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Children's understanding of market forces

David Leiser *, Reut Beth Halachmi

*Department of Behavioural Sciences, Center for Decision Making and Economic Psychology,
Ben-Gurion University, Negev, P.O. Box 653, 84105 Beer Sheva, Israel*

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Abstract

This study investigated children's understanding of the effect of changes in supply and demand on the exchange value of everyday goods and services. Sixty-four children (aged 6, 8, 10 and 12) were told short stories and asked to predict whether certain circumstances would affect price or exchange rate. Explanations for their answers were also elicited and scored. Two dimensions were manipulated in the stories: Money vs. barter, and supply vs. demand. A second study ($N = 64$) sought to dissociate effects of supply and demand from direct and indirect causation. It was found that children can understand supply and demand to a larger extent than was thought, and that demand effects are easier to understand than supply effects. The findings are interpreted in terms of the relative complexity of the mechanism in each case.
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1. Introduction

This study investigates children's understanding of two main economic forces, supply and demand. As economics textbooks explain, at prices above the equilibrium

* Corresponding author. Tel.: +972 544 979225; fax: +972 8 6472932.
E-mail address: dleiser@bgu.ac.il (D. Leiser).

there is *excess supply* while at prices below the equilibrium there is *excess demand*. The effect of excess supply is to force the price down, while excess demand creates shortages and forces the price up. The price where the amount consumers want to buy equals the amount producers are prepared to sell is the *equilibrium market price*. The present study investigates the development of these notions in children.

The progress of economic understanding in children in general has been traced by several investigators over the years and the reader is referred to these sources (Berti & Bombi, 1988; Berti & Grivet, 1990; Danziger, 1958; Furth, 1980; Furnham & Cleare, 1988; Jahoda, 1979; Leiser, 1983; Leiser, Sevón, & Levy, 1990; Stacey, 1982; see especially Webley, 2005, for a recent review of the literature, which covers well the issues of interest in this study).

We will stress here several prominent features of this development. Progress in understanding is characterized by a transition from isolated partial systems, to an increasing integration of understanding; by a transition from understanding of economics as motivated by ethical considerations to a realization that economics has its own logic, distinct from moral considerations (Leiser et al., 1990; Sevón & Weckström, 1989), and from one that relies on the motivation of individuals, to one based on an appreciation of the aggregate effects of the actions and desires of groups of people (Leiser, 1983; Leiser et al., 1990).

Berti and Grivet (1990) were the first to address the question that will concern us, namely the understanding of the effect of supply and demand on prices. These authors studied children's understanding of the relations between changes in supply, demand, and prices, by telling stories about a small and isolated village, where "each inhabitant produces and sells just one commodity". The stories involved the changes (increase or decrease) in one out of the three variables and the children (aged 8–13) were asked to tell "what she/he thought would happen afterwards, what customers and sellers would do". When required, the experimenter offered a cue by explicitly asking about the variable affected (e.g., "will the price remain the same or will it change?"). Children understood the effect of price changes on purchases long before they understood the converse effects of changes in supply and demand on prices. There was not a clear pattern in the relative difficulty of answering questions involving a change in demand and a change in supply. When children aged 8–9 were asked to explain their prediction, it became clear that they failed to separate moral from economic considerations and typically countenanced changes in prices only as a way to ease life for poor people. People were thought to want to earn enough money to live on, not to maximize profit. These last results by Berti and Grivet (1990) were obtained in a working class area of Torino, Italy, and form an intriguing contrast with the findings by Thompson and Siegler (2000), to which we return below on another topic. Working with middle-class children in a Catholic school in Pittsburgh, USA, they report that, out of several possible goals relevant to economics, preschoolers really only understood the concept of desire to acquire valued goods (i.e., greed), whereas the 7 years old had some understanding of the additional economic principles involved (seeking profits, acquiring goods inexpensively, or competing successfully with other sellers).

The development in understanding of supply and demand was also investigated by Siegler and Thompson (1998) in a study involving their effect on sales volume. Children were told little stories, and asked to predict the change in sales, if any, that followed a change in supply or demand. For example, the demand-change story was:

“One day it was a holiday and a lot of people were out of town, so not as many people as usual walked down Kathy’s street. Do you think Kathy sold more, or the same, or less cups of lemonade than she usually did?”

The supply-change story went:

“Usually John’s lemonade stand was the only one on the block. But one day, both kids who lived next door to John decided to run lemonade stands too. Do you think John sold more, or the same, or less.”

Results indicated that preschoolers understood the effects of demand, and second graders also understood the effects of supply. The authors attribute the difficulties encountered to two general factors (a) direct links between causes and effects are understood before indirect ones, (b) positive correlations between causes and effects are understood before negative ones. The latter effect is also known as the “*more is more*” effect (Acredolo, Adams, & Schmid, 1984; Levin, 1979; Levin & Gilat, 1983), which consists in postulating that two related variables will vary in the same direction. Siegler and Thompson found, in particular, that pre-schoolers predict that more sellers would lead to *more* sales by each.

The study closest to ours is that by Thompson and Siegler (2000). Whereas Siegler and Thompson (1998) studied the effect of supply and demand on sales, and Leiser (1983) and Leiser et al. (1990) studied the effect of prices on sales, they set out to study the effect of changes in each of the following variables on each of the others: supply, demand, price and sales. Children aged 5, 7 and 9 were asked about short stories that had the same basic structure: one of the variables was made to vary, and the child was asked about the effect on one of the other variables (they ran another experiment involved more complex stories, but this is less relevant to us). Thompson and Siegler found that the effects of changes in supply was better understood as age went on, so that each age group studied did better than the younger one. In contrast, the effect of changes in sales and in demand yielded no difference between the age groups. Regarding changes in prices, a difference was only found between 7 years old and the pre-schoolers. When the same variables as *outcome* were compared, no differences were found between the age groups. The results do not fall in a clear pattern, but the authors report that understanding effects on sales was easier than that on prices.

These findings of Thompson and Siegler (2000) we just reviewed are open to question. At issue is the development of the understanding of the effect of changes in supply and demand on prices. Careful consideration of the stories they told the children reveals that the ones they devised to tap this understanding do not, in fact, allow evaluating it. Consider the following sample story (p. 675), called by the authors “Supply causal, Price outcome”

“Usually Kathy sold about 10 cups of lemonade each morning, but one morning she sold about 50 cups. Would that make Kathy charge more, or the same, or less money than usual for each cup of lemonade that day? Why?”

Contrast this with another, called “Price causal, Demand outcome”

“Usually Pam sold lemonade for 10 cents a cup, but one day she decided to raise the price to 50 cents a cup. Would that make more, or the same, or less people than usual want to buy lemonade from Pam that day? Why...?”

In the story about Kathy, the change in sales is *not* the cause of the lower price; rather, the reverse is true. When children were required to reason from a consequence (the increased sales) to its cause (the unit price), the increase in sales does serve as a premise, but this does not make it a cause, as Thompson and Siegler imply. Indeed, the lowering of the price would have occurred before the sales, as causes tend to do. This confusion is very unfortunate by itself, and made especially so because the authors present their results in aggregated form. A further (regression) analysis suggested that children’s difficulty lies in the information processing required, which are challenging for the youngest age groups: inverse relationships and taking on multiple perspectives are notoriously difficult for them.

1.1. Money vs. Barter

To understand the nature of the children’s difficulty with the mechanisms of changes of supply and demand, it is important to separate it from their difficulty with the concept of money and of acquisition by paying a monetary price (Webley, 2005). Barter (“swopping”) is closer to the children’s world, and based on social understanding already present in kindergarten, such as threats, reciprocity etc. (Webley, 1996). In contrast, the exchange for money remains a ritual for the younger children and its understanding only progresses slowly, by a succession of stages (Berti & Bombi, 1981; Strauss, 1952). The acquisition of the concept of money was also studied by Gentner (1975): in her study of possession verbs (e.g., give/take, buy/sell, pay, trade, and spend), Gentner asked children from $3\frac{1}{2}$ to $8\frac{1}{2}$ to demonstrate their comprehension of these words by following instructions to give, buy, trade, etc. objects. The youngest children understood *give* and *take* but none of the others. The 8-year olds had mastered *pay* and *trade*, but most of them could not comprehend *buy*, *spend* and *sell*. The obvious interpretation for their difficulty is that *buy*, *spend* and *sell* all specify that *money* is involved.

It is therefore possible that children do grasp the relative value of items or services and what this entails in terms of reciprocity and exchanges, but cannot translate it in money terms. Evaluating the understanding of the effects of supply and demand only in the context of monetary prices would then underestimate it. If we circumvent the money aspect, we may therefore have a more sensitive tool for measuring their understanding, and may show that understanding of supply and demand occurs at a younger age than when monetary values are involved.

2. Experiment 1

2.1. Method

We interviewed children aged 6, 8, 10 and 12. In order to have as homogeneous groups as possible, we interviewed all children within a month of their birthday. Each age-group consisted of 12 children, 6 boys and 6 girls. The children came from lower middle class backgrounds, and were sampled at random from several kindergartens and elementary schools in Beer Sheba and Kiryat Gat, Israel.

Children were interviewed individually in a quiet room, and great care was taken to make them feel comfortable. The experimenter, a young woman very experienced in working with young children, engaged in small talk with the child before announcing that they would be playing a little game. The child was then told a story and asked the question. If they failed to answer correctly or fully, they were given up to three successive hints, carefully calibrated and prepared in advance. The proceedings were recorded, literally transcribed, and the transcribed answers graded by two “age-blind” judges (that is, who were not told the ages of the interviewees, though they might have been able to guess it from linguistic cues). The inter-rater agreement was very high (about 97%), and the few remaining differences were easily resolved by common agreement.

2.2. Scoring

We use a more stringent and more differentiated measure of what constitutes a correct explanation than Thompson and Siegler (2000). Children had to do more than mention the relevant principle. To be considered correct, an answer had to: (1) include a reference to how the situation would change prices; (2) express something related to competition; (3) express how the relevant variable was changed. For instance (see example in Appendix A): *The price will be higher, because there are more children who want the chocolate balls, and some will offer to pay more to make sure they get the chocolate balls.* Scoring was done in accordance with the number of hints required. A complete answer that required no hint was graded 4, one with one hint was graded 3, and so forth.

2.3. Materials

There are four combinations of the variables Supply/Demand \times Money/Barter; we devised two stories of each type, eight in total. Sample stories are given in Appendix A. The stories were all illustrated in a cartoon style, with two large drawings each, one depicting the situation before the change in supply or demand, the other afterwards. Each story was drawn on a differently coloured background, while both illustrations of the same story were on a same-coloured background.

2.4. Results

The scoring scheme described provided a value between 0 and 4 on each question. These scores were subjected to a repeated-measures ANOVA. We will discuss the various aspects of this analysis in the following sections. As expected, Age had a highly significant effect [$F(3, 60) = 65.31, p \approx .000000$] (see Fig. 1). Progress is apparent throughout the age range studied. The highest possible score is 32 (eight questions with a maximum score of 4). As our scoring method was very conservative, one may consider that the 12 years old reached the maximum value.

Questions involving money were actually *easier* than those involving barter (see Fig. 1). The effect, though small, is statistically significant [$F(1) = 16.87, p = 0.0001$] and consistent at all ages: the interaction of Money/Barter and age is nil [$F(1, 3) = 1.04, ns$]. This finding is in the direction opposite from that expected. Whatever the source of the difficulty children experience with our questions, it does not stem from the opacity of the concept of money at these ages.

Next we contrast the difference between supply-change and demand-change stories (see Fig. 2). Demand-change questions were significantly easier than supply-change questions [$F(1) = 63.84, p \approx .000000$]; the gap between them decreases slightly with age [$F(1, 3) = 3.75, p = 0.015$].

These findings fit and extend those by Siegler and Thompson (1998), who studied understanding of supply and demand changes on sales. We asked the more difficult question about the effect of prices; the findings are parallel.

Before we can discuss and interpret this result, we should pay attention to a potential confounding variable. The main explanation offered by Siegler and Thompson (1998) and Thompson and Siegler (2000) for their finding was that understanding demand-change questions is easier because the relevant variables correlate positively: increased demand leads to increased prices, whereas increased supply leads to lower prices. This explanation raises a question: are demand effects easier because they are direct effects (in terms of the sign of the correlation) or because

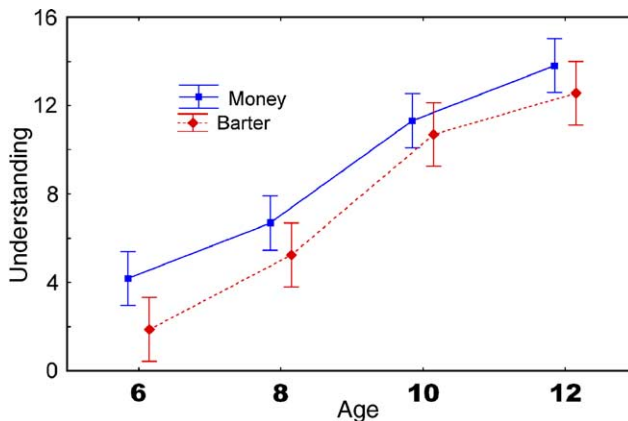


Fig. 1. Money vs. barter by age. Note: vertical bars indicate the 0.95 confidence interval throughout.

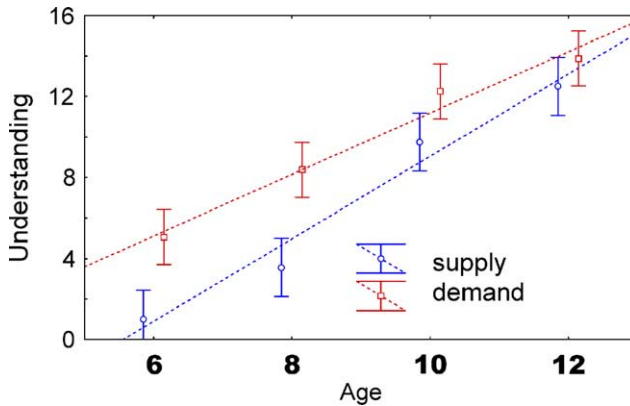


Fig. 2. Supply vs. demand by age with linear fit.

demand changes are in some way more understandable to the children? In order to test this, we ran a control experiment that addresses this issue.

3. Experiment 2 – Controlling direct/inverse effect

3.1. Method

Participants in this study were again aged 6, 8, 10 and 12 years, with groups of 12 children each, half of them boys, half girls, from the same population as in Experiment 1. The conditions of the experiments were also the same as in Experiment 1, as were the materials, except for one crucial difference. This time, the participants were asked: “Will the buyer be more (or less) *pleased*?” The rationale for this is as follows: Buyer satisfaction is positively correlated with increased supply, and negatively with increased demand, which is the opposite from price. Thus, asking about buyer satisfaction allows separating the difficulty of supply/demand from the sign of their correlation with prices.

3.2. Results

Scores were subjected to a repeated-measures ANOVA. In this experiment, we are only concerned with the effect of the Supply/Demand dimension. Demand-change questions are *still* easier than supply [$F(1,44) = 120.321$, $p \approx .000000$], even though the relation with positive/negative correlation was reversed. It may be noted, incidentally, that no age-trend was found in this experiment [$F(3,44) = 0.80$, ns], a surprising finding for which we have no explanation. In any event, we were interested in the main effect supply vs. demand, and at all ages, demand-change questions were easier. Clearly, there is something in demand-change effects that makes them harder to grasp, beyond the “*more is more*” effect.

In searching for an interpretation, we might look at children's lack of differentiation of ethics or morals and economics, an effect to which we referred in the introduction. This issue should not be confused with the moral development of the child and their concept of fairness, which, as has been shown by many authors, progresses with age. As children grow older, they become increasingly capable of appreciating a situation from another's perspective. Altruism, therefore, can increase with age, in line with a realization of the consequences of one's actions (Piaget, 1932/1977; Keil, 1986). Damon (1975, 1980) described a series of stages of "positive justice" understanding spanning the ages from 4 to 9 and beyond, and his views were subsequently supported by others (Enright, Franklin, & Manheim, 1980; McGillicuddy-De Lisi, Watkins, & Vinchur, 1994). In the present study, we are not concerned with the ethical level of the children, but in their ability to *differentiate* between moral and economic considerations, and to focus selectively on economic mechanisms when asked.

Leiser and Zaltsman (1990), comparing urban children in Israel to those raised in the collectivistic kibbutz, noted that the latter had a comparable grasp of economics, but also evinced more altruistic tendencies. Harbaugh, Krause, and Liday (2002) studied actual negotiations (using the "Dictator" and the "Ultimatum" game) and noted a clear progression with age – attributable to an increased preference for fairness rather than to a change in bargaining ability.

Could it be that the children in our experiment give more "moral" answers to supply-change questions than to demand-change questions? If so, this would explain why supply questions are harder, since "moral" answers to our stories counted as failure to understand the economic mechanism. To settle this question, we returned to the answers given by the subjects in Experiment 1, but used different scoring principles. This time, we tallied the number of answers that failed to differentiate moral from economic considerations. Each child could therefore have a maximum of 8 points by this scoring method, namely one point per story, in case she/he failed to

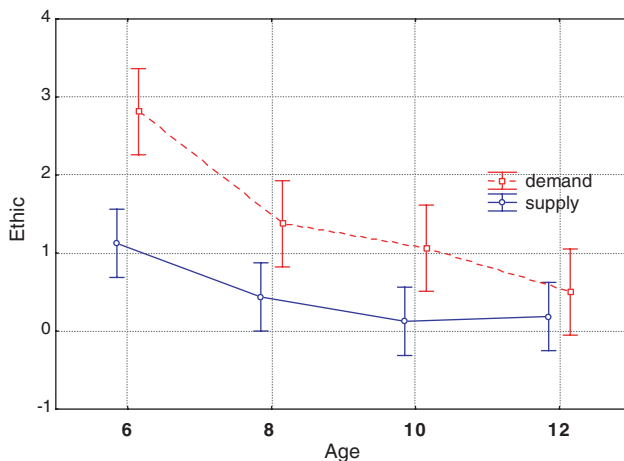


Fig. 3. Differentiation of ethics and economics by age and supply/demand.

differentiate morals and economics in each story. Two age-blind judges again evaluated the answers individually, and then discussed the cases of disagreement until they agreed on a score.

We subjected these scores to a two-way ANOVA. The main effect of age was found, as expected [$F(3, 60) = 11.335, p \approx .000000$]. As children grow older, they differentiate increasingly the two types of considerations.

What interested us here was the interaction Age * Supply/Demand. This interaction proved significant [$F(3, 60) = 4.69, p = .005$], and is portrayed by Fig. 3. As can be seen, the differentiation of ethics and economics is *better*, at all ages, for supply-change stories than for demand-type stories. Demand-change situations actually provoke *more* moral considerations, so that the better score on understanding demand-change questions occurs despite the difference in indifferentiation of ethics and economics.

4. Discussion

The development of understanding the effect of supply and demand is a slow process, and children only consistently manage to articulate the mechanisms involved by age 12. Their difficulty cannot be attributed to a difficulty with the concept of money, which is only an issue at the early ages in any event. If anything, we found the opposite, namely that questions involving prices expressed in terms of money were easier to grasp at the ages considered than those involving barter.

We confirmed that changes in demand are easier than changes in supply. This had already been suggested by Berti and Grivet (1990), and also by Siegler and Thompson (1998), albeit regarding the effect on sales volume. Siegler and Thompson attributed the difference to the positive vs. negative correlation of the variables involved. However, our findings indicate that even when that relation is reversed, as we did in Experiment 2, the effects of changes in demand are still easier to grasp. One additional hypothesis that we tested was the effect of the progressive differentiation of ethics and economics that is known to occur. We wondered whether this feature of the children's development interacts with the supply/demand dimension in a way that might account for the pattern of findings. As we saw, the results belie this hypothesis. Children find it easier to keep ethics and economic considerations separate when asked about supply changes than about changes in demand.

Why then is the effect of change in demand easier to understand than that of changes in supply? We offer the following explanation. From the point of view of the child, it is the seller who sets the price (see also Leiser et al., 1990). This is what overtly happens in buying situations children are familiar with: the buyer asks "how much?" and the seller quotes a price. If demand increases, the buyer can exploit the situation and raise the price. Conversely, if demand drops, the seller can try to ask for less. The type of causality involved here is the simplest of all: a deliberate decision.

When there is a change in supply, however, the buyer is not in a symmetric status, and cannot simply declare a different price: it still is the seller who decides, as far as

the child is concerned. The buyer can walk out, of course, but the seller sets the price. The customers are not altogether powerless, though: If there are more suppliers, more buyers may decide to try to shop elsewhere, demand will slacken, and the seller, sensing this, may decide to lower the price to lure them back. Thus, while the increased supply enables the buyers *collectively* to put pressure on a price, this is a form of aggregate causality that is more complex, and harder for the child to fathom (Leiser, 1983).

One might argue that this line of reasoning runs counter to the results of [Henriksen \(1996\)](#) who found, when asking children aged 6–9 to play act, that buying transactions were easier for them to perform than selling transactions. These findings stand to reason, as in real life children tend to be in the role of buyer, directly or with a caretaker, and it is therefore natural that they identify more readily with the buyer. But if so, shouldn't one expect them to appreciate the options open to the buyer more than those of the seller, which appears to point more to reacting to changes in demand? The rejoinder to this is that if, as we argued, the child considers the seller as the party that sets the price, then changes in demand and in supply must both be channeled through the seller. In the case of changes in demand, that path is direct; if demand changes, the effect is more roundabout and, as [Siegler and Thompson \(1998\)](#) and others noted, indirect effects are more difficult. Development in understanding effects of supply and demand would therefore consist in getting a grip on increasingly convoluted reasoning.

Another objection to our interpretation would be to observe that supply changes are more difficult to understand even when volume of sales is concerned ([Siegler & Thompson, 1998](#)), yet our explanation does not account for this finding. While we readily admit that it does not apply to it, we also contend that it is not required there. [Siegler and Thompson](#) report that preschoolers understood the effects of demand and by second grade already understood the effects of supply of sales. Their questions were straightforward, and no profound insights are required to explain why the effect of increased demand on the volume of sales of individual sellers is more straightforward than that of a change in supply. Our questions were much more difficult. This can be seen from the results of [Thompson and Siegler \(2000\)](#), who mention that understanding effects of other variables on sales was easier than that on prices, and that difficulty is reflected in the age of acquisition, which continues until about 12 years of age in the case of effects on prices. As we saw, the difference between supply and demand too decreases but persists throughout the age-range studied, so that an interpretation different from that of [Thompson and Siegler](#) is required in our case. While we believe ours has its merits, we also feel that further investigations are required and additional variables should be examined before final conclusions are reached.

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Appendix A

A.1. Car wash: Supply, money

(Fig. 4(a) is shown) This is Dorit. In Dorit's neighborhood, every neighbor washes his car once a week.

During the summer vacation, Dorit decided to open a car wash business.

She got from her Mom a large pail, a couple of rags, and plenty of soap, and went into the parking lot.

In the parking lot, she offered the drivers to wash their car.

For every car she washed, she received from the driver 10 Shekel.

(Fig. 4(b) is shown) The following week, the other children in the neighborhood saw that Dorit was making lots of money, and every one of them decided to open his *own* business of car washing.



Fig. 4. Little Dorit's business debut.

Now all the children are in the lot, and each one holds a rag and a pail of water.

Whenever a car goes by, all the children cry to the driver: “Come and let me wash your car, come and let me wash your car!”

Do you think that the price of washing a car will go up, or down, or will it stay like it was before?

A.2. Football cards: Demand, barter

In Ido’s class, the kids collect soccer players cards, and sometimes they exchange cards amongst them. The children in his class like Revivo best (*which one do you like best?*). During every recess, Ido and Shmulik swap cards [*point*]: Ido gives Smulik a card with Revivo on it, and Shmulik gives him in return three regular cards.

During the last recesses, they met children from the other class [*point*], and they too want to swap with Ido, and to get Revivo cards. Now both Shmulik, and the other children, are all around Ido, and each one of them wants Ido to exchange the Revivo card with him.

Will Ido receive now more regular cards for the Revivo card, or fewer regular cards, or will he get just like before?

Hints

1. How will Ido decide with whom to swap his card?
2. Will the children agree to give him five cards if he asks them?
3. If one other child offers five regular cards, for the Revivo card, will other children also be ready to offer more cards to Ido?

Chocolate balls: Demand, money

This [*point*] is Naama. Naama is a very good cook. She especially likes to prepare delicious chocolate balls. Yoav [*point*] loves chocolate balls, and always comes to buy chocolate balls from Naama. He pays 2 Shekel for every chocolate ball.

Little by little, the children in the neighborhood heard about the tasty chocolate balls that Naama makes. They too came to buy chocolate balls [*point*].

Now all the children are in front of Naama, and they all want to buy chocolate balls from her. Will the price of chocolate balls go up, or down, or will it stay the same?

Hints

1. If there remains only one chocolate ball, and all the children cry: “I want it, I want it!”, whom will Naama give it to?
2. If one chocolate ball is left, and all the children want to buy it, will Naama be able to ask 5 shekel for it?
3. If Yoav decides that he is willing to pay 5 shekel for the ball, will other children offer more money for the ball?

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