ECONSTOR

WWW.ECONSTOR.EU

Der Open-Access-Publikationsserver der ZBW – Leibniz-Informationszentrum Wirtschaft
The Open Access Publication Server of the ZBW – Leibniz Information Centre for Economics

Kosse, Fabian; Pfeiffer, Friedhelm

Working Paper

Quasi-hyperbolic time preferences and their intergenerational transmission

ZEW Discussion Papers, No. 13-002

Provided in Cooperation with:
ZEW - Zentrum für Europäische Wirtschaftsforschung / Center for European Economic Research

Suggested Citation: Kosse, Fabian; Pfeiffer, Friedhelm (2013) : Quasi-hyperbolic time preferences and their intergenerational transmission, ZEW Discussion Papers, No. 13-002, http://hdl.handle.net/10419/68224

Nutzungsbedingungen:
Die ZBW räumt Ihnen als Nutzerin/Nutzer das unentgeltliche, räumlich unbeschränkte und zeitlich auf die Dauer des Schutzrechts beschränkte einfache Recht ein, das ausgewählte Werk im Rahmen der unter
→ http://www.econstor.eu/dspace/Nutzungsbedingungen
nachzulesenden vollständigen Nutzungsbedingungen zu vervielfältigen, mit denen die Nutzerin/der Nutzer sich durch die erste Nutzung einverstanden erklärt.

Terms of use:
The ZBW grants you, the user, the non-exclusive right to use the selected work free of charge, territorially unrestricted and within the time limit of the term of the property rights according to the terms specified at
→ http://www.econstor.eu/dspace/Nutzungsbedingungen
By the first use of the selected work the user agrees and declares to comply with these terms of use.

ZBW Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Mitglied der Leibniz-Gemeinschaft

Discussion Paper No. 13-002

Quasi-hyperbolic Time Preferences and Their Intergenerational Transmission

Fabian Kosse and Friedhelm Pfeiffer

ZEW
Zentrum für Europäische Wirtschaftsforschung GmbH
Centre for European Economic Research

Discussion Paper No. 13-002

Quasi-hyperbolic Time Preferences and Their Intergenerational Transmission

Fabian Kosse and Friedhelm Pfeiffer

Download this ZEW Discussion Paper from our ftp server:

http://ftp.zew.de/pub/zew-docs/dp/dp13-002.pdf

Die Discussion Papers dienen einer möglichst schnellen Verbreitung von neueren Forschungsarbeiten des ZEW. Die Beiträge liegen in alleiniger Verantwortung der Autoren und stellen nicht notwendigerweise die Meinung des ZEW dar.

Discussion Papers are intended to make results of ZEW research promptly available to other economists in order to encourage discussion and suggestions for revisions. The authors are solely responsible for the contents which do not necessarily represent the opinion of the ZEW.

Nontechnical Summary

Time preferences play an important role in economics. Among others, time preferences are responsible for the decision on how much people invest in human capital and schooling. For instance stronger preferences for present compared to future consumption may lead to underinvestment in schooling and may prevent success in school.

Recent studies provided initial empirical evidence that preferences and beliefs are transferred from generation to generation in a very specific and often precise way. For instance, risk attitudes towards health seem to be strongly correlated between parents and children, whereas parents' willingness to take risk in health aspects seems to be not correlated to their children's willingness to take risk in career aspects. Research gaps in understanding the intergenerational transmission of important preferences remain, such, it is little known about the specific intergenerational transmission concerning time preferences.

In this paper we contribute to the literature on intergenerational preference transmission by exploring the relationship of patience between mothers and their preschool children and focussing on differences between short-run and long-run patience. A new and straightforward procedure is proposed to assess and distinguish individual values of adults' short-run and long-run patience. Based on this assessment the link between the short- and long-run patience of mothers and the intertemporal behaviour of their preschool children, measured in a short-run patience paradigm, is examined.

In collaboration with the Socio-Economic Panel Study in Berlin (SOEP) and Institute for Empirical Research in Economics in Zürich (IEW) experimental data, called the mother-child pilot study, was collected to analysis the intergenerational transmission of time preferences. Children were asked to decide between an immediate available reward in the form of one bag of gummy bears or if they would opt instead for a larger but delayed reward, namely two bags of gummy bears. The mothers were asked to decide between receiving a certain amount of money immediately, and obtaining a larger but delayed available amount of money. While the children had to wait 47 minutes for the larger reward on average (i.e. the time it took to interview the mother), the mothers had to wait several months.

Based on a sample drawn from the mother-child pilot study, our findings demonstrate that mainly mother's short-run patience is related to her preschool children's ability to delay gratification. Thus the results contribute to improve the understanding of preference formation during childhood that should have long consequences for educational performance, among others.

Das Wichtigste in Kürze

In ökonomischen Modellen spielen Zeitpräferenzen eine wichtige Rolle. Unter anderem sind sie entscheidend, wenn es um Investitionen in Humankapital oder Bildung geht. Eine ausgeprägte Gegenwartspräferenz kann beispielsweise dazu führen, dass zu wenig in Bildung investiert wird und dass der Erfolg in der Schule leidet. Neue empirische Studien zeigen, dass Präferenzen oft auf eine sehr spezielle und präzise Weise von Generation zu Generation weitergegeben werden. Unter anderem wurde gezeigt, dass das Risikoverhalten in Bezug auf Gesundheit zwischen Eltern und deren Kindern sehr ähnlich ist, wohingegen das Risikoverhalten von Eltern in Bezug auf Gesundheit und das Risikoverhalten von Kindern in Bezug auf die berufliche Karriere in keinem systematischen Zusammenhang stehen. Trotz dieser Fortschritte ist jedoch noch zu wenig bekannt, in welchem Ausmaß Präferenzen im Allgemeinen und Zeitpräferenzen im Speziellen zwischen den Generationen weitergegen werden.

Mit der hier vorliegenden Studie wollen wir dazu beitragen, das Verständnis über die generationenübergreifende Weitergabe der Eigenschaft Geduld zu verbessern und konzentrieren uns dabei auf Unterschiede zwischen kurzfristiger und langfristiger Geduld. In einem ersten Schritt stellen wir eine neue Methode zur Unterscheidung und Abschätzung von kurzfristiger und langfristiger Geduld bei Erwachsen vor. In einem zweiten Schritt untersuchen wir, basierend auf diesen Berechnungen, den Zusammenhang zwischen kurz- und langfristiger Geduld von Müttern und der Fähigkeit ihrer Kinder im Vorschulalter Belohnungsaufschub zu leisten.

In Zusammenarbeit mit dem Sozio-oekonomischen Panel in Berlin (SOEP) und dem Institut für Empirische Wirtschaftsforschung in Zürich (IEW) wurden experimentelle Daten, genannt Mutter-Kind-Pilotstudie, erhoben, um den generationenübergreifenden Zusammenhang bei Zeitpräferenzen zu analysieren. Kinder wurden gebeten sich zwischen einer sofort verfügbaren Packung Gummibärchen und zwei Packungen, die aber erst nach einer Wartezeit verfügbar waren, zu entscheiden. Die Mütter wurden gebeten, sich zwischen einer direkt verfügbaren Geldsumme und einer höheren, aber mit einer Verzögerung ausbezahlten Geldsumme zu entscheiden. Die durchschnittliche Wartezeit bei den Kindern betrug 47 Minuten (die Dauer eines Interviews mit der Mutter), während die Mütter mehrere Monate auf den höheren Geldbetrag warten mussten.

Basierend auf Analysen mit den Daten der Mutter-Kind-Pilotstudie zeigt unsere Studie, dass vor allem die kurzfristige Geduld der Mütter in einem Zusammenhang mit der Fähigkeit des Belohnungsaufschubes ihrer Kinder im Vorschulalter steht. Die Ergebnisse tragen somit dazu bei, den Mechanismus zur Entstehung von Geduld im Vorschulalter besser zu verstehen, der langfristige Konsequenzen, unter anderem für den Erfolg in der Schule, hat.

Quasi-hyperbolic time preferences and their intergenerational transmission

Fabian Kosse* and Friedhelm Pfeiffer**

December 2012

Abstract:

This study explores the intergenerational transmission of time preferences and focuses on the question which specific aspects of mother's time preference are related to her preschool child's ability to delay gratification. We provide a new procedure for assessing the parameters of a "quasi-hyperbolic" discount function (Laibson, 1997) using two trade-off experiments. We apply the procedure to a sample of 213 mother-child pairs and show that especially mother's beta parameter is related to her preschool child's ability to delay gratification.

Keywords: Intergenerational Transmission, Time Preference, Quasi-Hyperbolic Discounting, Preschool Children

JEL- Classification: D90, D10

Acknowledgments: We would like to thank the Leibniz Association (LA) for supporting this study in the research network "Noncognitive Skills: Acquisition and Economic Consequences". We furthermore thank Ernst Fehr, Jürgen Schupp, Katharina Spieß and Gert Wagner for collaboration in the mother-child pilot study. The views expressed in this article are those of the authors and do not necessarily reflect the views of the LA or our collaborators. The usual disclaimer applies.

* Corresponding author, Bonn Graduate School of Economics, University of Bonn, Kaiserstraße 1, 53113 Bonn, Germany, kosse@uni-bonn.de

** Centre for European Economic Research (ZEW), Mannheim, and University of Mannheim, Germany, pfeiffer@zew.de

1. Introduction

The drivers of individual decision-making are hypothesized to be intergenerationally transmitted (Bisin and Verdier, 2008, among others). Recent studies provide initial empirical evidence that preferences and beliefs are transferred from generation to generation in a very specific and often precise way. While relatively much is known concerning risk and trust related behaviour, less seems to be known concerning intertemporal decision making (Dohmen et al., 2012, among others).

For instance, risk attitudes towards health are strongly correlated between parents and children, whereas parents' willingness to take risk in health aspects is not correlated to their children's willingness to take risk in career aspects. Knowles and Postlewaite (2005) estimate an intergenerational correlation of saving behaviour in a life-cycle model and suggest that the underlying driver is the transmission of time preference. Bartling et al. (2010) and Kosse and Pfeiffer (2012) provide some initial evidence that mother's discounting behaviour is related to their preschool children's ability to delay gratification. Findings indicate that the mother's short-run discounting is a better predictor for children's self-control than her long-run discounting behaviour.

In this paper we contribute to the literature on intergenerational preference transmission by exploring the intergenerational transmission of the two fundamental parameters of a specific discrete-time discount function called "quasi-hyperbolic" (Laibson, 1997) or β-δ ("beta-delta") discount function (McClure et al., 2004).

In a first step we propose a new straightforward procedure to assess individual values of β and δ. In a second step we explore the relationship between the two parameters of quasi-hyperbolic discounting of mothers and the intertemporal behaviour of their preschool children, measured in a short-run patience paradigm. Based on the experimental data from a mother-child pilot study (see Bartling et al., 2010), our Probit estimates demonstrate that especially mother's beta (β) parameter is related to her preschool children's ability to delay gratification.

2. Assessing quasi-hyperbolic preferences with experimental data

A calculation procedure is proposed which requires information on two indifference pairs per individual to obtain individual values of β and δ. The indifference pairs should concern the choice between a fixed smaller-sooner reward (*SS*) which has no delay ($t = 0$) and distant larger-later rewards ($LL_i^*(t)$) with two different delays ($t = \{\tau_1, \tau_2\}$ with τ_1 and $\tau_2 > 0$). For each indifference pair it holds that $U(SS,...) = U(LL^*(t),...)$. As in Laibson (1997), a time-separable utility function for one present period ($t = 0$) and one future period ($t > 0$) may

be written as $U(c_0, c_t) = u_0(c_0) + \beta\delta^t E[u_t(c_t)]$ where $u(c)$ is the instantaneous utility received from consumption of c. In this formulation, β matters relatively more for short delays and represents short-run patience. The relative weight of the discount parameter δ increases with the delay and indicates long-run patience. We assume a local-linear instantaneous utility function and that a relatively moderate monetary shock provides a utility jolt in that period in which it is received.

Therefore, in a situation of indifference concerning *SS* and *LL*, it holds that

$$\begin{aligned} & u_0(c_0) + E[SS] \cdot u_0'(c_0) + \beta\delta^t E[u_t(c_t)] \\ & = u_0(c_0) + \beta\delta^t \left(E[u_t(c_t)] + E[LL^*(t)] \cdot E[u_t'(c_t)]\right) \end{aligned} \tag{1}$$

If there is no uncertainty concerning the rewards ($E[SS] = SS$; $E\left[LL^*(t)\right] = LL^*(t)$) and if expected instantaneous marginal utility from the future period equals the instantaneous marginal utility from the present period ($u_0'(c_0) = E[u_t'(c_t)]$), equation (1) simplifies to $SS = \beta\delta^t LL^*(t)$.

Using indifference pairs with two different delays $t = \{\tau_1, \tau_2\}$, there are two equations with two unknown parameters. Solving the two equations delivers individual values of β and δ:

$$\beta_i = SS\left(\frac{LL_i^*(\tau_2)^{\tau_1}}{LL_i^*(\tau_1)^{\tau_2}}\right)^{\frac{1}{\tau_2 - \tau_1}} \tag{2}$$

$$\delta_i = \left(\frac{LL_i^*(\tau_1)}{LL_i^*(\tau_2)}\right)^{\frac{1}{\tau_2 - \tau_1}} \tag{3}$$

How realistic are the assumptions? Irrespective of the choice, participants received the payments by cheque, which was sent by mail and administered by a highly credible and in Germany well-known agency. Thus, the experimental design ensured trustfulness in receiving the reward in a way that uncertainty is the same for all choices.

The assumption that marginal utility today equals the expected marginal utility on the future delivery date might not hold or might not hold for all participants. Yet, since a maximum delay of one year is employed in this study, fundamental changes in the instantaneous utility function or the consumption level may not occur. Therefore, we regard our procedure as an initial straightforward approximation of the different facets of quasi-hyperbolic discounting.

The pairs of indifference values are taken from classic choice experiments[1]. The sample used contains 213 mother-child pairs, who were visited by trained interviewers in their homes[2].

The mothers went through a series of decisions between a fixed amount of 100€, available without a delay, or a higher amount, available after a delay. To implement incentive-compatible trade-offs, there was a 1-in-7 chance that the participant received the result of one randomly selected decision. The larger-later reward, starting from 100€ plus 2.5% p.a., increased successively by steps of 2.5% p.a., which revealed an interval in which the mother is indifferent between receiving the smaller-sooner or the larger-later reward[3].

For the further calculations, the middle of this interval is used as the value of indifference ($LL_i^*(t)$). The censored observations of mothers who either always preferred the delayed or the non-delayed reward are replaced by their conditional expectation from Tobit estimations using a set of survey questions and socio-economic variables[4]. Two versions of the experiment were played, the first with a delay of 6 months and the second with a delay of 12 months.

Inserting the indifference values into (2) and (3) gives us a mean (standard deviation) for β_i of 0.948 (0.097) and for δ_i of 0.832 (0.171). We do not want to interpret these parameters too literally. However, they are useful to conceptually separate short-run and long-run patience and study its intergenerational transmission.

3. Exploring the intergenerational link of quasi-hyperbolic time preferences

The experimental setting concerning the children's patience follows the delay of gratification experiments by Mischel et al. (1989). Similar to the mothers, a trade-off between receiving a smaller-sooner reward and receiving a larger-later reward was imposed. The interviewer opened a pack of gummy bears, offered it to the child and explained that she could either eat them now or wait until the end of her mother's interview and receive an additional pack. The average interview duration was 47 minutes.

[1] The basic experimental design was developed by Dohmen et al. (2010).

[2] The sample was taken from a pretest for the German Socio-Economic Panel Study (SOEP, see Wagner et al. 2007) performed in 2008, called mother-child pilot study, see Bartling et al. (2010) and Kosse and Pfeiffer (2012). To control for confounding effects, our sample is restricted to biological mothers with German citizenship who breastfed their child and for whom all variables are available. The sample is also restricted to children who like gummy bears to ensure incentive compatibility. The restrictions reduced the number of observations from 271 to 213.

[3] 20 steps were implemented. After the first choice of the larger-later reward it was assumed that participants prefer all higher *LL*.

[4] Estimates are available from the corresponding author upon request.

22.1% of the children took the smaller-sooner reward and were classified as impatient. 77.9% waited for the larger-later reward and were classified as patient.[5]

If there is an intergenerational relation, a patient mother is expected to have a higher probability of having a patient child. Since the delay of gratification experiment reflects a relatively short-run decision, we expect especially mother's β to be related to her child's decision. We performed Probit analyses, with the child's patience as dependent variable and mother's β and δ values as explanatory variables (Table 1). A set of variables was added to correct for the potential biases regarding the behaviour in the experiments, so it is controlled for mothers' wealth and children's hungriness, among others.

Table 1: Probit analysis

	1:Patient Child	
	(1)	(2)
β (standardized)	.071**	.073**
	(.030)	(.030)
δ (standardized)	.037	.041
	(.031)	(.031)
Controls: Child characteristics	Yes	Yes
Controls: Family characteristics	No	Yes
Observations	213	213
McFadden's Pseudo R-squared	.125	.141

Notes: The dependent variable is one for patient children and zero for impatient children. β and δ are calculated according to formula (2) and (3). Controls concerning the child are age, age squared, sex, birth weight, the duration of breastfeeding, and dummies indicating the point in time since the last bigger meal. Controls concerning the family are age and age squared of the mother and dummies indicating house ownership and if the child has to share his room, both serving as proxies for wealth. The reported coefficients are average marginal effects; robust standard errors in parenthesis; ** indicate significance at the 5% level.

The results in columns 1 and 2 demonstrate that higher values of β are associated with a higher probability that the child delays gratification. An increase of one standard deviation (0.097) of β increases the probability that the child is patient by about 7.3% (p=.015) while the correlation concerning mother's δ is also positive but not significant (p=.177).

[5] See Bartling et al. (2010) for a detailed description of the experiment.

4. Conclusion

The transmission process concerning time preference seems to be similarly specific as for risk preference (Dohmen et al., 2012). Combining these findings with neuroscientific evidence implies that the early intergenerational transmission of intertemporal behaviour traces back to processes in the limbic system ("β areas"), which drives immediate gratification and develops early in life, while the long-run orientated frontal cortex ("δ areas") is still developing until the end of teenage age (McClure et al., 2004; Price and Willshaw, 2000, among others). Therefore, with respect to future research, a comparable study, based on a sample of adult children and their parents, is needed to investigate the relationship between the long-run oriented δ component of parents and their offspring.

References

Bartling, B., Fehr, E., Fischer, B., Kosse, F., Maréchal, M., Pfeiffer, F., Schunk, D., Schupp, J., Spieß, K. Wagner, G. (2010) Determinanten kindlicher Geduld – Ergebnisse einer Experimentalstudie im Haushaltskontext, *Schmollers Jahrbuch - Journal of Applied Social Science Studies*, 130, 297-323.

Bisin, A. and Verdier, T. (2008) Cultural Transmission, in *The New Palgrave Dictionary of Economics*, 2nd ed (Eds) Steven N. Durlauf and Lawrence E. Blume, Palgrave Macmillan, New York.

Dohmen, T., Falk, A., Huffman, D. and Sunde, U. (2010) Are Risk Aversion and Impatience Related to Cognitive Ability? *American Economic Review*, 100, 1238-1260.

----- (2012) The Intergenerational Transmission of Risk and Trust Attitudes, *Review of Economic Studies*, 79, 645-677.

Knowles, J. and Postlewaite, A. (2005) Do children learn how to save from their parents, *PARC Working Paper Series*, 05-07,

Kosse, F. and Pfeiffer, F. (2012), Impatience among preschool children and their mothers, *Economic Letters* 115 (3), 493-495.

Laibson, D. **(**1997) Golden Eggs and Hyperbolic Discounting, *Quarterly Journal of Economics*, 112, 443-477.

McClure, S., Laibson, D., Loewenstein, G. and Cohen, J. (2004) Separate Neural Systems Value Immediate and Delayed Monetary Rewards", *Science*, 306, 503-507.

Mischel, W., Shoda, Y. and Rodriguez, M. **(**1989) Delay of Gratification in Children, *Science*, 244, 933-938.

Price, D. and Willshaw, D. (2000) Mechanism of Cortical Development. Oxford University Press, New York, NY.

Wagner, G. G., J. R. Frick, and J. Schupp. (2007) The German Socio-Economic Panel Study (SOEP) - Scope, Evolution and Enhancements. *Schmoller Jahrbuch - Journal of Applied Social Science Studies* 127 (1), 139-169.