Reciprocity, Altruism, and Implicit Worldviews[†]

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Abstract

The main purpose of this paper is to study how the individual differences in implicit worldviews regarding categories versus relationships and reciprocal expectation affect altruistic decision towards parents, children, and non-family members, using the data obtained through internet surveys conducted in Japan. Our analyses revealed that individuals who put more weight on relationships than categories become less altruistic towards parents and children, which suggests that relation-based worldviews negatively affect an individual's altruistic decision regarding the recipients who are related to them. We hypothesized that one possible mechanism behind the association between altruistic behavior and relation-based worldviews might be attributable to reciprocal expectation. We found that if individuals with relation-based worldviews expect that their parents would return when they do a favor, they become generous, whereas their generosity is reduced if the reciprocal return from parents is not expected. Our main finding about the implicit worldview in association the conditional reciprocal expectation suggests that individuals' generosity depends on their perception at the implicit level on their relationship with the recipients in regards to expected reciprocation.

Keywords: altruism, reciprocity, implicit worldviews, relationship, generosity
JEL Classification: D03, D64

1. Introduction

Self-interest is emphasized as the primary motive in most economic models. However, experimental economists have challenged the self-interest model through a great number of laboratory experiments (Davis and Holt, 1993; Güth et al., 1982; Ledyard, 1995). Extant research analyzes how selfless behavior is observed in controlled laboratory experiments and elaborates what the results imply in relation to the traits of humans. This related literature has found that individuals often cooperate in public goods and refuse unfair offers in economic experiments. According to Fehr and Schmidt (2006), experimental economists have gathered evidence indicating that other-regarding preferences act as the motivation of economic decision made by many individuals and that fairness and reciprocity should be taken into consideration in social interaction.

Other-regarding preferences suggest that people care about the welfare of others as well as their own utility (Fehr and Schmidt, 1999; Jones and Rachlin, 2006). The generosity has been found to decline as a function of the closeness of the subject's relationship with others. In other words, if the others are socially distant, people care less about them. Jones and Rachlin (2006) found that people will forgo a hypothetical amount of money for themselves to give the money to another person. The amount of money that people forgo varies in a systematic way. It becomes larger as the perceived social distance to the receiver is closer. In the neuroscientific research field, Strombach et al. (2015) recently found that generous choices engaged brain regions, which is the temporoparietal junction (TPJ).

In regards to the closeness of the relationship with the others, Hamilton's (1964) theory predicts that people become altruistic on a larger scale to people with greater genetic overlap. The degree of altruism is decided by how closely related individuals are to the recipient. This indicates that whether the giver is related or unrelated to the receiver will affect the amount of reward to be shared for the benefit of recipients. Rachlin and Jones (2008) found that people are more generous to relatives that non-relatives even at the same social distance. It has also been found that people care less when they are more anonymous and less identifiable (Frey and Bohnet, 1997; Hoffman et al., 1996). Based on existing studies, in our work, we examine how the amount of hypothetical monetary reward differs between family members (parents and children) and anonymous others. In addition to the decision maker's altruism that could vary between family members and strangers, we also examine how the amount of monetary reward that the respondent is willing to share with the recipients differ by economic condition of recipients.

To examine the differences in altruistic decision by the relationship with and condition of the recipients, this paper focuses on two main factors as important determinants. One is implicit worldviews. Hiebert (2008) proposed for studying cultures in anthropology. He assumed that a worldview exists behind each culture and it consists of explicit and implicit levels. According to

Hiebert, different types of logic operate at the implicit level of the worldview, the most important ones being algorithmic logic and relational logic. This classification is in line with Nisbett's (2003) theory of reasoning that compares Westerners and East Asians, indicating that, relatively speaking, compared to Westerners, East Asians tend to use relationships more, while relying on the categories less (see Lee et al., 2013 for more details). The second main variable is expectation of reciprocity. Reciprocity occurs when people behave in a more friendly manner in response to the friendly behavior of others and behave in a unfriendly manner in response to the hostile behavior of others (Rabin 1993). We hypothesized that altruistic behaviors could be attributable to expectation of reciprocation towards receivers, as reciprocal generosity maximizes the givers' benefit in the long run (Rachlin & Jones, 2007).

We used data obtained through internet surveys conducted in Japan, which contain various measures of implicit and explicit worldviews, as well as individual preferences. Our work differs from the previous studies in this filed mainly due to the usage of data that represent implicit worldviews about categories and relationships. The main purpose of this paper is to increase our understanding of how and through what channels implicit worldviews affect an individual's altruistic behaviors. We hypothesized that implicit worldviews act as a significant driving force for other-regarding behavior, in association with reciprocal altruism. Our main findings reveal that implicit worldviews have statistically significant effects on altruistic attitudes. Another finding is that positive reciprocity increases individuals' generosity while negative reciprocity negatively affects the generosity. Furthermore, we found that implicit worldviews, in association with reciprocal expectation, affects individuals' altruism. Those who have relation-based worldview and have higher positive reciprocity are more likely to be generous if they could expect the return from the recipients. To the best of our knowledge, this is the first work in the related field to examine how an individual foundational framework that is formulated at the implicit level could affect altruistic decision in association with reciprocal expectation.

The remainder of the paper is organized as follows. Section 2 reviews existing studies that focus on worldviews, while Section 3 describes the data and main variables used in our study. The economic framework and the estimation results are summarized and discussed in Section 4. The results of the robustness check are explained in Section 5 and Section 6 concludes the paper.

2. Existing Literature about Worldviews

The main focus of this paper is the effect of worldviews on an individual's economic behavior. Hiebert (2008) defined "worldview" in anthropological terms as "the foundational cognitive, affective, and evaluative assumptions and frameworks a group of people makes about the nature of reality which they use to order their lives" (pp. 25-26). A worldview is behind each culture, and Hiebert (2008) considered explicit and implicit levels of a worldview, as shown in

Figure 1. Culture has several levels, which consist of the surface, explicit and implicit elements. On the top of the levels of culture, some cultural products and patterns of behavior are observed. Signs and rituals that lead to expressions of beliefs and feelings are located underneath those visible elements. Hibert (2008) explained that these signs and rituals help people to define, understand and establish the culture themes and social norms, which are essential to preserve their culture and society. Under the surface of patterns of behavior, systems of belief exist as explicit element. Hibert (2008) described that belief systems encode the cultural knowledge. The bottom level of culture is composed of worldview themes, categorical and relation logics, and epistemology. These are unobservable foundations, on which the explicit culture are structured and established.

Some researchers have recently started to study worldviews in order to explain international differences in intergenerational altruistic attitudes (see, for example, Kubota et al., 2013 for a comparative study of Japan and the United States, and Akkemik et al., 2013 for a study of Turkish people living in Turkey and in Germany). These authors have found that certain elements in explicit worldviews (or belief systems), such as confidence in worldview beliefs, have statistically significant effects on intergenerational altruistic attitudes, and can explain substantial proportions of international differences in them. Lee et al. (2013) focused on the implicit worldviews at the bottom level of culture (Figure 1). They found that implicit worldviews have statistically significant effects on some altruistic attitudes. In addition, confidence in spiritual beliefs in explicit worldviews also has significant effects on some altruistic behaviors. These estimation results gave a hint at the possible effects of an individual relation and categorical worldviews that exist at the implicit level on an individual's economic behaviors.

3. Data

The data used for the analyses conducted in this study are based on internet monitor survey entitled "Survey about Economic Behavior and Worldviews", which has been conducted from March 6 to 12 in 2015. It is a nationwide internet survey using publicly recruited monitors, who are selected in a consideration of population proportional distribution. The number of responders was 6,074 (response rate: 11.5%). Then, we additionally conducted a survey using same responders of the first survey, in order to measure other related variables including reciprocity from to August 19 to 28 in 2015. As the response rate was 67.8%, the size of samples used for the main analyses became reduced to 3,798.

3.1 Altruistic Decision

We measured the hypothetical amount of money a person was willing to forgo in order to give $75 to another person (in this paper parents, children, and anonymous others). We

hypothesized that the perceived relationship between respondents and other people affects respondent's altruistic attitudes. We also measured how altruistic behavior toward the same person differs by the economic condition of recipients. We used the following questions to identify the relationship between the giver and receiver and the condition of the receiver.

Imagine that your [parents] are alive and that you live apart from. Also imagine that "your parents have just been fired from work through no fault of their own and are now unemployed". Imagine either you or your parents receive an amount of money. The money cannot be shared with each other, and the person who receives the money can spend it only on himself/herself. Which option would you choose?

A. You: 0 Yen   B. Parents: 7500 Yen

…

A. You: 9000 Yen   B. Parents: 7500 Yen

In the question above, [parents] are replaced with [children] and [anonymous others] to examine the differences in the relationship with the decision maker. The reason of unemployment explained between quotation marks above is replaced by the following sentence to differentiate two different conditions of recipients: "your parents have just been fired and are now unemployed because they committed a wrongful act and caused a huge loss to their company". This combination makes six different questions. The left column (the A column) contained eight items with the amount changing as follows: 0, 100, 500, 1000, 3000, 7500, and 9000. The right column is set at 7500 yen. The money amounts ran in newton methods (please see the following figure).
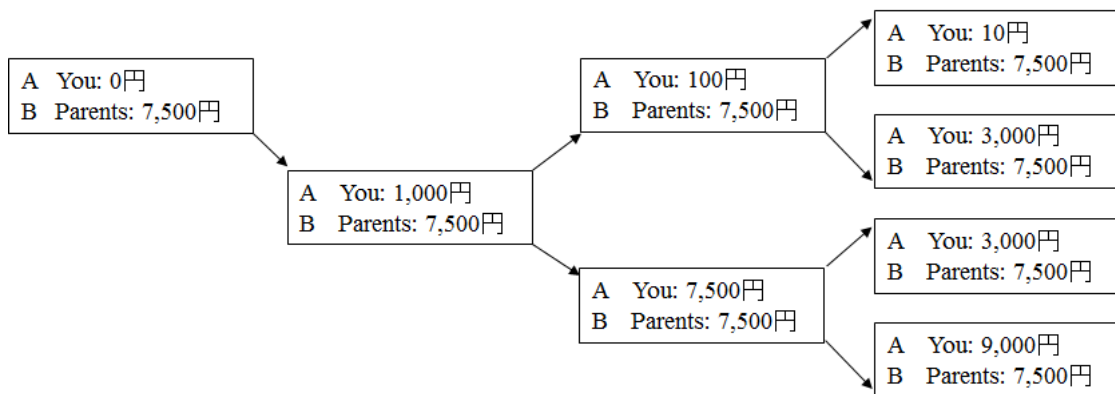
If a respondent prefers A (0 yen for themselves), no more options are asked to choose. If the respondent prefers B option (7500 yen for parents), then the following option (either A. 1000 yen for you and B. 7500 yen for parents) is provided to choose. Then the following option is either

7500 yen for you and 7500 yen for your parents, which is further followed by two combinations depending on your choice between A and B (choice of A: 3000 for you and 7500 yen for parents; choice of B: 9000 for you and 7500 yen for parents). Discount rate was calculated for each participant at each option by the difference in the amount of money between you and parents, which was then divided by the amount of money a participant would forgo, and then the averages of the switch points were calculated as the decision maker's altruism. The interpretation of this variable is that higher values represent more selfish selection that respondents made.

3.2 Implicit Worldviews: Relation Logic and Categorical Logic

We measured the difference in the implicit worldviews by asking the survey respondents the following question, "which of the following does not belong with the other two?" There are three options: (1) Banana; (2) Panda; (3) Monkey. Most participants chose "banana" because it is a fruit while the others are categorized as an animal (Table 1). We consider this as evidence of the use of algorithmic logic or categories when making a selection. On the other hand, some respondents selected "panda" as being different from others, because we assume that they implicitly relate "banana" to "monkey" as its food. This is interpreted as evidence of the usage of relational logic or relationships[4]. We took this question with a slight change in wording[5] from Ji et al. (2004), which is explained by Nisbett (2003, p 140). There are people who chose "monkey". We consider this choice as categories-based worldviews in our study, since in our Japanese survey questionnaire, "monkey" is written in Chinese character while the other two are written in Japanese alphabet. If respondents used categorical logic to separate out one option from the other two based on the alphabet, this should be also considered as categories-based worldviews[6]. The rationale behind interpretation of each selection is that the immediate selection of one option, irrespective of the respondents' perception of why they chose it, can be thought as being affected by their implicit worldviews that determine how people perceive the world.

In our study, we also created several variables, based on the culture system of Figure 1, which indicate explicit worldviews such as the confidence in spiritual and non-spiritual matters and one's belief system. Using four questions regarding (non-)spiritual matters and respondents' confidence

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[4] Two more examples of a neuropsychologist A. R. Luriia (1976) introduced in Hibert (2008, p 43) are used for comparison and robustness check. For details, please refer to Appendix 1 and Table 5.

[5] The original question used in Ji et al. (2004) was "which two of the three were most closely related?" We revised this question to "which one of the following does not belong to the other two", for a better comparison with the alternative indicator of Appendix 2, which asks the question in the same way to our revised question.

[6] For a better comparison between relation-based and categories-based worldviews, we used two alternative indicators of implicit worldviews: (i) a binary indicator, which equals 1 if the choices are either panda or monkey and 0 otherwise; (ii) a binary indicator, which equals 1 for the choice of panda and 0 for the choice of banana (the choice of monkey is dropped). See Appendix 3 for the estimation results

in these questions, we created spiritually directed and non-spiritually directed confidence variables. In addition, to measure one's belief system, we created the degree of devotion to their own religion (for more details about how to construct variables regarding explicit worldviews, see Lee et al., 2013)

3.3 Reciprocity and Time Discount Rate

Using the following four questions, we categorized reciprocity into two positive reciprocity ((A) and (B)) and two negative reciprocity ((C) and (D)).

(A) If my [parent(s)] do me a favor, I am prepared to return it

(B) If I do my [parent(s)] a favor, they are prepared to return it

(C) If my [parent(s)] offend me, I will offend them back

(D) If I offend my [parent(s)] they will offend me back

[Parent(s)] are replaced with [children] and [others] to measure the degree of reciprocity toward children and anonymous others. In addition, to examine the effect of an individual's impulsivity (discounted by time) on an individual's altruistic decision, we also include time discount rates into our model. The question used for this measurement is as follows. "Imagine that you have two options to receive some money. You may choose Option "A", to receive the given amount of money (around $30) today; or Option "B", to receive a different amount in 7 days from today. Compare the amounts and timing in Option "A" with Option "B" and indicate which amount you would prefer to receive for all 8 choices. (Please circle A or B for EACH choice)"

4. Estimation Framework and Results

Table 1 reports descriptive statistics of variables used for analyses in this paper. Average hypothetical monetary rewards to be shared with the recipients are lower for family members than for anonymous others regardless of the reasons of unemployment. It means that respondents are more generous to their family members. This is consistent with previous findings indicating that people care less when they are more anonymous and less identifiable (Frey and Bohnet, 1997; Hoffman et al., 1996). If we compare respondents' altruistic attitudes towards parents and children, respondents appear to be more generous to their child(ren) than to their parents. Furthermore, when comparing monetary rewards by the reason of unemployment, the shared rewards are lower when family members and others are fired from work through no fault of their own. It suggests that respondents become more generous when the receivers are "unfairly" unemployed.

As for implicit worldviews, as expected, 88.7% of people selected "banana" as the choice which does not belong to the other two. It can be interpreted that a substantial percentage of people

have categories-based worldviews (see Section 3.2 for our analytical framework regarding this interpretation). In contrast, 7.7 % of people chose "panda". We hypothesized that these people have relation-related worldviews. 3.7% of people selected "monkey" which was hypothesized to possess categories-based worldviews in our paper. It should be again emphasized that when respondents immediately selected one option without much perception and thoughts on why they chose it, we assume that this immediate selection can be thought as being affected by people's worldview at the implicit level that determines their way to perceive the world.

On average, people have higher values on positive reciprocity and lower values on negative reciprocity. They respond more to positive reciprocal expectation than negative reciprocal expectation. This suggests that they have a higher desire to be kind to those who are perceived to behave kindly towards them. If we look at the average degree of reciprocity, people have both higher positive and higher negative reciprocity for anonymous others than parents and children.

To find basic differences in altruism and reciprocity by implicit worldviews, we also report cross-section tables that describe statistics of altruism and reciprocity by three choices regarding implicit worldviews. Comparatively, those who chose "panda" which is interpreted to have relation-based worldview appear to make more selfish decision towards family members. As for the degree of reciprocity, no big difference is observed, but those with the choice of "panda" has a slightly higher positive and lower negative reciprocity toward family members. These descriptive statistics led us to examine how this relation logic worldview is correlated to altruistic decision, in association with positive and negative reciprocal expectation.

Our basic specification is estimated using Ordinary Least Squares (OLS) to control for observable confounders as follows:

$$Y_i = \alpha + W_i'\beta + X_i'\gamma + \varepsilon_i$$

Where Y_i represents the decision maker's altruistic decision measured by hypothetical monetary rewards to be shared with the recipients, W_i' is a vector of implicit worldviews (binary indicators of choice in relation to implicit worldviews; the base is "banana"), and X_i' is a vector of respondents behavioral and individual characteristics, which contain time discount rate, explicit worldviews, age dummies, educational attainment, one's own income, gender. To investigate interaction effects of implicit worldviews and reciprocity, we added the interaction terms between the dummy variable of the choice of "panda" and each of four reciprocity questions to the model.

4.1. Altruistic Decision and Implicit Worldviews

Tables 3 present the estimation results about altruistic decision in relation to implicit worldviews using the OLS regressions. Columns (1), (3), and (5) show the results pertaining to how worldviews are associated with altruistic decision when the money receivers are parents, children, and anonymous others. These three columns are the results of altruistic decision when

they are fired from work through no fault of their own and is unemployed. The rest of columns (2), (4), and (6) are results when they are fired because they committed a wrongful act and caused a huge loss to their company.

Columns (1) to (2) indicate that the choice of "panda", which we interpret as having relation-based worldview, is positively associated with altruistic decision. It suggests that those who have relation-based worldview tend to be less generous to their parents, regardless of the reason of unemployment. In the case of children, this result is observed when children are fired from work through no fault of their own (Column (3)). As for anonymous others, those who chose "monkey" as not belonging with the other two are likely to be generous. These results suggest the possibility of the positive effect of relation-based worldviews and negative effect of categories-based worldviews on altruistic decision. One thing that should be noted here is that the base choice is "banana" which is interpreted as categories-based worldviews same as the choice of "monkey". Thus, the significant negative effect of the choice of "monkey" should not be too much emphasized as the effect of categorical worldviews[7]. Our focus is to examine why relation-based worldviews lead respondents to less generous choices towards their parents and children, in comparison to those who have categories-based worldviews.

4.2. The Effects of Implicit Worldviews in Relation to Reciprocity on Altruistic Decision

Table 4 presents the estimation results of the OLS regressions, with interaction terms between implicit worldviews and reciprocity questions. The aim of this analysis was to investigate in a greater detail why relation-logic worldviews are correlated with selfish decision on altruism. We hypothesized that the effects of respondents' relation-based worldviews on altruistic decision are related to reciprocal expectation. More specifically, those who have relation-based worldviews act in a more or less generous manner, having the expected reciprocal behavior of recipients taken into consideration.

This is observed in Column (2) of Table 4. The interaction terms between the relation-based worldviews, proxies by the choice of "panda", and positive reciprocity is statistically significant. However, the signs are contradicting between two positive reciprocal questions. It suggests that those with relation-based worldviews behave differently depending on what kind of reciprocal expectations the respondents have. If they expect that parents will return to their own favor, they become more generous. In other words, their generosity is determined by the expectation of parents' future reciprocity. In contrast, those who have the desire to be generous only if parents behave kindly towards them, they tend to make more selfish decision when positive reciprocal behavior is not expected. It suggests that positive reciprocal expectation is conditional. Positive

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[7] To check the possibility of the measurement error, we estimate with the inclusion of monkey into categories-based worldviews and with dropping the choice of banana (see footnote 6 and Appendix 3).

reciprocity is only applied when respondents could expect some reciprocal altruism in response to their kindness. These results are for respondents who relation-based worldviews. Namely, their implicit worldviews that put weight on relationship are affected how they perceive their relationship with their parents in relation to reciprocal expectation.

In contrast, those with categories-based worldviews are more generous when they have positive reciprocity; however, they tend to be more selfish when they have negative reciprocity. This suggests that individuals become generous to the others if they perceive positive reciprocal expectation from the others, but selfish if they perceive more negative reciprocal expectation in relationship with the others.

4.3 Altruistic Decision and Other Variables.

Aside from results of implicit worldviews and reciprocity, one notable result is found the relationship between time discount rate and altruistic decision. Table 3 indicates that higher time discount rate (choosing immediate reward) is associated with higher selfish decision. In other words, those with make choices with a more delayed reward, which is found to be positively correlated with self-control, tend to make more generous selection for the recipients. Some previous studies also elaborated the correlation between self-control and altruism (Jones and Rachlin, 2006; Rachlin and Jones, 2007).

In addition to the findings about the statistically significant effects of time discount rate, our results in Table 3 also report that in most of estimations, higher income, higher educational attainment, and having a child, and female are likely to be generous. The results of these variables are not reported in Table 4 but we found that they similarly affect altruistic decision. In contrast, the variables that measure explicit worldviews such belief system and confidence in spiritual and non-spiritual matters are not significantly associated with altruistic decision.

5. Robustness Check

One may doubt the reliability and validity of the indicator of implicit worldviews used in this paper. As Appendix 1 shows, other questions could be alternatively used to measure implicit worldviews. In our survey, we also asked "which figure does not belong with the other three figures?" using a more simplified version of Appendix 1 (see Appendix 2). Third figure which is different from the other three because of its size can be considered as evidence of the use of algorithmic logic when making a selection. On the other hand, the other three figures are likely to be selected because respondents typically interpret the image as being related to each other; for example, it represents a family, consisting of the father, the mother, and the child. This is interpreted as evidence of the usage of relational logic or relationships based on the example of a psychologist A.R. Luria (1976). We compared the percentage of people who chose relation-based

worldviews with those who chose categories-based worldviews in this alternative question and our panda/banana/monkey question. It appears that those who chose "panda" were more likely to choose the 1st (41.0%), 2nd (36.6%) or 4th figure (28.3%) of the question in Appendix 2, which are assumed to have relation-based worldviews. This is also observed that 90.2% of respondents with the choice of "banana" selected the 3rd figure in Appendix 2 which are both interpreted as categories-based worldviews.

We also estimated our model with this alternative variable of implicit worldviews measured by four figures in Appendix 2. Relation-based worldview is coded as 1 if respondents chose either 1st, 2nd or 4th figures (interpreted as relation-based worldviews) and 0 if they chose 3rd figure (interpreted as categories-based worldviews). The coefficients of this variable can be compared with those of "panda". Table 5 reports that as shown in Table 3 and 4, people with the choice of relation-based worldview are less likely to be generous to their family members especially when they are unfairly unemployed. It is also found that positive reciprocity is correlated with generous altruistic selection and negative reciprocity is correlated selfish altruistic selection. The interaction effects of implicit worldview and reciprocal expectation are also observed in the decision maker's altruism toward family members. Those who have relation-based worldview and expect a hostile behavior of children against one's own unkind acts are less likely to be generous. This result suggests that implicit worldview affects an individual altruistic decision in association to reciprocal expectation, as found in our main analyses. Overall results in Table 5 could not fully assure our analytical framework of interpretation of "panda" as relation-based worldviews in comparison with banana and monkey, but we believe that the rationale behind its measurement and interpretation appears to be largely justified.

6. Conclusion and Discussion

In this study, we found that the worldviews concerning relational logic worldviews and reciprocal expectation affect individual altruistic decision towards parents, children, and non-family members. Our analyses revealed that individuals who put more weight on relationships than categories are likely to less generous to parents and children, which suggests that negative relations between relation-based worldviews and altruistic decision towards family members. One possible mechanism behind this negative association might be attributable to reciprocal expectation. More specifically, if individuals with relation-based worldviews expect that their parents would return when they do a favor, they become generous, whereas their generosity is reduced if the reciprocal return from parents is not expected. Our overall estimation results suggest that the implicit worldviews, reciprocity, time discount rate and individual possesses act as a set of rules that determine his/her altruistic behavior, even after controlling for socioeconomic variables.

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Figure 1. Levels of Culture.
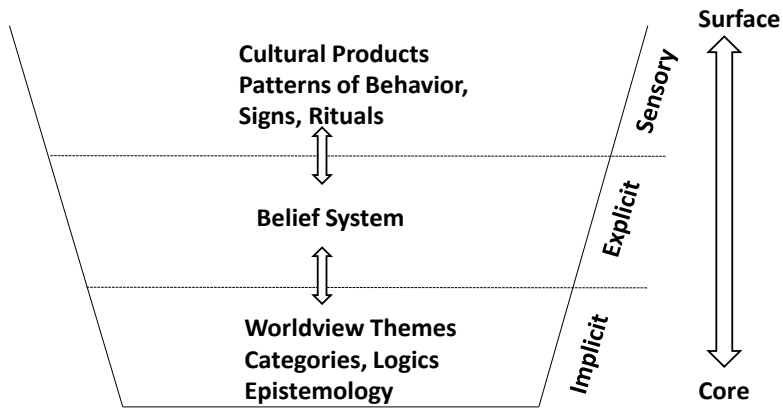
Source: Adopted from Hiebert (2008, p. 33).
Note: This figure indicates that a worldview is behind each culture, and
Hiebert (2008) considers explicit and implicit levels of a worldview and
posits that different types of logic act at the implicit level of the worldview.

Table 1. Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
Altruistic Decision (Hypothetical Monetary Rewards)				
Parents (no fault)	-0.250	1.485	-1.618	1.782
Parents (fault)	0.123	1.287	-1.276	1.679
Children (no fault)	-0.525	1.717	-1.973	1.959
Children (fault)	0.098	1.508	-1.497	1.890
Others (no fault)	0.559	1.004	-0.901	1.553
Others (fault)	1.031	0.951	-0.801	1.731
Implicit Worldviews				
Choice of Panda	0.077	0.266	0	1
Choice of Monkey	0.037	0.188	0	1
Choice of Banana	0.887	0.317	0	1
Reciprocity				
Positive Reciprocity (Parents)	3.101	0.859	1	5
Negative Reciprocity (Parents)	2.277	0.926	1	5
Positive Reciprocity (Children)	2.941	0.848	1	5
Negative Reciprocity (Children)	2.319	0.917	1	5
Positive Reciprocity (Others)	3.506	0.570	1	5
Negative Reciprocity (Others)	2.773	0.775	1	5
Individual Characteristics				
Age Group 1 (Lower than 30, base)	0.131	0.338	0	1
Age Group 2 (30-39)	0.226	0.418	0	1
Age Group 3 (40-49)	0.230	0.421	0	1
Age Group 4 (50-59)	0.194	0.395	0	1
Age Group 5 (60-)	0.219	0.413	0	1
One's Own Income (Log)	4.584	2.271	0	7.314
Female (=1)	0.492	0.500	0	1
Years of Completed Schoolings	12.177	1.256	9	14
Having a Child (=1)	0.533	0.499	0	1
Other Behavioral, Worldview-related Variables				
Time Discount Rate	0.129	0.169	-0.103	0.478
Spiritually-directed Confidence	0.079	0.189	0	1
Non-spiritually-directed Confidence	0.194	0.293	0	1
Religious Devotion (Buddhist)	0.007	0.082	0	1
Religious Devotion (Christianity)	0.006	0.078	0	1

Note: Table 1 reports descriptive statistics with the sample used for our main analysis in Table 3 (2) (N=3,798).

Table 2. Altruism and Reciprocity: By Implicit Worldviews

Altruistic Decision	Banana (N=3367)				Panda (N=291)				Monkey (N=140)			
	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
Parents (no fault)	-0.278	1.479	-1.618	1.782	0.051	1.532	-1.618	1.782	-0.187	1.474	-1.618	1.782
Parents (fault)	0.103	1.284	-1.276	1.679	0.349	1.300	-1.276	1.679	0.131	1.308	-1.276	1.679
Children (no fault)	-0.561	1.705	-1.973	1.959	-0.198	1.796	-1.973	1.959	-0.352	1.760	-1.973	1.959
Children (fault)	0.085	1.504	-1.497	1.890	0.238	1.537	-1.497	1.890	0.118	1.525	-1.497	1.890
Others (no fault)	0.554	1.003	-0.901	1.553	0.668	1.010	-0.901	1.553	0.447	1.017	-0.901	1.553
Others (fault)	1.034	0.946	-0.801	1.731	1.050	0.977	-0.801	1.731	0.901	1.029	-0.801	1.731
Reciprocity	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
Positive Reciprocity (Parents)	3.098	0.859	1	5	3.180	0.847	1	5	3.007	0.881	1	5
Negative Reciprocity (Parents)	2.277	0.921	1	5	2.220	0.976	1	5	2.396	0.951	1	5
Positive Reciprocity (Children)	2.944	0.840	1	5	2.973	0.910	1	5	2.786	0.894	1	5
Negative Reciprocity (Children)	2.326	0.908	1	5	2.220	0.990	1	5	2.379	0.976	1	5
Positive Reciprocity (Others)	3.510	0.558	1	5	3.485	0.614	1	5	3.438	0.743	1	5
Negative Reciprocity (Others)	2.781	0.762	1	5	2.668	0.844	1	5	2.775	0.908	1	5

Note: Table 2 reports descriptive statistics with the sample used for our main analysis in Table 3 (2) (N=3,798).

Table 3. Determinants of Altruistic Behaviors: Implicit Worldviews

	Parents		Children		Others	
	(1) No fault	(2) One's own fault	(3) No fault	(4) One's own	(5) No fault	(6) One's own fault
Implicit Worldviews						
Panda	0.2905***	0.2260***	0.3147***	0.1311	0.0869	0.0058
	(0.090)	(0.078)	(0.104)	(0.092)	(0.061)	(0.058)
Monkey	0.0289	-0.0062	0.1382	0.0003	-0.1461*	-0.1517*
	(0.127)	(0.111)	(0.147)	(0.130)	(0.086)	(0.082)
Socio-economic Variables						
One's own income (log)	-0.0018	-0.0237**	-0.0087	-0.0103	0.0014	-0.0123
	(0.012)	(0.010)	(0.014)	(0.012)	(0.008)	(0.008)
Years of schooling	-0.0575***	-0.0518***	-0.0470**	-0.0449**	-0.0268**	0.0056
	(0.020)	(0.017)	(0.023)	(0.020)	(0.013)	(0.013)
Having a child (=1)	-0.0208	0.0313	-0.2179***	-0.1605***	-0.0568	-0.0593*
	(0.055)	(0.048)	(0.064)	(0.056)	(0.037)	(0.035)
Time Discount Rate	0.8442***	0.6213***	0.8489***	0.7845***	0.7177***	0.5021***
	(0.145)	(0.126)	(0.167)	(0.147)	(0.097)	(0.093)
Female (=1)	-0.2775***	-0.1183**	-0.2755***	-0.0602	-0.1920***	-0.0077
	(0.055)	(0.047)	(0.063)	(0.056)	(0.037)	(0.035)
Constant	0.5345**	0.9890***	0.1580	0.8000***	0.9987***	1.0545***
	(0.264)	(0.229)	(0.305)	(0.269)	(0.178)	(0.170)
Observations	3,798	3,798	3,798	3,798	3,798	3,798
R-squared	0.027	0.018	0.025	0.017	0.031	0.013

Note: All estimations in this table are controlled for socioeconomic variables (age dummies, years of complete schooling, one's own income, gender), and explicit worldviews (the confidence in (non-)spiritual matters and the degree of devotion to one's own religion,). Standard errors are in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

Table 4. Determinants of Altruistic Behaviors: Implicit Worldviews and Reciprocity

	Parents				Children				Others			
	No fault		Fault		No fault		Fault		No fault		Fault	
	Base	Reciprocity	Base	Reciprocity	Base	Reciprocity	Base	Reciprocity	Base	Reciprocity	Base	Reciprocity
Implicit Worldviews	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panda	0.2972***	0.0500	0.2384***	0.1403	0.3267***	0.1381	0.1407	0.1844	0.0944	-0.1643	0.0082	0.2755
	(0.090)	(0.379)	(0.078)	(0.329)	(0.104)	(0.382)	(0.092)	(0.338)	(0.061)	(0.372)	(0.058)	(0.357)
Monkey	0.0177	0.0181	-0.0196	-0.0189	0.1236	0.1213	-0.0048	-0.0047	-0.1512*	-0.1529*	-0.1532*	-0.1534*
	(0.127)	(0.127)	(0.111)	(0.111)	(0.147)	(0.147)	(0.130)	(0.130)	(0.086)	(0.086)	(0.082)	(0.082)
Interaction Terms between Panda (Relation-Related Worldview) and Reciprocity												
Positive Reciprocity A	-0.0404	-0.0545*	-0.0603**	-0.0633**	-0.0738**	-0.0737**	-0.0172	-0.0136	-0.0866***	-0.0792***	-0.0394*	-0.0282
	(0.027)	(0.029)	(0.024)	(0.025)	(0.032)	(0.034)	(0.028)	(0.030)	(0.021)	(0.025)	(0.021)	(0.024)
Positive Reciprocity B	0.0073	0.0223	0.0130	0.0177	0.0021	-0.0091	0.0021	-0.0013	-0.0047	-0.0252	0.0114	-0.0065
	(0.026)	(0.028)	(0.023)	(0.024)	(0.036)	(0.037)	(0.032)	(0.033)	(0.020)	(0.027)	(0.019)	(0.026)
Panda * Positive Reciprocity A		0.1641*		0.0347		-0.0184		-0.0422		0.0458		-0.0521
		(0.098)		(0.085)		(0.114)		(0.101)		(0.088)		(0.084)
Panda * Positive Reciprocity B		-0.1854*		-0.0608		0.1388		0.0416		-0.0040		-0.0484
		(0.098)		(0.085)		(0.129)		(0.114)		(0.083)		(0.080)
Negative Reciprocity C	0.0910***	0.0882***	0.0734***	0.0722**	0.0866**	0.0862**	0.0245	0.0261	0.0526***	0.0554***	0.0187	0.0229
	(0.032)	(0.033)	(0.028)	(0.029)	(0.040)	(0.041)	(0.035)	(0.037)	(0.019)	(0.019)	(0.018)	(0.018)
Negative Reciprocity D	-0.0056	-0.0115	0.0275	0.0228	0.0528	0.0589	0.0639*	0.0632*	0.0206	0.0149	0.0052	0.0021
	(0.031)	(0.032)	(0.027)	(0.028)	(0.040)	(0.041)	(0.035)	(0.036)	(0.022)	(0.023)	(0.021)	(0.022)
Panda * Negative Reciprocity C		0.0052		0.0017		0.0456		-0.0078		-0.0396		-0.0217
		(0.116)		(0.101)		(0.164)		(0.144)		(0.062)		(0.059)
Panda * Negative Reciprocity D		0.1019		0.0706		-0.0980		-0.0014		0.0664		0.0565
		(0.121)		(0.105)		(0.159)		(0.141)		(0.074)		(0.071)
Time Discount Rate	0.8329***	0.8342***	0.6069***	0.6060***	0.8097***	0.8104***	0.7620***	0.7628***	0.6980***	0.6980***	0.4928***	0.4931***
	(0.145)	(0.145)	(0.126)	(0.126)	(0.167)	(0.167)	(0.148)	(0.148)	(0.097)	(0.098)	(0.093)	(0.094)
Constant	0.3770	0.3965	0.8260***	0.8347***	0.1580	0.0059	-0.0209	0.0059	0.5844**	0.5838**	1.0744***	1.0830***
	(0.284)	(0.286)	(0.247)	(0.249)	(0.305)	(0.329)	(0.327)	(0.329)	(0.289)	(0.290)	(0.190)	(0.197)
Observations	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798
R-squared	0.030	0.032	0.024	0.025	0.025	0.031	0.031	0.031	0.019	0.019	0.015	0.015

Note: All estimations in this table are controlled for socioeconomic variables (age dummies, years of complete schooling, one's own income, gender), and explicit worldviews (the confidence in (non-)spiritual matters and the degree of devotion to one's own religion,). Standard errors are in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 5. Determinants of Altruistic Behaviors: Alternative Indicators of Implicit Worldviews

	Parents				Children				Others			
	No fault		Fault		No fault		Fault		No fault		Fault	
	Base	Reciprocity	Base	Reciprocity	Base	Reciprocity	Base	Reciprocity	Base	Reciprocity	Base	Reciprocity
Implicit Worldviews	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Relation-Related Worldview	0.3123***	-0.2149	0.0634	-0.0860	0.2617**	-0.0130	0.0610	-0.2267	0.0717	0.1205	0.0715	0.0019
(Using Question of Four Figures)	(0.112)	(0.447)	(0.098)	(0.389)	(0.130)	(0.456)	(0.114)	(0.402)	(0.076)	(0.447)	(0.072)	(0.428)
Interaction Terms between Relation-Related Worldview and Reciprocity												
Positive Reciprocity A	-0.0366	-0.0375	-0.0571**	-0.0599**	-0.0754**	-0.0761**	-0.0177	-0.0209	-0.0867***	-0.0873***	-0.0394*	-0.0419**
	(0.027)	(0.028)	(0.024)	(0.024)	(0.032)	(0.033)	(0.028)	(0.029)	(0.021)	(0.022)	(0.021)	(0.021)
Positive Reciprocity B	0.0067	0.0102	0.0125	0.0208	0.0071	0.0082	0.0044	0.0098	-0.0038	0.0029	0.0119	0.0209
	(0.026)	(0.027)	(0.023)	(0.024)	(0.036)	(0.037)	(0.031)	(0.032)	(0.020)	(0.020)	(0.019)	(0.020)
Relation * Positive Reciprocity A		-0.0090		0.0240		-0.0373		0.0066		-0.0045		0.0242
		(0.119)		(0.104)		(0.147)		(0.129)		(0.100)		(0.096)
Relation * Positive Reciprocity B		-0.0529		-0.1481		0.0721		-0.0042		-0.1076		-0.1481*
		(0.117)		(0.102)		(0.158)		(0.139)		(0.083)		(0.079)
Negative Reciprocity C	0.0928***	0.0883***	0.0747***	0.0695**	0.0853**	0.1041**	0.0240	0.0413	0.0514***	0.0522***	0.0184	0.0167
	(0.032)	(0.033)	(0.028)	(0.028)	(0.040)	(0.041)	(0.035)	(0.036)	(0.019)	(0.019)	(0.018)	(0.018)
Negative Reciprocity D	-0.0100	-0.0226	0.0243	0.0171	0.0495	0.0238	0.0623*	0.0361	0.0207	0.0150	0.0057	0.0001
	(0.031)	(0.032)	(0.027)	(0.028)	(0.040)	(0.041)	(0.035)	(0.036)	(0.022)	(0.023)	(0.021)	(0.022)
Relation * Negative Reciprocity C		0.0747		0.0909		-0.3689**		-0.3264**		0.0053		0.0544
		(0.136)		(0.118)		(0.183)		(0.162)		(0.082)		(0.079)
Relation * Negative Reciprocity D		0.2310*		0.1265		0.4246**		0.4144***		0.0803		0.0781
		(0.136)		(0.118)		(0.165)		(0.146)		(0.088)		(0.084)
Time Discount Rate	0.8405***	0.8294***	0.6144***	0.6060***	0.8224***	0.8170***	0.7664***	0.7600***	0.6959***	0.6950***	0.4874***	0.4853***
	(0.144)	(0.144)	(0.126)	(0.126)	(0.167)	(0.167)	(0.148)	(0.147)	(0.097)	(0.098)	(0.093)	(0.093)
Constant	0.3772	0.3891	0.8507***	0.8514***	0.0004	0.0023	0.5984**	0.5988**	1.0576***	1.0566***	1.0582***	1.0616***
	(0.284)	(0.285)	(0.247)	(0.248)	(0.327)	(0.328)	(0.289)	(0.289)	(0.198)	(0.199)	(0.189)	(0.191)
Observations	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798	3,798
R-squared	0.030	0.032	0.022	0.024	0.029	0.031	0.019	0.021	0.037	0.037	0.014	0.015

Note: All estimations in this table are controlled for socioeconomic variables (age dummies, years of complete schooling, one's own income, gender), and explicit worldviews (the confidence in (non-)spiritual matters and the degree of devotion to one's own religion,). Standard errors are in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Appendix 1. Other Indicators of Implicit Worldviews

Figure 2.3
RELATIONAL LOGIC
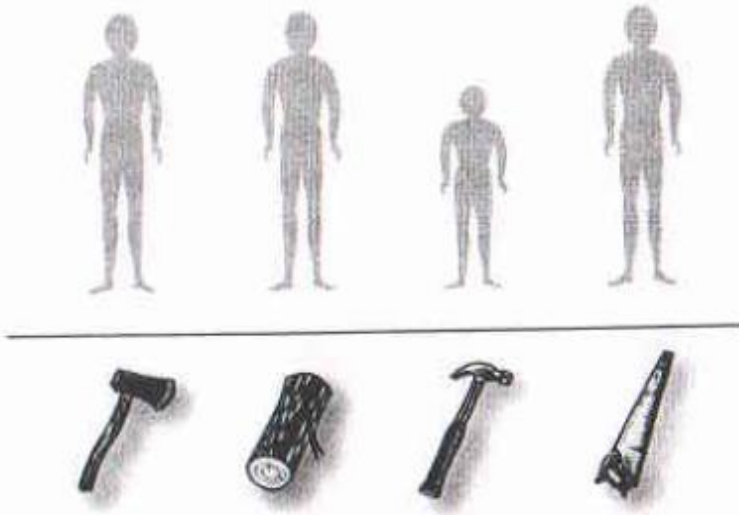
Source: Hibert (2008, p 43).
Note: These are examples of A. R. Luriia (1976) introduced by Hibert (2008) to investigate the relational logic. Four figures above are simplified as Appendix 2 and used for the comparison in our paper and the other four figures below are a hatchet, a log, a hammer, and a saw. Similarly, those with categorical logic would choose a log because it is not a tool, whereas those with relational logic would choose the hammer because it is useless without nails to build something using the log.

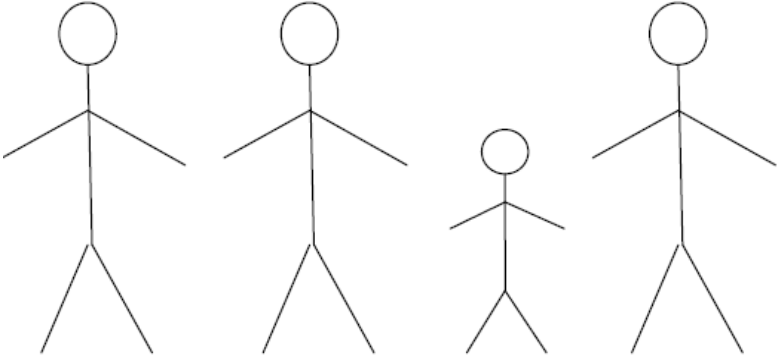Appendix 2. Survey question simplified to measure implicit worldviews.

Which figure does not belong with the other three figures? (X ONE Box)

Appendix 3. Determinants of Altruistic Behaviors: Using Alternative Indicators of Implicit Worldviews

	Parents (No Fault)				Children (No Fault)				Others (No Fault)			
	Banana/Monkey: Categories-based Worldviews		Banana: Categories-based Worldviews (Monkey dropped)		Banana/Monkey: Categories-based Worldviews		Banana: Categories-based Worldviews (Monkey dropped)		Banana/Monkey: Categories-based Worldviews		Banana: Categories-based Worldviews (Monkey dropped)	
	Reciprocity	Interaction Terms	Reciprocity	Interaction Terms	Reciprocity	Interaction Terms	Reciprocity	Interaction Terms	Reciprocity	Interaction Terms	Reciprocity	Interaction Terms
Implicit Worldviews	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panda (Relation-based Worldviews)	0.2965***	0.0491	0.2986***	0.1261	0.3216***	0.1304	0.3305***	0.1833	0.1009*	-0.0662	0.0955	-0.0573
	(0.090)	(0.378)	(0.090)	(0.379)	(0.104)	(0.382)	(0.104)	(0.383)	(0.060)	(0.344)	(0.061)	(0.345)
Interaction Terms between Relation-based Worldviews and Reciprocity												
Positive Reciprocity A	-0.0404	-0.0545*	-0.0230	-0.0356	-0.0745**	-0.0744**	-0.0651**	-0.0638*	-0.0862***	-0.0903***	-0.0815***	-0.0851***
	(0.027)	(0.029)	(0.028)	(0.029)	(0.032)	(0.034)	(0.033)	(0.034)	(0.021)	(0.022)	(0.022)	(0.023)
Positive Reciprocity B	0.0072	0.0223	0.0012	0.0158	0.0014	-0.0099	-0.0036	-0.0160	-0.0043	0.0021	-0.0013	0.0055
	(0.026)	(0.028)	(0.027)	(0.028)	(0.036)	(0.037)	(0.036)	(0.038)	(0.020)	(0.021)	(0.020)	(0.021)
Panda * Positive Reciprocity A		0.1642*		0.1407		-0.0179		-0.0299		0.0462		0.0382
		(0.098)		(0.098)		(0.114)		(0.114)		(0.077)		(0.077)
Panda * Positive Reciprocity B		-0.1853*		-0.1764*		0.1396		0.1470		-0.0695		-0.0715
		(0.098)		(0.098)		(0.129)		(0.129)		(0.068)		(0.068)
Negative Reciprocity C	0.0910***	0.0883***	0.1000***	0.0981***	0.0865**	0.0861**	0.1023**	0.1033**	0.0521***	0.0543***	0.0512***	0.0534***
	(0.032)	(0.033)	(0.033)	(0.034)	(0.040)	(0.041)	(0.041)	(0.042)	(0.019)	(0.019)	(0.019)	(0.020)
Negative Reciprocity D	-0.0055	-0.0114	-0.0044	-0.0105	0.0534	0.0596	0.0512	0.0572	0.0213	0.0138	0.0185	0.0101
	(0.031)	(0.032)	(0.032)	(0.033)	(0.040)	(0.041)	(0.040)	(0.042)	(0.022)	(0.023)	(0.022)	(0.023)
Panda * Negative Reciprocity C		0.0051		-0.0038		0.0459		0.0281		-0.0247		-0.0234
		(0.116)		(0.117)		(0.164)		(0.164)		(0.063)		(0.063)
Panda * Negative Reciprocity D		0.1018		0.1014		-0.0990		-0.0932		0.0811		0.0871
		(0.121)		(0.121)		(0.159)		(0.159)		(0.075)		(0.075)
Time Discount Rate	0.8335***	0.8347***	0.8220***	0.8224***	0.8137***	0.8143***	0.7835***	0.7847***	0.6932***	0.6965***	0.6932***	0.6967***
	(0.144)	(0.144)	(0.148)	(0.148)	(0.167)	(0.167)	(0.171)	(0.172)	(0.097)	(0.097)	(0.100)	(0.100)
Constant	0.3777	0.3972	0.3630	0.3764	-0.0134	0.0136	0.0423	0.0669	1.0482***	1.0620***	1.0830***	1.0963***
	(0.284)	(0.286)	(0.291)	(0.293)	(0.327)	(0.328)	(0.334)	(0.336)	(0.198)	(0.201)	(0.203)	(0.206)
Observations	3,798	3,798	3,658	3,658	3,798	3,798	3,658	3,658	3,798	3,798	3,658	3,658
R-squared	0.030	0.032	0.031	0.032	0.030	0.031	0.031	0.031	0.037	0.038	0.036	0.037

Note: All estimations in this table are controlled for socioeconomic variables (age dummies, years of complete schooling, one's own income, gender), and explicit worldviews (the confidence in (non-)spiritual matters and the degree of devotion to one's own religion,). Standard errors are in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1