accounts to transfer at the specific dates. The administration of the University of Duisburg-Essen transferred the money to the chosen participants three months or six months after the experiment. The participants were informed that the payment could be within five working days before or after the specified date.

After the multiple price list task, the participants had to answer a questionnaire. They were asked for demographics, self-assessment of personality traits, and financial situation. Table 2 in Appendix D shows participants demographics. Column four of Table 2 reports the standard deviation. We do not find significant differences in any of the demographics between both groups.

### 3 Results

Participants switch on average after 2.51 rows to Option B. Mean switching row of participants with 5 Euros participation fee is 2. Participants with a participation fee of 20 Euros have on average a switching row of 3. See Figure 2 for a comparison between both groups.

FIGURE 2: The Row in which Participants Switch from Option A to Option B



A two-sided Mann-Whitney U test reveals significant differences between both groups (p-value 0.025). The null hypothesis that there are no differences between both groups can be rejected. However, testing against the alternative that participants with lower lab wealth switch *later* from Option A to Option B – the poor are more impatient, – the p-value is 0.988. To conclude, low lab wealth makes participants significantly *less* impatient.

The result of the experiment suggests that lab wealth affects behaviour of participants. This again suggests that the underlying (marginal) latent preferences of participants are affected as well. However, it is not obvious which latent variables are affected and how they are affected. In the following, I will try to illuminate the space of possible changes in latent preferences, following Andersen et al. (2008).

Assuming that individuals discount future payments exponentially, an individual is indifferent between an earlier income option  $M_t$  and a later income option  $M_{t+\tau}$ , if

$$(\omega + M_t) + \frac{1}{(1 + \delta)^\tau} \omega = \omega + \frac{1}{(1 + \delta)^\tau} (\omega + M_{t+\tau}). \quad (1)$$

Where  $\omega$  is a measure of background consumption<sup>2</sup>,  $\delta$  is the discount rate,  $t$  is the delivery date of the sooner payment option,  $t + \tau$  is the delivery date of the later payment option. Without any further assumptions, we must conclude that lab wealth has an effect on the latent variable  $\delta$ . However, it is a common assumption that utility of individuals does not increase linearly with income. The most common way to model this is a Constant Relative Risk Aversion (CRRA) utility function

$$U(M) = \frac{(\omega + M)^{(1-r)}}{(1-r)} \quad (2)$$

for  $r \neq 1$ . The CRRA coefficient  $r$  indicates risk averse preferences if  $r > 0$  and risk loving behaviour if  $r < 0$ . Based on these two simple assumptions (risk aversion and exponential discounting), it is not possible to clearly state which of the latent variables ( $r$  and  $\delta$ ) was changed by the payment in the laboratory. I used the maximum-likelihood estimation procedure like Andersen et al. (2008) to estimate which latent variable is most likely. First, I assume that  $r$  is unaffected. Then I assume that  $\delta$  is unaffected.

Assuming an unaffected  $r$  of 0.79<sup>3</sup>, I find  $\delta = 0.65$  for the whole sample,  $\delta = 0.44$  for the participants with show up fee of 5 Euro,  $\delta = 0.82$  for the participants with a show up fee of 20 Euro. Assuming, on the other hand, an unaffected  $\delta$  of 0.65, the whole sample has an  $r = 0.81$ , the 5 Euro participants have an  $r = 0.23$ , the 20 Euro participants have an  $r = 0.89$ . It is not possible to say whether impatience ( $\delta$ ) has changed or whether risk aversion ( $r$ ) has changed. Of course, it is also possible that both ( $r$  and  $\delta$ ) have changed in the same direction or one in one and the other in the other direction. Andersen et al. (2008) show how both aspects interact with each other. It also cannot be ruled out that individuals make their decisions based on a different, perhaps more complex, utility function. However, based on the experiment we can say that poor people (participants with less lab wealth) *behave* less impatiently.

## 4 Discussion

This paper presents an experiment to test whether the poor are more impatient than the rich. The simple experiment focuses solely on answering that single question, to avoid many tasks within the experimental session. Possible influence of other decisions or payments is thus excluded. This paper finds clear evidence that the poor are not more impatient, but *less* impatient.

However, the difference is not significant in earlier experiments that deal with other research questions but can nevertheless be used to approach the above question. This obvious discrepancy suggests that the

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<sup>2</sup>In lack of data for German students, I followed Andersen et al. (2008) and set  $\omega = 118$  DKK = 15.79 Euro. That is probably a bit too high for German students. Therefore, I checked results with an  $\omega$  half of the size. It reduces the whole sample  $\delta$  to 0.53 and the whole sample  $r$  to 0.61. However, the comparative statistics hold.

<sup>3</sup>Andersen et al. (2006) found this value in a sample of students which is roughly comparable to ours.

circumstances play a major role.

Ifcher and Zarghamee (2011) as well as Drichoutis and Nayga (2013) test whether “induced mood” affects intertemporal and risk preferences. Ifcher and Zarghamee (2011) affect the mood of participants by showing them short video clips. They find that positive mood makes participants more patient. Similarly, Drichoutis and Nayga (2013) test the effect of mood on financial decisions. They trigger different moods by giving participants different math tasks. Difficult math tasks together with the information that the participant performed below average should trigger negative mood. Easy math tasks together with the information that participant performed above average, should trigger positive mood. They find that both – positive emotions and negative emotions – decrease impatience. Both experiments suggest that it is not irrelevant whether payments in experiments are lucky profits or whether participants are paid for appearing and know nothing about whether someone else receives more or less.

In summary, explanations for the divergent evidence could be: 1. Lower wealth could make impatience less affordable and thus decreases impatience (income effect); 2. Lower wealth could trigger a negative mood which decreases the current value of future consumption which increases impatience (mood effect). The circumstances determine which effect dominates. That poor households have a higher propensity to consume can therefore only be explained if the mood effect clearly exceeds the income effect.

This study cannot find support for Fisher’s above-mentioned assertion – a poor man is more impatient than a rich man. However, this study is limited to examining only a microscopic change in wealth and is not able to reproduce the complex social, physical and psychological conditions of poverty. To conclude, the income effect must be considered *together* with many other aspects, such as emotional conditions, in order to make a robust statement about impatience of the poor.

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## A Comparison of Experiments

TABLE 1: Comparison of the Experiments

n	n lw	n no lw	idr all	idr lw	idr no lw	cor lw idr	cor test	MWU p
My Experiment (Lab Wealth by Show Up Fee)								
59	30	29	8.43	9.88	6.94	0.2	0.12	0.03**
Andersen et al. (2006) (lab part of the experiment; lab wealth by RA task)								
90	7	83	36.23	42.08	35.73	0.03	0.76	0.6
Andersen et al. (2006) (lab part of the experiment; lab wealth by endowment)								
90	90	0	36.23	36.23	–	-0.07	0.51	–
Andersen et al. (2008) (field part of the experiment; lab wealth by RA task)								
253	22	231	14.05	12.5	14.2	-0.05	0.44	0.32
Andersen et al. (2014) (field part of the experiment; lab wealth by RA task)								
413	20	393	36.09	35.12	36.14	-0.06	0.23	0.78
Andersen et al. (2014) (field part of the experiment; lab wealth by show up fee)								
413	208	205	36.09	36.69	35.49	0.03	0.6	0.58
Andersen et al. (2014) (field part of the experiment; lab wealth by show up fee + RA task)								
413	219	194	36.09	36.6	35.52	-0.05	0.28	0.63
Andersen et al. (2014) (field part of the experiment; lab wealth by RA task, only RA first)								
229	20	209	37.55	35.12	37.78	-0.1	0.14	0.53
Andersen et al. (2014) (lab part of the experiment; lab wealth by RA task)								
88	8	80	36.46	38.44	36.26	-0.06	0.6	0.83

$p < 0.1^*$ ;  $p < 0.05^{**}$ ;  $p < 0.01^{***}$

The first column (n) shows the number of (independent) participants. In the second column (n lw) is the number of participants who got (high) lab wealth. The number of participants without (high) lab wealth is in column 3 (n no lw). The average individual discount rate assuming risk neutral individuals (idr) of all participants is in column 4 (idr all). The average idr of participants with (high) lab wealth is in column 5 (idr lw) and the average idr of participants without (high) lab wealth is in column 6 (idr no lw). The correlation coefficient between lab wealth and the idr is in column 7 (cor lw idr). The p-value of a Pearson correlation test between lab wealth and the idr is in column 8 (cor test). The p-value of a Mann Whitney U test comparing the idr between the group with (high) lab wealth and the group without (high) lab wealth is in column 9 (MWU p).

## B Instructions

### Welcome to the experiment!

You take part in a study of decision-making behaviour within the framework of experimental economic research. During the investigation, you will be asked to make decisions. You can earn money doing it. How much money that will be depends on various factors. Detailed instructions are given below.

#### Basic Payment

Irrespective of the further course of the experiment, you will receive a basic payment of **5 EUROS [20 EUROS]**. This amount will be paid to you in cash at the end of the experiment. Therefore, please remain seated at your seat after the experiment until your seat number is called.

#### Comprehension Questions

Before starting the actual experiment, you will be asked 8 comprehension questions and you will go through a trial run. The comprehension questions and the trial run have no effect on your payment. They only serve the purpose of understanding and have no effect on the further course of the experiment. Should you have any questions before the start of the main part of the experiment, please contact a member of the laboratory staff by hand signal. He will then come to your place and help you. No more questions can be answered during the experiment. Any communication with the other participants is not permitted during the experiment. Violation of this rule will result in immediate exclusion from the experiment.

#### Main Part

In the main part of the experiment you will be asked to make several decisions. You will be presented with a list of 10 decision options. For this list you make 10 decisions by choosing between payment Option A and payment Option B. These payment options represent potential transfers to you in the future. If you choose **payment Option A** and the corresponding decision option is randomly selected and randomly realized, the corresponding amount will be transferred to you in **three months**, i.e. on 18 March 2018. If you choose **payment Option B** and the corresponding decision option is randomly selected and randomly realized, the corresponding amount will be transferred to you in **six months**, i.e. on 18 June 2018. However, the payment may be delayed by up to five working days. Whether and which decision possibility is realized, depends on two random generators. The first random generator selects one of the ten decision options. After the main part of the experiment, when you have made all ten decisions, one of your decisions from the main part of the experiment is randomly drawn by the computer and displayed on your screen. The probability of being selected is the same for all ten decision options.

It is therefore 1/10 or 10%. Whether the randomly selected decision option is actually made with the corresponding payment option selected by you, depends on the second random number generator. The probability that this payment will actually be made is 1/16, i.e. 6.25%. Whether the payment is actually made or not, is shown on the screen. If you are notified that your selected payment option is actually being made, you will automatically be asked for your IBAN and address. The amount will then be transferred to your account at the specified time. The transfer is carried out by the Finance Department of the University of Duisburg-Essen. Your address is required for the transfer to be made by the University of Duisburg-Essen. We will not use your personal information for purposes other than processing the transaction.

The decision situation is described in more detail below. A list is displayed on your screen. In this list, you can choose between two payment options in each row. The difference between the two disbursements lies in the amount and the time of disbursement. The example illustrates a corresponding decision situation:

<b>Main Part</b>		
<b>Option A:</b> amount in three month 18th of March 2018 (+- 5 workingdays)	Please, choose one option in each row and press OK afterwards. <input type="button" value="OK"/>	<b>Option B:</b> amount in six month 18th of June 2018 (+-5 workingdays)
35.0 €	A      B	35.0 €
35.0 €	A      B	38.5 €
35.0 €	A      B	42.0 €
35.0 €	A      B	45.5 €
35.0 €	A      B	49.0 €
35.0 €	A      B	52.5 €
35.0 €	A      B	56.0 €
35.0 €	A      B	59.5 €
35.0 €	A      B	63.0 €
35.0 €	A      B	66.5 €

The payment time described indicates when you will receive the potential payment. You therefore choose between a potential payment of the amount of Option A at an earlier date and a potential payment of the amount of Option B at a later date. The amount of the later payment increases as you continue to

go down in the list of decision options.

For each of the ten choices, click A or B to make a choice between the two. You have the following options:

- You can choose A in all rows
- You can choose B in all rows
- You can choose A in one or more rows and then change to B.

If you change from A to B in a row, the program also automatically selects B for the following rows. But you can still change the decision. After you have chosen one of the two options in each of the ten rows, please confirm your choice with "OK".

### Payment Modalities

Once you have made your decision, the computer randomly selects one of the ten options. Depending on your decision, Option A or Option B of the selected decision option is the potential payment option for you. Whether or not this payment is actually made depends on the second random draw. After the random draws happened, a questionnaire opens. Only after all participants have answered the questionnaire completely, the payment of the basic payment of **5 EUROS [20 EUROS]** in cash begins. After completing the questionnaire, please remain seated until your cabin number is called.

## C Comprehension Questions

- Question 1: How high is the basic payment, which you receive in cash regardless of the main part of the experiment, in Euro?
- Question 2: In how many months is the earlier payment date of the main part?
- Question 3: In how many months is the later payment date of the main part?
- Question 4: What is the probability (in percent) that one of the ten decision options will be selected?
- Question 5: What is the probability (in percent) that a selected payment option will be executed?
- Question 6: How often is it possible to switch between Option A and Option B?
- Question 7: How many trials are there before the main part?
- Question 8: How high is the basic payment, which you receive in cash regardless of the main part of the experiment, in Euro?

## D Characteristics of Participants

TABLE 2: Characteristics

	high lab wealth	low lab wealth	all	sd
n	30	29	59	
female	22	17	39	0.48
age	22.7	25.1	23.9	4.4
semester	5.1	6.4	5.7	4.2
school	2.4	2.5	2.4	0.7
(Home) Wealth	516.7	615.4	562.5	294.8
Savings	66.8	36	52.8	74.6