Cognitive Development and Children's Understanding of Personal Finance*

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Overview

Since very young children are financially dependent on parents and have few resources (monetary or property) that they independently control, they are not typically the target of financial literacy efforts. At the same time, it is generally recognized that very young children can be taught about the basic benefits and tools of sharing, savings, and purchases that will support good financial habits and practices as they grow, leading to better managed financial lives as independent adult spenders and savers.

While a review of financial education programs in the European Union concludes "there is only a small degree of dissent about the ideal contents of a financial literacy scheme" (Habschick et al., 2007, p. 96), we do not find this same uniformity among the financial literacy education programs oriented towards the very youngest children. In part we argue this is because there is, among those developing financial literacy education programs, little agreement on what underlying concepts should be taught at early ages nor on what concepts and teaching methods are most appropriate for very young children.

This chapter is based on a review of financial literacy programs targeted to young (pre-school and K-3rd grade) children and an assessment of the basic financial concepts each emphasizes.[1] Our immediate interest was whether financial literacy programs for this age group have been structured taking into account what is known about cognitive development and

[1] The programs reviewed were necessarily those more easily available through web sites or reviews of programs by umbrella organizations. A list of these programs are available in the final report for the project which is available at: http://www.cunapfi.org/download/168_CUNA_Report_PHASE_ONE_FINAL_4-28-9.pdf

capabilities of the young children they target. We also sought whether these programs have been rigorously evaluated in order to distinguish the learning due to the program from the learning that would results as young children interact over time with the financial environment.

Our conclusion is that the literature on children's cognitive development and financial literacy education are not well integrated. This is a due to a gap in both literatures: little attention is paid by the former to the financial literacy literature and by the latter to the cognitive development literature. Indeed few financial literacy programs are explicit about how the concepts taught were chosen and how the early teaching of concepts might link to the efficacy of financial education at older ages.[2] There has been virtually no rigorous evaluation of these programs. This is not to say that some of the programs we found—and there are lots of them—may not improve children's ability to later become better financial decision makers. However, financial literacy programs for younger children typically provide lessons without apparent consideration of what are the underlying concepts to be taught, the cognitive ability of children to grasp those concepts, the diversity that might exist among young children, and the behavior and timing of behaviors these activities intend to improve.

Introduction

Financial literacy has not traditionally been a major focus of cognitive developmental research, but there is a literature that would support the efficacy of early financial literacy education. We first describe general theoretical approaches that inform understanding of children's cognitive development and the development of financial literacy. We then discuss

[2] It is also the case that financial literacy education programs targeted on older children rarely give identify what students are expected to know at the outset of the program and therefore fail to give guidance on what should be taught at younger ages.

how each of these theories views children's growth in understanding selected personal finance concepts. We conclude with implications for early childhood financial literacy education.

A challenge in preparing this review was to identify concepts important to financial reasoning. While there is a large literature on cognitive development and general topics, such as number or quantity, there is quite sparse literature about important but more complex topics for financial decision-making such as future value or gains from exchange. Nevertheless, the cognitive development literature can provide guidance to financial literacy educators. Concepts of quantity and time, and abilities to plan and delay gratification are clearly central to financial literacy and financial behavior but are important in non-financial contexts as well. Ideas about exchange and understanding of value are certainly basic to financial literacy, but are also broader issues that are treated in the cognitive development literature. Concepts and abilities that are more typically considered "financial" have also been treated in this literature. For example, researchers have explored children's understanding of money and wealth, the acquiring, distribution, and exchange of resources.

We developed a set of fundamental financial concepts (available from the authors) are important to understanding the financial literacy lessons met in later grades and to successfully negotiating the financial landscape. In selecting these key concepts we drew from our own experiences in financial education research (Holden) and in cognitive development research (Kalish) as well as from sources that describe essential knowledge to understanding more advanced economic or personal finance principles.[3] We examined the learning expectations of

[3] These include materials developed by the Council on Economics Education, formerly the National Council on Economics Education, (http://www.ncee.net/ea/standards/), the Jump$tart Coalition for Personal Financial Literacy

individual state's education standards for financial education as well as the few financial education programs that describe underlying principles (see, for example, ASIC, 2003). These concepts provided the structure for reviewing the cognitive development literature and what it says about what can be learned at the very youngest ages. This chapter is a selective summarization of a more detailed review available from the authors.

General Conceptual Development in Children

The research on cognitive development considered in this review represents three distinct theoretical approaches. One tradition, identified with Jean Piaget, looks at the general developmental processes and constraints that characterize children's thinking at particular stages of development. A second tradition emphasizes the role of experience in learning. Children's thinking about a given phenomenon is seen as a function of the information available to them and the beliefs they form in response to prior experience. Within this second tradition, theorists may emphasize children's individual cognition (*theory-theorists)* or the experiences which form the objects of that cognition (*socio-cultural theorists)*. The third theoretical perspective focuses on maturation, especially brain development. Relevant to financial literacy, is the assertion that physical changes in the developing brain have important implications for children's abilities to learn.

Piaget.

According to Piaget (1968), individuals learn by reconciling inconsistencies in understanding. He called this process equilibration. If something is not understood, a person is said to be in a state of disequilibrium. As children equilibrate new concepts, they go through

(http://www.jumpstart.org/guide.html), the Economic Education Web (http://ecedweb.unomaha.edu/K-12/K-5concepts.cfm)

four stages of development, including sensorimotor, preoperational, concrete operations and abstract thought. These stages are distinct, consecutive and necessary. That is, all children progress through the stages in order and no stage may be skipped.

Infants up to the age of two are said to be in the sensorimotor stage of development. They are learning about the world through sensory interaction. The end of this stage is marked by the presence of object permanence, or the understanding that an object continues to exist even when it is out of sight. From approximately two to seven years of age, children are said to be in the preoperational stage of development. In addition to now having the ability to use and understand language, they experience the world from a very selfish, or egocentric, perspective and tend only to be able to understand one feature of a situation or object. The end of this stage is marked by an understanding of conservation, or the idea that a physical object maintains certain properties even when surface properties are manipulated (e.g., two cups of water will always have the same volume, whether it is poured into a tall, skinny glass or a short, wide glass). Children ages 7 through 11 are in the concrete operational stage. They can now reason about the world by understanding multiple dimensions of a problem or situation, provided that situation is made concrete. It is not until around age 12 that individuals are able to reason beyond concrete examples. In this final stage, hypothetical, philosophical and scientific (i.e. hypothesis testing) become integral in their learning about the world.

Children of the age that is the focus of this chapter (pre-school and early grades, ages 2-7) would be at the preoperational stage. This is characterized by their experiencing the world in a very egocentric manner. Occurrences relate to the self only and other people's perspectives would not factor into their reasoning. This implies that their reasoning about personal finances

in this stage would be largely limited to the effect that any decision or event would have on the child directly.

According to the Piaget theoretical approach to cognitive development, children in this stage are limited in the number of dimensions in which they think of problems. At the youngest ages children reason only about one dimension at a time. For example, if given a balance scale problem where both the amount of weight placed on each side and the distance from the fulcrum can be manipulated and asked to decide which side will descend, five- and six-year-old children will only focus on the weight, expecting the side with the most weight to go down. They seem unable to consider the effect of both weight and distance (Inhelder et al., 1958). Similarly, if given the choice of 10 pennies or one quarter, the child would be expected to choose the 10 pennies because it would be difficult for them to consider both numbers and monetary value in judging the relative worth of the coins.

Much reasoning about personal finance involves thinking about concepts that are not concrete or visible (e.g. bank accounts, credit, profit of store owners). According to Piaget, preoperational children tend to be 'perceptually bound:' They focus on what is visible or apparent in experience. Young children have difficulty conceiving of unobservable causes and abstract properties. For example, one's future state is a fairly abstract concept, especially when contrasted with the here-and-now present. Piagetian theory suggests that young children focus on the immediate and observable. A stronger claim that is consistent with Piagetian theory is that preoperational children are actually unable to mentally represent abstract concepts such as value or future.

Theory Theory/ Core Knowledge.

While Piagetian theory was hugely influential in defining the field of cognitive development, its specific claims have not fared well empirically. In particular, Piaget's characterization of preschool-aged children's thinking is considered to be overly restrictive. More recent theories of conceptual development argue that age-determined constraints matter far less to cognitive development than does a child's engagement with the world. One response challenging Piagetian theory is what has been labeled 'Theory Theory.'

According to theory theorists, children change their concepts of the world by modifying theories they create as they interact with objects and situations. While theory theorists differ in the emphasis given to innate constraints, most argue that development is a process of interaction between innate 'core knowledge' and experience. Core knowledge is the starting point in conceptual development that influences but does not determine the process and end-state. In contrast to Piagetian stages theory, core knowledge is domain-specific; the biases or constraints related to learning about object motion may not be those involved in learning about number or human behavior. Thus understanding the nature of conceptual development in a given domain becomes a matter of empirical investigation. Critically, theory theorists reject the dominance of general constraints, such as egocentrism or centration, arguing that core knowledge and the theories children develop may involve abstract entities, hidden causes, and complex relations as one theory is replaced by another, rather than being a consequence of increasing cognitive complexity or logical power.

As may be obvious to anyone who has spoken with a young child about money, children's initial theories about financial relationships are often wrong, incomplete or based on misunderstandings. These initial theories are called naïve theories precisely because they are

often based on limited experiences. Critically, development occurs as result of encounters between children's existing theories and the world. While accepting the basic premise that children learn from experience, the theory theory continues the traditional Piagetian view that learning is mediated by cognitive state. Children learn from experience, but what they learn from a given experience depends on what they already know or believe. The task of cognitive developmental research is to diagnose children's intuitive theories and to understand the kinds of experiences that lead to those theories. A secondary goal, especially relevant to education, is to identify opportunities to improve children's theories. Based on how children are thinking about some phenomenon, it should be possible to identify critical evidence or experience that will move them to a more mature conception. Critically, the evidence that will do this depends on the nature of the existing theory.

An advantage of the theory theory approach over traditional Piagetian work is that it naturally accommodates individual and cultural differences. According to Piagetian theory, culture and experience could accelerate or retard development, but the course of development is universal. Theory theory suggests that all children may start from a common point, the core knowledge, and possess theory-building expertise, but the specific experiences and environment will determine the concepts and abilities that children develop. Culture provides children experience with different practices (e.g., allowance traditions, sharing principles). Engagement in practices leads to internalization, the cognitive representation of such activities. Thus what children know about financial relationship will be the result of their engagement in socio-cultural practices involving money. [4]

[4] This is analogous to human language. Many argue there is a core set of cognitive structures that constrain human language. Yet there is clearly significant diversity and development. The challenge is to understand cultural and

Therefore, the theory theory/core knowledge view hinges on children's development of theories about the world around them. Teaching according to this framework requires knowing what children's initial, or naïve theories are. This can depend upon the cultural upbringing of the child as experiences build theories. It will then be necessary to create a learning environment that challenges any naïve theories that may be incomplete or incorrect while still incorporating them into the learning process. Learning in this framework is about modifying theories and that process of modification is important, not just the end product.

Brain/Executive Function Development.

Neuroscience and an understanding of the developing brain are becoming important influences on theories of cognitive development. Work in cognitive neuroscience has been quite influential in several areas related to financial literacy, notably the development of number and quantity concepts. However, much of the research is at a very basic level, removed from higher-order or more complex cognitions involved in financial decisions. One notable exception is work on the development of executive function. Executive function refers to the ability to exercise cognitive control, to direct attention, to focus, and to select the objects of thought. Executive function is central to planning. In this review we will focus on the role of brain development for financial literacy primarily in terms of executive function.

The central process in brain development is connectivity of neurons. As currently understood, thinking is a process of sending activation from one neuron to another. Learning and memory involve changes in those patterns of activation and transmission. The developmental process most relevant to this review is the myelinization. Myelin is a coating

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individual differences as variations on a common theme; what is the core similarity and what kinds of experience produce the distinctive features?

around neurons that greatly improves the speed and efficiency of connections. Different parts of the brain become myelinated at different points in development; areas responsible for executive function (frontal lobes) are not fully myelinated until late adolescence. In the young child, the frontal lobes are not fully connected or integrated with other areas of the brain. Maturation of the frontal lobes is often associated with children's increasing abilities to plan, to delay gratification, and to inhibit impulses, in short, with executive function.

Development of Personal Finance Concepts: Numbers

The concept of number, or having a number sense, underlies most personal finance concepts. Understanding numbers, what is more or less than something else and how numbers grow or diminish, is important to comprehending the role of production and consumption and to being able to interpret financial measures and patterns.

Piaget.

Though Piaget's theory does not explicitly address innate concepts of number, he does specifically address the concepts of symbol use and centration. Children who have a difficult time focusing on more than one aspect of a problem simultaneously are said to centrate. Centration is a hindrance since it only allows someone to represent part of a problem at a time. During the preoperational stage of development, children gain symbolic understanding. This should allow them the ability to represent the amount of a set of objects with a written number. Much as the written or spoken word "cat" represents a four-legged, furry, meowing creature in the world, a written or spoken "five" should represent the number of M&Ms in a set on the table in front of a child. Attaining these simpler mental representations will allow children to more

easily work with and understand numbers and properties of numbers as well as learn to work with them.

Preschoolers, however, still have trouble comparing number to other properties of a set of objects (Piaget, 1965). For example, four-to-five year old children will often say, when given two rows of five objects with one row's spaced widely and the other row's objects close together, that the widely spaced row of objects contains more objects than the closely spaced row of objects. This phenomenon remains intact even when the child is encouraged to count the objects in each row. Here, the child is conflating amount, or number with size, or length. Similarly, a row of five widely spaced pennies may seem like "more" to a preschool child than a row of closely spaced pennies. Similarly a child in the pre-operational stage of development, will ignore number in favor of overall size of objects in a set. It is as if the two senses of "bigger" become conflated.

Theory Theory/Core Knowledge.

Core knowledge is particularly good at explaining number and mathematical understanding documented in very young infants (Spelke, 2000; Wynn, 1995). It stands to reason that being able to distinguish between 'one' and 'more than one' is adaptive. If an individual is separated from the clan, being able to tell whether one or three warriors from another clan approach would be quite useful in determining one's prospect of survival in an altercation. Therefore, an innate sense of number is argued to be one of the important innate domains by core knowledge theorists (Spelke, 2000). In fact, in the study by Wynn (1995) this number sense was detected in infants as young as six months. Infants were repeatedly shown instances of a set number of objects on a screen, for example, two circles. When they habituated

to these cases (i.e. began looking away as nothing changed), the experimenter showed the same two circles to some infants or just one to others. The infants who were shown one circle looked at it longer than those who were shown the two circles suggesting that infants perceive a difference in numbers of objects.

Wynn (1992) has also argued that, in the same way a sense of arithmetic is innate. In this study, five-month-old infants were shown two Mickey Mouse dolls and allowed to look at them until their interest waned (habituation). A screen was raised obscuring the dolls while the infant could see an arm go behind the screen and remove one Mickey Mouse doll. When the screen dropped, there were either still two dolls or just one. The infants who were shown just one doll spent far less time looking at the stage while the infants who were shown two dolls still there stared much longer, presumably trying to figure out how an extra doll got there. Variations of this set-up were performed, but all results were that infants looked longer at situations that did not make mathematical sense.

Beyond infancy, children's knowledge of numbers expands to include elements of counting and relations between amounts, including equality. Around two-and-one-half years, children are able to distinguish counting words from other labeling terms (Markman, 1989). By preschool, many children are able to articulate rules of counting (Gelman & Gallistel, 1978). For example, they understand that when counting a set of objects, each object gets counted once. Younger children are often observed counting objects in a set more than once and either not knowing when to stop counting or stopping arbitrarily.[5]

[5] Other counting principles acquired by preschool include knowing that numbers are stated in the same order all the time (stable order), that one can count up and down or side to side and that order does not matter as long as each object is counted once (order irrelevance), that anything can be counted as long as the items in the set can be

According to theory theorists, children's developing concepts of number from infancy is a consequence of their experiences in the world. Young children will be asked to count things (e.g., days of the week, cars in the driveway) as well as be exposed to situations in which they have others count for them. The principles of counting are reinforced via these experiences and over time children will develop new theories about numbers and counting. Theory theorists would argue that the trouble some young children have reasoning about numbers is due to inefficient experiences with the multiple properties of numbers. Theory theory suggests that exposing children to these situations that would distinguish between and reinforce how properties such as size and amount interact would lead to children reformulating their initially more naïve number theories.

Development of Personal Finance Concepts: Time.

Personal finance management at all ages requires making time-related decisions. The critical time concepts are not so much whether children understand a clock or how seconds, minutes and hours relate. It is rather duration of time and the relation of past, present and future. Having a sense of the "future" is important in understanding the value of delaying gratification of saving, investing, and increasing asset value (i.e., time-value of money).

Piaget.

Piaget's theory can address conceptual development in the arena of time by focusing on centration. Piaget studied children's thinking of time by asking children to look at samples of

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distinguished (abstraction) and that the last number stated/counted represents the total number in the set (cardinality).

drawings by individuals who had started and stopped drawing lines at the same time. The children concluded that the person who produced the paper with more lines on it must have drawn for a longer time. These children were conflating duration with speed.

The future is an abstract concept. To Piaget, who claimed that true abstract thinking does not occur until much later in life, it likely would not come as a surprise that children younger than seven appear to have difficulty understanding the future. Friedman (2000) proposed this concept could be made more concrete by linking it to a concrete image children are likely to understand at younger ages, such as a birthday or Christmas. It is consistent with Piaget to ground the "future" in something more real to children at their particular stage of development.

Theory Theory/Core Knowledge.

Core knowledge theory would argue that humans are born with an understanding of time; infants experience regularities in heartbeat and breathing which to theory theorists becomes inherent knowledge of the regularities that occur with the passage of time (Harner, 1981). Harner also suggests that as children age, they increasingly realize that an action that elicited a particular response in the past is likely to elicit that response again in the future. In this way, even very young children begin to conceptualize past, present and future through their interaction with the environment around them. As children observe that cause and effect in the past is the same as cause and effect in the present, their theories about how time works become more sophisticated

Brain/Executive Function.

Given that an understanding of the future is necessary to be able to delay gratification, the role of brain and executive function development is important to children's developing concepts

of time. According to neuroscientists, neither an understanding of the future nor an ability to delay gratification exist in any meaningful or useful way prior to between ages 3 and 4. It is not until four years of age that children begin to distinguish between two future events, and this reasoning is only present for special events, such as birthdays or major holidays like Christmas, that are one to two months away (Friedman, 2000). As physical neuronal development in the brain accelerates, these tasks and understandings become much easier for children.

Development of Personal Finance Concepts: Money and Income

Money functions as a store of value and thus a means of exchange, yet is not the sole means of receiving income or paying for goods and services. In contrast to numbers, used in counting concrete objects, and time which can be observed and experienced by children, understanding the origin and use of money and the receipt of income require a sophisticated sense of why exchanges occur.

Piaget.

According to Piaget, children in the preoperational stage of development should have a fairly difficult time understanding the different dimensions of money. For example, money comes in different shapes, sizes, colors and textures. We have described earlier how preschool children have difficulty considering even two physical aspects at the same time (Piaget, 1965). Money carries the additional non-physical property of value; a dollar is more valuable than a quarter which is more valuable than a dime. Value is not determined by the physical characteristics—i.e., it is not the case that a coin bigger in physical size is also bigger in value and a silver dollar has the same value as a dollar bill.

Strauss (1952) has shown that children have trouble distinguishing the various aspects of money. For example, preschool age children often reason that a coin that is larger in size must be larger in value as well. Grunberg and Anthony (1980) showed that children younger than six will choose 100 pennies over a one-dollar bill when given a choice, despite being told that the two quantities are equal in value. This trouble in understanding two dimensions of an object is an example of Piaget's concept of centration.

Theory Theory/Core Knowledge.

The theory theory of conceptual development would postulate that with greater exposure to various types of coins and repeated observations that size of a coin does not determine relative value, children's understanding of money value would increase in sophistication.

Cross-cultural research on children's understanding of money supports the idea that the particular interactions children have in this domain affect their understanding of money.. In a study of South African children from rural, urban, or semi-urban areas of the country, children were asked where money comes from (Bonn & Webley, 2000). Many seven year olds cited "God" or "bosses", or "whites," while older children (8-14 years) cited "banks" or other institutions. Similarly, a young child who accompanies his parents to an automated teller machine to receive money might infer that the machine makes the money (Claar, 1995).

It is often argued that allowances help children understand the origin and use of money and how income is earned and received (see Beutler & Dickinson, 2007 for review of studies on this topic). A crucial distinction is between an "entitled" allowance, which is granted unconditionally, and an "earned" allowance, which is construed as payment for service (Miller & Yung, 1990). Researchers have debated which form of allowance is developmentally appropriate

(Mortimer, et al. 1994). Because young children have little understanding of a wage as an exchange of money for labor, allowances are more likely understood as an exchange between family members, a sign of parental approval, a way of being nice, or an entitlement. Yamamoto and Takahashi (2008) argue that allowance as a money grant from parents does not become distinguished from other purposes until children reach early adolescence.

Development of Personal Finance Concepts: Markets and Exchange

Personal finance is primarily about understanding financial market exchanges, among institutions and among individuals and how the terms and value of individuals' monetary transactions are determined over time. An important aspect of children's growing understanding of personal finance is their being able to understand how money functions as a means of exchange and to trust the outcomes of exchange with individuals other than family and friends. *Piaget*.

Berti and Bombi (1981) observed children participating in mock consumer/storekeeper exchanges and concluded that their reasoning about the role of money in exchanges was constrained by their particular Piagetian stage of development. Very young children (3-4) could explain that money was used to buy things, but in role-playing often took merchandise without paying. While somewhat older children (4-5 years) were aware that money had to be exchanged for goods receipt, they did not seem to understand that denomination of that money mattered, or if they did understand that, they tended to equate a single item with a single denomination. By five to six years of age, children appeared to understand different denominational values but often, when playing the role of the storekeeper, would give back change because that is 'what

storekeepers do.' It is only around seven years of age that children begin to follow the logical rules of exchange, understanding that money can be exchanged for goods and that change is provided only when denominations are larger than the cost of the item. According to Piaget, the reasoning required to keep these money-for-goods rules straight and in mind simultaneously is not present until the concrete operational stage around 7 years of age.

Theory Theory/Core Knowledge.

Theory theorist argue that preschool children's difficulties in understanding exchange can be explained by limited experiences. Fiske (1991) proposes four types of group interactions: communal sharing, authority ranking, equality matching and market pricing. Communal sharing is characteristic of families with young children who receive goods and services from their parents without being aware of the prior market exchange. To them exchange is about receiving rather than a balance between receipt and payment. Over time, children gain understanding of market exchange relationships as their experience with the extra-familial world and market pricing relationships increases.

Oh, et al (2005) examining cultural differences in children's exchanges emphasize the central importance of friends in exchanges among children. Indeed, Yamamoto & Takahasi (2008) suggest that not until children reach early adolescence do they clearly distinguish sharing of goods, even when purchased, among friends from other social exchanges and begin to understand money as a means of allowing market-based exchange among non family members and friends. This delayed realization may be because moving to an understanding of price-based exchange relationships requires reasoning about equality and inequality. Pinker (1999) argues humans are hardwired to detect inequality in exchanges because detecting cheaters is

evolutionarily beneficial for survival. However, if this innate sense (core knowledge) is not activated and reinforced in children through experiences with market exchanges, communal sharing will remain the observed norm making it more difficult for children to understand and both trust and be cautious about market exchanges.

Recall that core knowledge theory purports that concepts develop in a domain-specific manner in accordance with experience. This may also be the case for children's initial naïve understanding of market exchange motivations. Siegler & Thompson (1998) conclude that children 4-5 years of age understand demand, but it is not until around age eight that supply is integrated into their understanding of markets. This is because they more often experience and it is easier for them to understand demand effects, for example if many children want a new toy that the toy may be more difficult to find on the shelf and the price will increase. Children may have less experience seeing how supply responds to demand and price changes.

Jahoda (1979) concluded that only older children, at around 11 years of age, understand the concept of profit and its role in willingness of produce and sell goods. Younger children tend to think that items are sold at the same price as they are purchased by the seller. Integration of sale price, production price and profit (or losses) constitutes a major conceptual change in the way children understand market exchanges. Work in this field suggests that children require experiences comparing and contrasting these concepts in order to successfully change their overall concept from disjoint to connected systems of supply price, demand price and profits (Berti & De Beni, 1988, Webley, 2005).

Development of Personal Finance Concepts: Institutions

Many aspects of money and the use of money cannot be understood without considering the institutions that help manage money and monetary like exchanges. Young children see money "produced" by ATM machines, handed to parents by store keepers as well as goods given to them by individuals. How an understanding of institutions' roles in personal finance develop in young children has been investigated by a few scholars.

Piaget.

In an interview of 180 school children in South England, Furth et. al. (1976) explored young people's understanding and views of social institutions such as families, government, doctors and shopkeepers. They found that children's evolving views followed a generally Piagetian framework. The first stage, most prominent in children younger than six years of age consists of voicing knowledge about facts of a social situation. A child of this age might explain that the storekeeper's job is to provide goods/services and money (in the form of change). The child may also explain that the shopper gives money to the storekeeper, but there is no integration of these two concepts (i.e. that change is provided when the shopper hands over more than the cost of the item). It is not until around age seven that children begin to integrate the two individuals' use of money.[6]

Theory Theory/Core Knowledge.

It is generally thought that a reasonable understanding of the complex institutional nature of banks and credit unions does not emerge until around 10 or 11 years of age (Jahoda, 1981; Ng, 1983). However, Ng (1983) showed that children in Hong Kong tend to have better

[6] Furth et. al. (1976) give an example of that integration: One child posited that passengers give the bus driver money and the bus driver can then give that money to the person who sells gas for the bus. This child does not just portray facts of the situation, but is able to make inferences as to the usefulness of each fact or the purposes of observed actions.

understandings of the banking system earlier in life than U.S. children because of their particular experiences with banking. Similarly, children in Japan have an even less advanced view of banking institutions, it is thought because of more limited use of daily banking services in that country (Takahashi & Hatano, 1994). In South Africa, Bonn and Webley (2000) found that children living in rural areas of the country, where banks are less frequently found, have the least comprehensive understanding of the institution.

Development of Personal Finance Concepts: Choice

The topics discussed so far are entities or processes involved in thrift and financial literacy. Integrating these concepts for the purpose of making choices is central to financial literacy. Choice is necessary in managing information about scarce resources, assessing opportunity costs, in budgeting resources over time and accepting financial risk. How do children make decisions and select alternatives? Cognitive developmental research often focuses on key ideas such as delay of gratification and self-regulation.

Piaget.

Making choices often means suppressing immediate urges, sometimes temporarily, sometimes more long-term. Therefore, the development of self-control becomes central to making choices. Preschool age children have a hard time making a choice between a reward offered immediately or one promised in the future even when that future reward is greater (Mischel & Ebbesen, 1970).

Piagetian theory explains this phenomenon via the concept of centration. Imagine a four-year-old faced with the decision of whether to take a small reward immediately or to wait for a larger reward in five minutes. The child will have to hold several aspects of the situation in mind at one time: the type of reward, their desire for each type if they differ, the size of the reward, and the time when the reward will be received. If additional consequences are added, such as a parent who will be disappointed if the child takes the small reward immediately, the decision becomes more complicated. In the pre-operational stage of development, children usually only consider one aspect of the problem at a time. Thus, the fact that they can have a reward now, regardless of the relative size or desirability compared to the later reward, might be the salient problem feature on which they centrate. Other relative aspects may be ignored because of the constraint of this cognitive mechanism.

Theory Theory/Core Knowledge.

Several studies have shown that younger children can be helped to make more efficient choices if they are guided through experiences that teach how to manage delayed gratification. For example, if they are taught to take their mind off of the desirable immediate choice (Mischel & Moore, 1980) or the most desirable attribute of that choice (Michel & Baker, 1975), they have an easier time delaying gratification. Research has also shown that if children are involved in the process and understand the choices they have, delay is easier (Hom & Fabes, 1984). LeSure (1978) shows that at older ages (children in 4^{th} and 5^{th} grade) children learn from past experience with delayed gratification if the gains from doing so were linked to ability or task difficulty rather than simple luck.

A specifically financial aspect of choice behavior is saving, one of the central elements of financial decision-making. Webley and colleagues (Otto, et al., 2006; Sonuga-Barke &Webley,1993) conducted several studies of children's saving behavior.[7] The results suggest changes in how children viewed savings between the ages of 6, the youngest age studied, and 12. The Webley argues that, while younger children did not have a financially based understanding of savings, their saving behavior was not random nor a result of total ignorance. Rather, savings have a different functional value for young children. Savings decisions are made in response to a broader set of social concerns, such as: fulfilling parental expectations, being a "good boy", or enjoyment of participation in an "adultlike" behavior. The purely financial meaning of savings is not salient to young children.

Brain Development/Executive Function.

Delaying gratification is an example of an application of inhibitory control which is housed within executive function. While most people may have trouble controlling inhibitions at times, this is particularly difficult for children around three or four years of age (Zelazo et. al., 2003). This phenomenon manifests itself by an inability in these children to persevere on simple sorting tasks. In other words, when sorting rules change, young children often lack the ability to inhibit the effect of an initial rule in order to apply a second.

Zelazo et. al. (2003) examined three- and four-year-olds' inhibitory control ability on a simple and commonly used card sort task. Participants were given a set of cards each with one item pictured on it. Items varied on two main dimensions. For example, children might have seen either red or blue objects and either animals or toys, such that there could be a blue cat, a

[7] These studies took a variety of approaches. Some involved games in which children were able to use savings as a response to risk of loss and variation in income. Others included structured interviews with parents, and analyses of educational materials.

red cat, a blue ball and a red ball. Participants were first asked to sort cards according to one dimension (e.g., color). Once children sorted all the cards into a red and blue pile, the cards were collected and the experimenter explained that the rule had changed. The child were then asked to sort the cards according to the second dimension, animals and toys. The study found that children failed to switch to sorting by the new rule. Studies by Carlson & Moses (2001) and Perner et. al. (1999) showed that children continue to make this error even when they can tell the experimenter the new sorting rule.

There are two theories as to why this happens. One theory posits that children of this age are unable to hold that much information in their memories at one time. However, a second theory suggests that the problem is not one of memory capacity, rather that children do not have the physical/cognitive ability to inhibit paying attention to the former rule. While the exact mechanism explaining why this happens is still debated, both theories agree that inhibitory control is key in dealing with situations that may involve multiple rules. Both views suggest that children may have difficulty focusing on the multiple aspects of choice.

Conclusions

While there may be no consensus on how cognition grows about important personal finance concepts, an appreciation of the difficulties children face in moving from naïve to more complex understanding of basic financial concepts, observed by all schools of cognitive development theory, should inform curriculum for pre-operational children. For example, knowing that very young children have a hard time keeping track of number and size at the same time should be incorporated into lessons that aim to teach about money as a means of exchange.

The bulk of the cognitive development literature relevant to financial concepts has been carried out within a Piagetian framework. This theory provides a clear model of the course of development and a basis for identifying developmentally appropriate financial literacy concepts and teaching challenges. Young children operate at a level of appearances; they focus on a single salient feature, and have very little appreciation of cause-effect relations. As cognitive capacities are subject to general constraints, financial education, based on the Piaget would focus on topics within these capacities. That is, introduction of more complex concepts must be consistent with sequential developmental transitions. Thus prescriptions for financial education for young children focus on providing them experience with concrete phenomena (e.g., distinguishing denominations of coins by size and color). The appropriate starting point for financial education is a few independent concrete features and instruction can only move to the multiple interacting abstract features as children mature into subsequent developmental stages.

Unfortunately, the clear framework laid out by Piaget has not fared well under empirical investigation. As the literature reviewed from other perspectives suggest young children are capable of complex, interactive, and abstract thinking. On the other hand, children's more sophisticated understanding about one aspect of finance does not predict their understanding of some other aspect. For example, young children seem to have a relatively sophisticated understanding of exchange. They appreciate the conditional structure of deals and trades. At least by the early elementary-school years children know something about the relations between supply and demand in determining people's willingness to make certain kinds of exchanges. At the same time, young children are often ignorant about the nature of financial institutions, profit, and inequality in exchange relationships. The explanation for this inconsistency in cognitive

capacities relies on domain specific concepts and experiences. Theory theory argues that young children will have a richer understanding of things that have been important features both of our species' evolutionary history and of their experiences. Problems of sharing, reciprocity, and enforcement of agreements have been central to human development and children's theories of financial interactions reflect that core knowledge. In contrast, children have little interaction with financial institutions, credit, and salaries, and these are also very recent features of our species' economic environment.

Although the core knowledge approach differs in many respects from the Piagetian, there are many commonalities. Just as Piaget believed that education that did not connect to existing cognitive structures would have little impact, core knowledge theorists hold that education is most effective when it relates to existing theories and experiences. Children may learn isolated facts, but they will retain and use those that "make sense" with respect to their current understanding. Both Piaget and core knowledge emphasize that children are active learners; information they receive is filtered and accommodated to fit with current beliefs. While Piaget held that it was possible to identify general qualities of children's thinking that could guide expectations about learning in specific domain, the core knowledge approach takes the existence of particular cognitive structures or constraints as an empirical question to be discovered in each particular domain. We illustrate how theory may inform the approach to early financial education using the example of exchange and value.

Children engage in transactions involving exchanges of resources from a very early age. The reciprocal interactions between caretaker and infant, involving turn-taking and coordinated activity, are very early economic exchanges. While in the first years of life most of those

transactions have an unconditional character (e.g., parents giving child food), as toddlers children begin to engage in conditional transfers (e.g., parents giving child reward). Fiske (1991) provides a model of how financial literacy in young children may develop as they move from Communal Sharing to an understanding of Market Pricing. We suspect that the critical feature of development of Market Pricing is the segregation or distinction of financial considerations from other elements of exchange (see also Sonuga-Barke & Webley, 1993; Yamamoto & Takahashi, 2008). For example, a financial exchange is not a matter of being nice, friendly, respectful, or even fair: A financial exchange is a matter of price and market. While niceness and fairness are involved in financial transactions, financial literacy involves being able to recognize and reason about these factors independently. Kalish et al. (2007) suggest that young children may not clearly distinguish property rights from other sorts of attachments to property or elements of social interactions. Adult intuitions clearly distinguish between ways of distributing property that are the nicest and fairest, and ways of distributing property that are consistent with property rights. I may have lots of marbles and you none. There are all sorts of reasons why I might give you some, but those reasons do not carry the same weight as the fact of actually owning some of the marbles. Young children tend to conflate those considerations.

Increasing sophistication in the domains of ownership and finance may involve refining pre-existing models of exchange and value to focus on only some aspects of these complex phenomena. This may be a challenge for children because in their experience financial considerations are not divorced from social and emotional ones. Actions such as saving or spending have important emotional components. There are also strong social norms governing financial behaviors. . When a child first receives an allowance, or first deposits money in a

bank, he or she is likely being guided by an expert (e.g., parent). Social and emotional motivations for interaction are driving these behaviors. The enjoyment of doing something with the parent, the feeling of mastery in participating in "grown-up" activities like going to the bank, or the familiar ritual of the weekly shopping provide the meanings and motives for young children. Interventions to teach financial behaviors to young children typically capitalize on any or all of these motives. If parents support and model saving, it is likely that children will engage in the behavior. However, it is not clear what turns such social behaviors into financial behaviors appropriate to market exchanges. How does the child come to appreciate a certain set of motives or considerations that feature in some, but not all, behaviors? Both Piagetian and theory theory indicate that experience and patterning is important in teaching personal finance concepts to young children, but differ on the reasons why learning may be constrained. Likewise brain development research provides insights into how children learn and the developmental constraints on learning.

Our hope is that this review will support financial literacy programs for young children that are sensitive to the necessity that the demands for financial education reflect the cognitive ability of young children. At the same time, further research on cognition and financial understanding is necessary to identify basic elements of financial literacy that are appropriate for young children and for designing programs that may enhance understanding in ways that increase children's ability to acquire financial knowledge as they mature. However, what young children do know, and what is relatively more or less difficult for them to understand, are only parts of the problem in designing financial literacy education for this age group. The other piece is an analysis of the goal-state; what would we like them to know or be able to do? The aims of

financial literacy education must come from an analysis of the financial environments children live in, and of the capacities we hope to see in adults, as the results of development and education. Psychological research can inform strategies for developing these capacities, in terms of ordering and means of introduction. However, why we might want to teach some aspect of financial literacy, is it important that children know or be able to do something, is not, strictly, a psychological question. That something is difficult for young children to understand does not tell us this is something best left alone but rather something that specialists in cognitive development and financial literacy should work on together.

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