

*Building a Market: From Personal to Impersonal Exchange**

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I. Introduction

Adam Smith identified two key components in the wealth creation process of human societies: exchange and specialization. Voluntary exchange among individuals is a positive sum activity in and of itself, simply because no individual would voluntarily engage in a transaction if he did not believe that there was something to be gained from doing so. However, when exchange occurs between individuals who have specialized in those activities in which they have a particular comparative advantage, it becomes possible to create immense wealth. Despite the long years of acceptance enjoyed by this truism, relatively little is understood about the underlying process by which people build exchange systems and discover comparative advantage. In *The Wealth of Nations*, Adam Smith observes that the extent of the market determines the degree to which people can specialize and thus create wealth (Smith, III, 26). But what are the social mainsprings that give rise to the market?

Personal, social exchange among kin and neighbors long precedes the advent of impersonal market exchange. In the form of reciprocal trading of favors, personal exchange is a highly visible form of cooperation that depends on explicit trust. The cooperation and trust among individuals that initiates and sustains impersonal market exchange, however, is implicit and not readily observable. Both personal and impersonal exchange are founded on a system of values that are largely unspoken. These ‘guides to action’ promote cooperative behavior by providing a common frame of reference that individuals rely on to support exchange in a variety of forms (see Zak chapter). Insights from research on nonhuman primates indicate that value-driven behavior may be an evolutionary adaptation guided more by emotion than explicit rules and logic (see Brosnan chapter).

In this chapter we report on a pilot experiment wherein we introduce opportunities for the evolution of long-distance trade into a system of interconnected virtual villages. Our experiment allows us to observe values in action through our subjects’ decisions and conversations. We hope to discover how and when the impersonal grows out of the personal.¹ This question is often posed or thought of as one of cooperative versus non-cooperative behavior or personal versus impersonal exchange, but with this laboratory experiment we seek instead to observe the trade-off between engaging in personal and impersonal exchange.

¹ See North (1981, 2005) for discussions of personal and impersonal exchange and how they relate to the development of long-distance trade and the process of economic change.

Our experiment builds upon a paper by Crockett, Smith, and Wilson (2006; hereafter CSW) which examines the efficiency of an economic environment capable of supporting specialization so long as the participants discover and develop some self-organized system of exchange. CSW create an experimental model village producing only two goods that is closed to all external interaction. The participants in the experiment must discover not only their own comparative advantages but also their ability to personally gain from those advantages by exchanging with one another. The authors find that a small majority of subjects either immediately settle into autarky or start to specialize in the good in which they have a comparative advantage. The rest typically follow an erratic development over the course of time, in which most trade occurs between appropriately specialized subjects with complementary comparative advantages. By the end of the experiment, half of the six, two-person economies find and achieve the welfare maximizing competitive equilibrium. What is extraordinary is that once they discover exchange, they almost immediately discover the competitive equilibrium price. The other three pairs remain content to live in autarky in which they tend to achieve efficient home production, but fail to discover the far more efficient exchange equilibrium with another person.

When CSW double the size of the economy to four subjects per session, one out of six sessions discovers and achieves complete specialization. One session remains at autarky, and the remaining four sessions vary from 25% to 75% of the full efficiency at the competitive equilibrium. Even though exchange is discovered quite early in many of the four-person economies, the existence of more potential partners is detrimental to the full development of exchange and specialization with one partner. When CSW again double the size of the economy to eight people per session, not a single session achieves complete specialization: three sessions remain locked in autarky; two achieve 20% of the complete specialization efficiency; and one nearly 60%. This stands in stark contrast to the conventional folk wisdom that the larger the potential market, the more likely it is to produce the competitive outcome. Instead, the authors find that the individuals in these eight-person sessions are remarkably autonomous and hence, perhaps disturbingly so, inefficient. Finding a trading partner is observed to be much more difficult in that only three out of the seven other people in the village are suitable partners with complementary productive advantages. Furthermore, contrary to the authors' expectations, in the

four- and eight-person economies, to the extent that exchange is observed, it is increasingly bilateral over time, i.e. it is not of the multilateral sort generally associated with markets.

In sum, they conclude that there are three stages in learning to achieve the competitive equilibrium in these economies: (1) discovering the ability to exchange, which may require “mind-reading” (inferring intentions from words and actions) and imitation, (2) finding a suitably endowed trading partner with whom one can benefit from exchange through specialization, and (3) building the relationship by increasing specialization over time. However, in these model economies, no *market*, as it is commonly thought of, ever emerges. People either do not trade or remain firmly entrenched in bilateral personal exchange. Even more intriguingly, in the eight-person treatment, where folk wisdom would most strongly predict the creation of a market, the level of exchange and specialization observed is at a relative minimum.

In a subsequent experiment, the authors further explore (2) and (3) by gradually building the eight-person economies from smaller groups. In particular, CSW begin each forty-period session with four two-person economies, merge these into two four-person economies after twenty periods, and finally merge these into one eight-person economy after thirty periods. This design significantly reduces the transaction/search costs of finding a suitable trading partner. Also, the gradual growth of the size of the economy introduces new potential trading partners who, having had the opportunity to discover their own comparative advantage, and being in the process of increasing their rate of specialization, could conceivably compete with the other participants as potential trading partners. Lastly, if individuals have not discovered trade, this allows them to imitate, or be taught, the innovations of others in exchange and specialization.

Full specialization, and thus, full efficiency often occurs in these economies, but all the exchange is still bilateral and fundamentally personal. It is the objective of the new experiment we report here, to attempt to introduce new possibilities for the development of more market-like exchange.

II. Experimental Design

Our experimental world consists of twelve subjects, four of whom are in each of three virtual villages within the world. There are a total of three goods available for consumption in the world, but each village is capable of producing only two of the three. For simplicity’s sake, we call the goods *red*, *blue*, and *pink*. There is a *red-blue* village, a *blue-pink* village, and a *pink-*

red village. Within each village, there are two types of people, producers and merchants. Producers are capable of producing twice as much of each good as merchants, but merchants have the additional ability to travel to a secondary area that remains unseen to the producers where they can trade with merchants from the other two villages. These two types are further divided into odds and evens. To prevent this description from becoming too muddled, we will discuss this in the context of the *red-blue* village and then extrapolate to the other villages.

In the *red-blue* village, each subject prefers to consume red and blue in strict complementary proportions. Specifically, for each unit of blue, odds must consume exactly 3 units of red to earn 3 cents, and evens must consume 2 units of blue for each unit of red to earn 2 cents. Furthermore, if the merchants from this world are able to acquire the third good, pink, the consumption of each unit of pink acts as a multiplier on that individual’s earnings from consuming red and blue. Table 1 below shows the value of the multiplier for each unit of pink consumed.

Table 1. Multiplier for the Third Good (Pink)

# of Pinks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Multiplier	1	1.21	1.41	1.57	1.7	1.82	1.92	2.01	2.1	2.17	2.24	2.31	2.37	2.43	2.48	2.53
# of Pinks	17	18	19	20	21	22	23	24	≥25							
Multiplier	2.58	2.62	2.66	2.7	2.74	2.78	2.82	2.85	2.88							

This same pattern is followed in the other villages; odds always need a 3 to 1 ratio of the first good in their village’s name, and evens always need a 2 to 1 ratio of the second good. Consumption of the third good always acts as a multiplier with the same value across all villages. In addition to their differences in consumption preferences, odds and evens also differ in their production functions. Each person in each village is given a 10-second production period at the beginning of each day. Using a scroll-wheel at the top of their screens, the subjects can allocate a certain percentage of that time to the production of each of the two goods available in their village. Again, to give a concrete example, we will stick to the *red-blue* village and extrapolate from there to the other villages. Table 2 below summarizes the production tables for each type in the *red-blue* village at five percent intervals, i.e., 50% indicates 5 seconds dedicated to producing blue and 5 seconds to producing red.

As mentioned above, producers and merchants also have differences in their production functions. Producers can produce exactly twice as much of each good as can merchants. In

individual autarky, odd (even) producers who wish to maximize their earnings should optimally spend 56% (51%) of their time producing red, thus producing and consuming 30 (13) reds and

Table 2. Production Functions for Producers

Odds				Evens			
Blue %	Red %	Blue	Red	Blue %	Red %	Blue	Red
0%	100%	0	130	0%	100%	0	25
5%	95%	1	114	5%	95%	0	24
10%	90%	2	100	10%	90%	1	23
15%	85%	3	87	15%	85%	2	22
20%	80%	5	74	20%	80%	4	20
25%	75%	6	63	25%	75%	7	19
30%	70%	7	53	30%	70%	10	18
35%	65%	8	44	35%	65%	13	16
40%	60%	9	36	40%	60%	18	15
45%	55%	10	29	45%	55%	22	14
50%	50%	11	23	50%	50%	28	13
55%	45%	12	18	55%	45%	33	11
60%	40%	14	13	60%	40%	40	10
65%	35%	15	9	65%	35%	46	9
70%	30%	16	6	70%	30%	54	8
75%	25%	17	4	75%	25%	62	6
80%	20%	18	2	80%	20%	70	5
85%	15%	19	1	85%	15%	79	4
90%	10%	20	0	90%	10%	89	3
95%	5%	21	0	95%	5%	99	1
100%	0%	23	0	100%	0%	110	0

10 (26) blues, and earning 30 (26) cents each period. Spending the same amount of time producing each good, odd (even) merchants will earn a total of 15 (12) cents.²

Without inter-village trade, that is, with internal trade but without the importation of pink, the competitive equilibrium brings significantly higher earnings than is available in home-production autarky. The odd producers specialize completely in the production of the red good, producing 130 units by scrolling their production-time wheel to 100%, while the even producers specialize in the blue good, producing 110 units. The competitive price of a blue unit is 4/3 of a red unit, and after exchanging at this price, the odd producer consumes 90 red and 30 blue, while the even producer consumes 40 red and 80 blue. Following CSW we chose these parameters so

² Based on the production functions described it would seem that even merchants should earn 13 cents, but because their consumption preferences require that they consume a 2 to 1 ratio, one blue is wasted each turn.

that the competitive profits (90 cents for odd producers, 80 cents for even producers) are roughly three times greater than autarky profits. Remember that the odd and even merchants, in this situation, trade with one another at the same prices but will earn exactly one-half the amount earned by producers.

Finally, at the competitive equilibrium with inter-village trade, both producers and merchants will remain fully specialized in their production, but they use a portion of that production to purchase the third good from other producers and merchants in the other villages. Since the ratio of each good to every other good in the world is exactly 1 to 1, the competitive price of each good in terms of each other good in the inter-village arena is 1. Odd (even) producers trade with their counterpart within their own village in order to consume 72 (32) reds and 24 (64) blues; they take the remaining 26 reds (22 blues) and give them to a merchant to exchange for an equal number of pinks from of the other villages. Then they consume those pinks to achieve maximum earnings of 208 (178) cents. Because of the nature of the multiplier, the earnings of the merchants in competitive equilibrium will not be exactly half of the earnings of the producers; rather the odd merchant earn 85 cents and the even merchant earn 72 cents. The other villages mirror this with their own respective goods. Thus, the equilibrium total earnings in each village are 543 cents per period.

The subjects were presented the interface displayed in Figure 1. Each subject owns both a house and a field, but one-half of the subjects in each village, the merchants, own a bucket. The house displays what will be consumed at the end of a period and the field displays what is produced during the production period. The bucket displays the goods that the merchant can carry with him when he goes to the travel screen. The total quantity of each good contained within the house, field, or bucket is displayed on the icon itself at all times. However, to view a moveable icon of each good, the subjects must click on their field, house, or bucket. This will highlight that icon and make all the goods contained within visible in the upper-left section of the screen.

The experimental session takes place over a series of “days”; each day is divided into two phases, A and B. This experiment lasted for 34 of these days. Phase A is the 10-second production period during which each subject produces goods in his field using the scroll-wheel described above. This scroll-wheel can be adjusted at any time during the experiment to allocate

production time for the next day. As production occurs, icons representing each of the goods will appear in the subject's field.

Phase B is the 120-second exchange and consumption phase during which these icons can be dragged and dropped into any of the houses, fields, or buckets on the screen. A subject's own house and field are green, while those of others are colored gray. To earn cash, the subjects consume by dragging and dropping the red, blue, and pink icons into their houses. Anything not in a house at the end of a day and any goods not consumed in the proportions specified above are wasted, that is, unconsumed goods do not rollover to the next day. In contrast to CSW, our subjects are aware that they can move goods to whomever they want, but they are not told that they ought to trade. At any time during the experiment, subjects may communicate with the other people in their village in a central chat room. They can discuss whatever they want so long as they do not use inappropriate language, discuss side payments, or make threats. Every 7th day is a 130-second rest period, during which no production or consumption takes place, but subjects

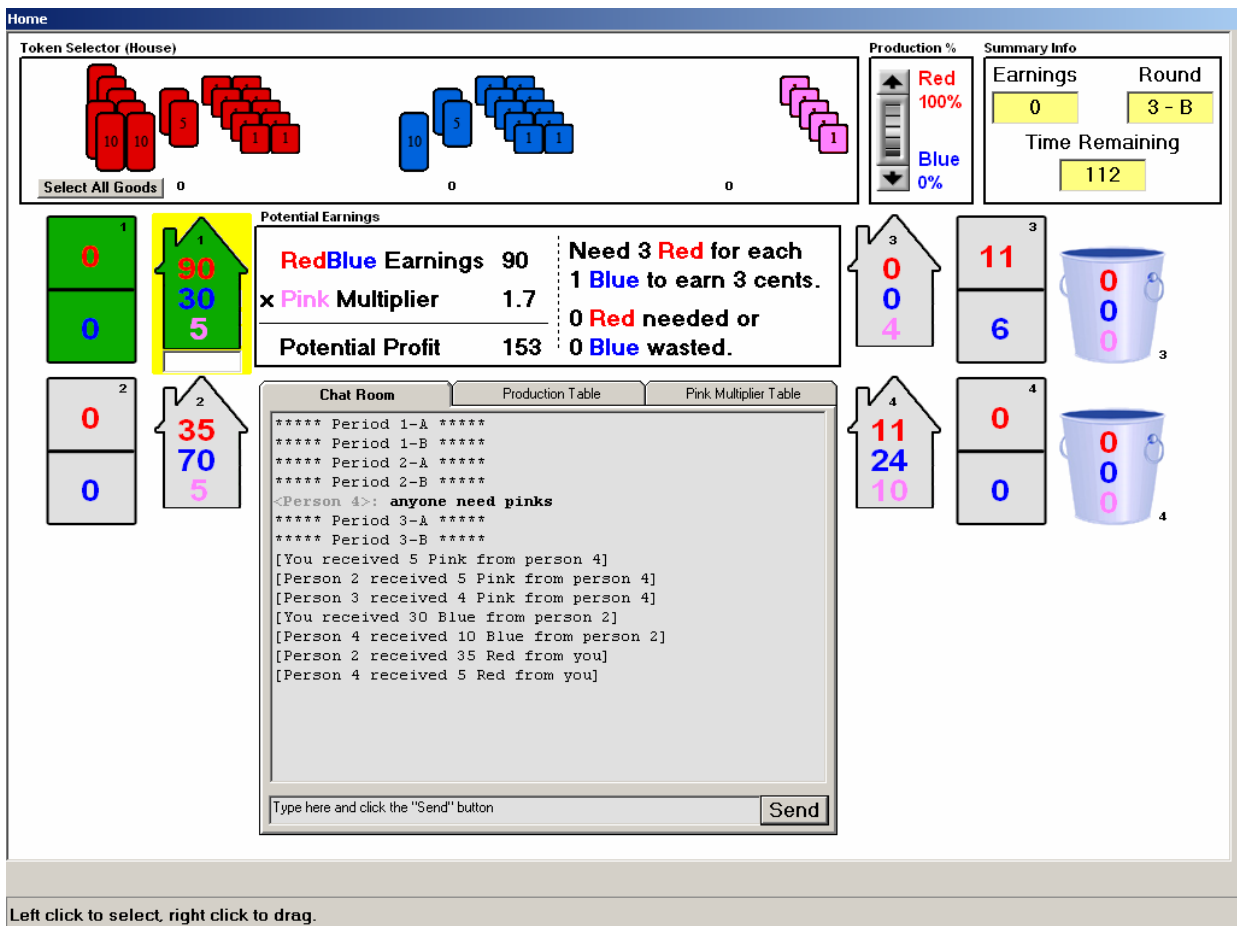


Figure 1. Red-Blue Village Interface

may still use the chat rooms at their leisure. Also, there is a space beneath each house where the owner may leave a one-line message that is always visible to other villagers.

In addition to the abilities mentioned above, merchants can click on a button labeled “travel” on the right side of their screen at any time to move to a secondary area (shown in Figure 2) with two more chat rooms. When they travel, their buckets, and anything contained in those buckets, travel with them. Only on this screen can individuals from the different villages interact, and this is where inter-village trade, if it is to happen, must take place. Any goods acquired on the travel screen must be taken back to the villages and placed in a house to be consumed. Anything left on the travel screen at the end of a day is wasted.

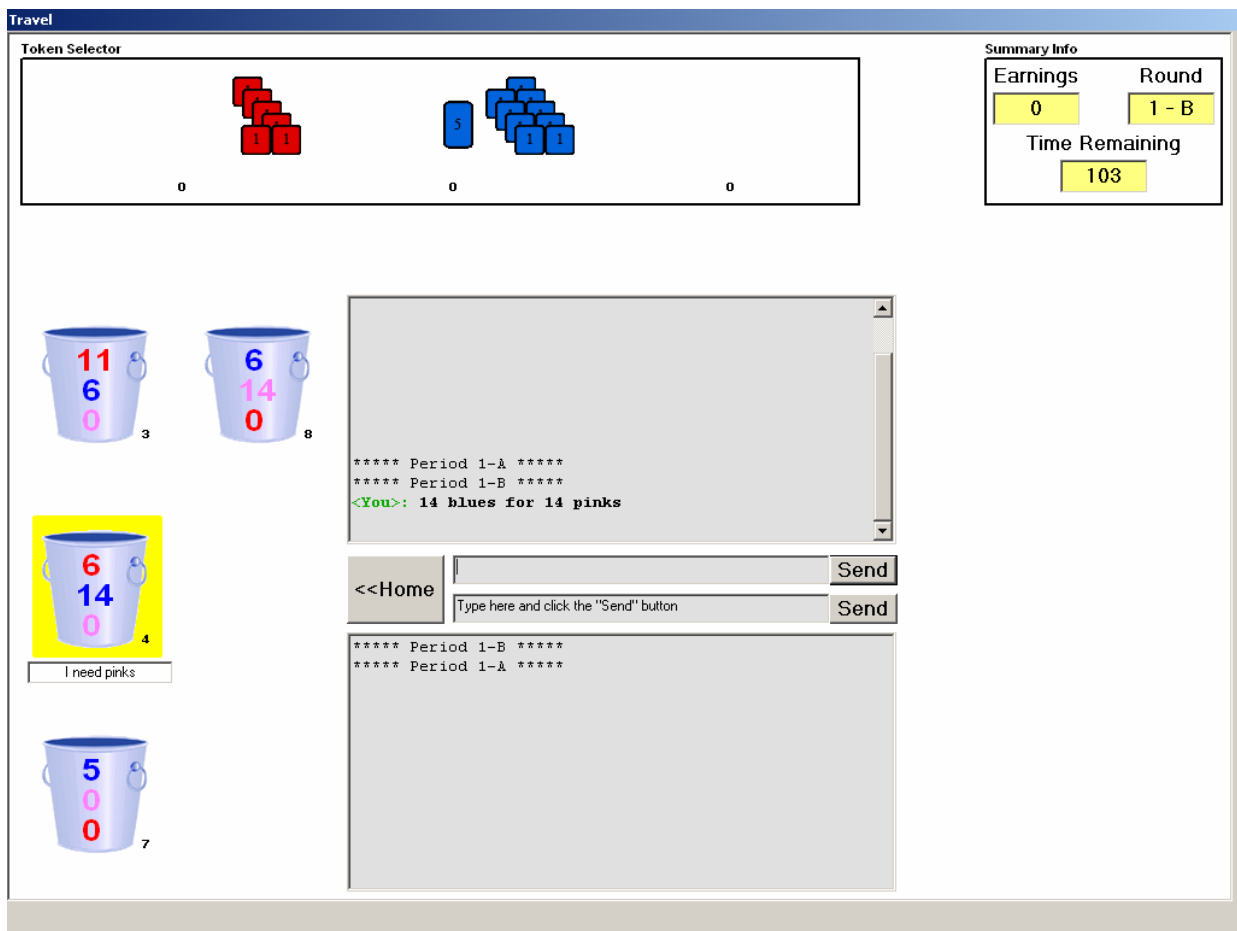


Figure 2. Merchant Area Interface

Our subjects were 12 George Mason University undergraduates, 10 of whom were recruited randomly from the 180 subjects in CSW and 2 of whom were recruited randomly from the student body as a whole. They interacted via visually isolated computer terminals and read

self-paced instructions prior to the beginning of the first period. In addition to \$5 for simply showing up on time, they received cash payments for their earnings in the experiment. The average total earnings in the session were \$18.55, ranging from \$5.75 to \$46.00.

III. Results

A. Chat Room Transcripts

The chief objective of this experiment is to introduce opportunities for long-distance trade and observe the extent to which, if any, impersonal market exchange grows out of the personal exchange. We begin by discussing the chat transcripts of the individual villages and the secondary merchant area. These transcripts of real time conversations reveal the qualitative attitudes of the participants toward the people with whom they interact through their choice of words.

We first observe that there is *absolutely no conversation* among the merchants during any of the four rest days (days 7, 14, 21, and 28). During these rest days all of the merchants remain at home in their village conversing with their producers as the following example from day 14 illustrates. Producers are identified as Persons 1, 2, 5, 6, 9, and 10 and Persons 3, 4, 7, 8, 11, and 12.

Red-Blue Village

***** Day 14*****

Person 1: ok

4: 55 blues

1: i can make 130 reds

4: usually

1: which is what i've been doing

2: correction, 110 blues

1: ah, right

1: wait

2: ok, what about 3 and 4?

3: what r these pinks for?

1: i can actually make 130 red

4: pinks are a multiplier

2: ok so $110 + 55 = 165$ blues

1: the pinks multiply profits

4: yea

2: 3, how many reds can you make?

3: 70

3: how can i increase it

2: ok so $70 + 130 = 200$ red

1: the production scroller on the top

2: me and 4 need more blues than red

4: right

2: 1 and 3 need more red than blue

3: two of us can make more reds and 2 can amke more blues

4: we need extra blues to trade for pinks also

1: what should we change for next round?

3: then we can excahnge if required

2: 1 and 3 maximize reds

1: i'm alrady at red producing max

2: me and 4 will max blues

1: okay

2: ok

1: #3 you got it?

3: ok

Blue-Pink Village

***** Day 14*****

5: i'm still looking for pinks

5: OK. Is anyone good at producing pink?

5: I can produce a lot of blue if we want to trade, that way.

6: are we allowed to ask what earnings we all have?

8: i am .. sometimes

7: 194

5: I'm not sure

7: oh I dont know

6: ok well dont say incase we arent
 7: can anyone else travel
 8: i can
 6: no
 5: you know. I was wondering about that
 7: what is it for
 6: does anyone have any red yet?
 7: nope
 5: I haven't seen any red at all
 8: i think you can trade with other groups..
 but im not really sure
 7: I bet we have to ravel to get red
 8: the people in the travel thing have red
 7: oh k makes sense
 6: i have a 1 next to where it says xred
 multiplier
 7: me too
 5: yeah me too
 7: and it stinks

Pink-Red Village
 ***** Day 14*****
 9: lemme get re
 9: man

11: 10 where you at
 10: yo
 11: who you know is the business man
 10: 10
 11: nah i get those great deals
 11: those meal deals
 10: if i had that bucket i wouldve bankrupted
 every other chat room
 11: produce something
 11: doing all that typing
 11: produce something
 11: do something
 10: naw
 10: im chillin
 9: yeah i wish i had that bucket
 11: you wouldnt know what to do with it
 9: i would do better then y'all 2
 11: yall probably just wear it on your head
 10: i come back with at least 1 million blue
 11: and get no deals
 11: im helping everyone come up
 11: when i eat everyone eat
 11: you know who said
 10: oh for real

Notice the personal and casual nature of the conversations among the producers and merchants. In the *red-blue* village, the discussion is about how “we need extra blues to trade for pinks” and “what should we change for next round?” This indicates a rather obvious sense of community among the producers and merchants within a village. The village members spend their rest day coordinating their production decisions for explicit mutual benefit.

Out of this sense of community they develop a narrative to frame their experience. The tone of the conversation in the *pink-red* village reveals out-group and in-group attitudes among the village members. Person 10 muses, “if i had that bucket i would’ve bankrupted every other chat room”, and after some playful exchanges, Person 11 adds the in-group statements that “i’m helping everyone come up” and “when i eat everyone eat”. Each villager contextualizes his experience (some frame the experiment as a contest, others as a cooperative venture) and this context with all its implicit values defines the limits of his behavior (see Casebeer chapter).

The nature of the exchanges within this village is also very similar to the CSW economies that build four two-person economies into one eight-person group. In their six sessions, the word “give” is used on average 40 times per session, or once a period. Similarly, within our three four-person villages, “give” is used 59 times to explicitly invoke the personal nature of giving in order to receive.

A flavor of the personal tone of the conversations is found in the transcripts for day 15 for the *red-blue* and *pink-red* villages:

Red-Blue Village

***** Day 15*****
[Person 4 receives 20 Red from person 1.]
2: ok so lets to 25 reds and 50 blues for me and 4
[Person 2 received 20 Red from person 1.]
3: i made only 61 this time on 100% reds
2: and 25 blues and 75 red for 1 and 3
1: oh, ok
2: does that work out?
3: ok
1: right, but we now only need to decide, of those red to you and 4, how many i give
1: and how many #3 gives
[Person 1 received 30 Blue from person 2.]
4: extra blues?
2: hmm
4: 2 i need the extras
2: how about 20 blues and 40 reds for me and 4
[Person 4 received 40 Blue from person 2.]
1: work your bucket magic
1: are you talking to me?
1: #2
2: just throwing out some ideas
2: actually 20 reds and 40 blues for me and 4
1: oh ok, i was just wondering

1: right
2: 20 blues and 60 red for 1 and 3
[Person 1 received 5 Pink from person 4.]
[Person 4 received 5 Pink from person 4.]
[Person 2 received 5 Pink from person 4.]

Pink-Red Village

***** Day 15 *****
9: 10 u got some reds for me?
[Person 9 received 40 Red from person 10.]
11: yall need to gimme some pinks
9: wow not too many
11: 30 reds
9: give me more then 2 blues
[Person 11 received 30 Red from person 10.]
9: and u can have mad pinks
9: pinks*
12: some1 gimme pinks and i'll get blues
[Person 11 received 20 Pink from person 9.]
10: let me get 20 pink
[Person 10 received 15 Pink from person 9]
12: 9 gimme some pinks
[Person 12 received 15 Pink from person 9.]
[Person 12 received 2 Blue from person 11.]
[Person 10 received 2 Blue from person 11.]
[Person 9 received 1 Blue from person 11.]

Notice all of the unspoken trust in the *red-blue* village among the two producers, Persons 1 and 2, and the merchant, Person 4. Person 1, without any prodding or discussion, begins the day by immediately moving 20 red to Person 4, and upon return from the merchant area, Person 4 moves 5 pink to Person 1. There is no discussion of how to allocate the pinks that Person 4 brings back from the merchant area. Persons 1, 2, and 4 all contribute units for trade in the merchant world and upon Person 4's return, each promptly receives 5 pink, despite the different amounts of blue and red that each contributed to the inter-village trade. Similarly, in the *pink-red* village, Person 11 solicits pinks and upon return moves blue to Persons 9, 10, and 12. Again, there is no discussion of assurances of delivering blue, and there is no bargaining for the third good. It is simply given to the village members.

The discussion in the merchant area, however, differs quite markedly in tone and substance from the village conversations, as the transcript in day 15 illustrates:

Merchant Area

***** Day 15 *****

3: any pinks for reds

8: yea i got it

3: how many

7: I need 5 redsa

8: i have 12.. u want em all

7: ok

7: yes

3: pinks please

7: person 8 what do you want

3: can i get some pinks

8: red

12: 7 pinks for 7 blues?

8: 3..ill give u 12 pink for 12 red

4: got pinks for blues

11: 20 20

3: person 11 can i get some pinks for 10 reds

11: yo 4

7: who has reds

11: 20/20

12: 7 pinks for 7 blues 4?

8: person 3.. i can give u 12 pinks

First, note that the use of “we” is plainly missing in the transcript. There is no discussion of how *we* coordinate production and or how *we* allocate units among the villagers. The merchants in this chat room appear to be only self-interested: “I need 5 reds.” “i have 12..u want em all.” “Person 11 can I get some pinks for 10 reds”. And they are less personal as they attempt to get each other’s attention (“yo 4”). In sum, the merchant area transcripts clearly lack idle chitchat and are filled with price quotes: “20/20” and “7 pinks for 7 blues”. The merchants arrive at the area, make their “deals”, and return to their village community. The cooperation here, as for example in “20/20”, is implicit—when *I* give 20 pinks, *you* will give 20 blues, and you and I will each be better off. There is no discussion of how the consumption of the goods generates earnings, nor is it visible how *we* will be better off from the transaction.

B. Production and Consumption

Figure 3 displays the average flows of goods between producers and merchants within each village and between the villages over the last 6 days. The volume of trade is clearly largest between the *red-blue* and *pink-red* villages, and not surprisingly, these are the two richest villages. The price of blue in terms of pink and the price of pink in terms of red are both 1; however, the price of blue in terms of red is about 2.6. We explain this in terms of the relative scarcity of blue. The *blue-pink* village never manages to specialize, but when its merchants begin to trade in the inter-village arena, the other villages are prepared to buy their goods, even at a relatively high price. The higher price creates an incentive for the *blue-pink* village to specialize to a larger extent. Yet, by the end of the experiment, the opportunities are not exploited.

The distribution within the villages is nowhere near identical. In the *red-blue* village, a single producer manages to fully specialize and consume red and blue at a level equivalent to the competitive equilibrium without inter-village trade, *and* he is able to acquire pink on top of that. Bringing in a total of \$46, he is far and away the highest earner in the experiment. Everyone else in his village specializes as well, and though they allow him a disproportionate share of the wealth, each earns at least \$20.

Yet, in the *pink-red* village, a single merchant manages to monopolize the inter-village trade for both of his producers, and as a result, he is the highest earner in that village, making nearly \$34. The other merchant in this village is left to flounder essentially alone; the wealthy merchant always gives him a share of the imported third good, but he fails to trade effectively with the other members of his village. He is the experiment's second-lowest earner.

The third world (pun intended), the *blue-pink* village, fails both to specialize internally and to engage effectively in inter-village trade. No one in this village earns more than \$14.

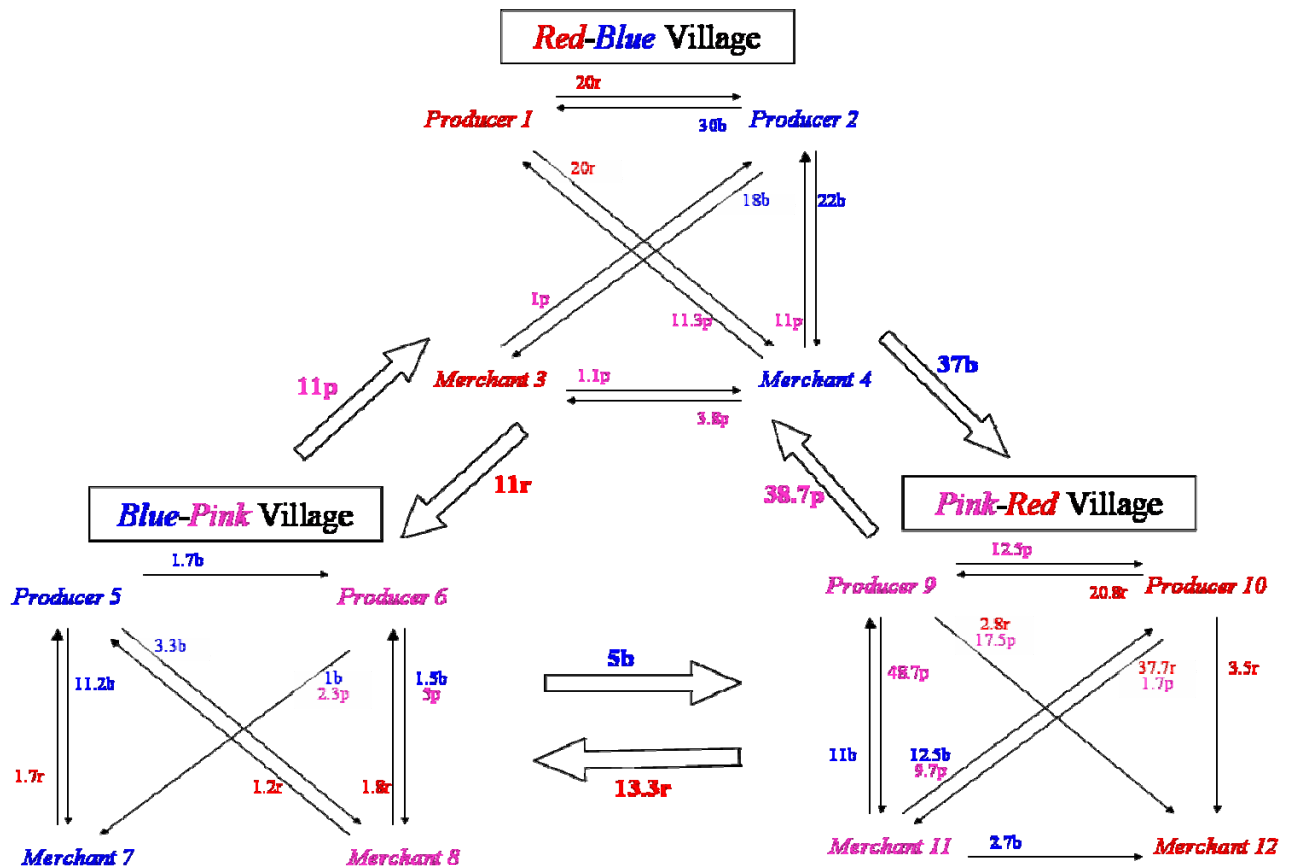


Figure 3. Flow of Exchanges Within and Between Villages

Interestingly, despite the fact that they witness trade in the other goods in quantities that are almost unheard of in their village, neither of the merchants from this village ever asks members of the other villages how they have created so many goods to trade. Thus, no information about specialization is ever exchanged, and the members of the *blue-pink* village wallow in (relative) poverty.

In terms of total earnings, the benefits of all the trade in this experiment are distributed nearly evenly between producers and merchants, despite the fact that they are so unevenly distributed among the villages. If trade had occurred relative to their ability to produce, as described in section II above, the producers would have received two-thirds of the profits while the merchants would have received one-third. The explanation for the general equality is not, however, that the participants consciously smooth consumption. Rather, as they explore new ways of organizing consumption and production, occasionally they hit on something that seems to work, and behavioral inertia sets in. Thus patterns of production and consumption that are not the *best* possible arrangement for all involved, but are satisfactory, appear to become more or less set in stone. That is not to say that all dynamism is wiped out of the economies; instead, change is slow-moving and incremental. Figure 4 below displays the percentage of total earnings captured by both producers and merchants in each village.

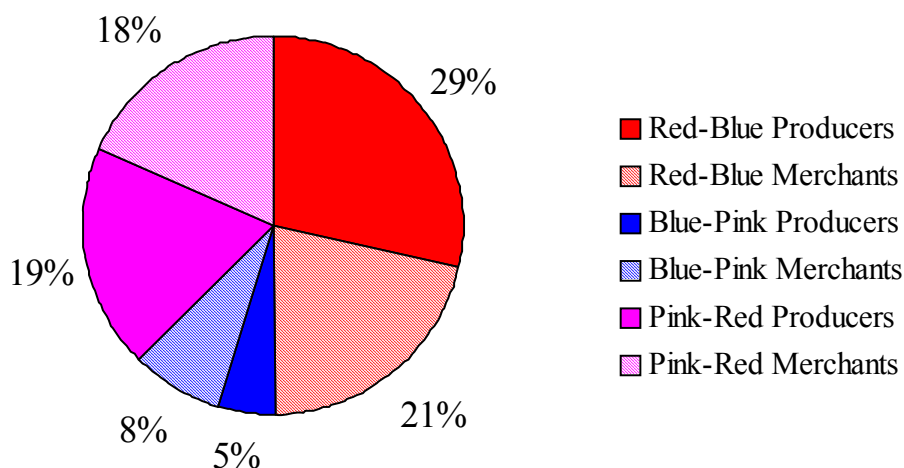


Figure 4. Distribution of Earnings

When we were designing this experiment, we focused some attention on an issue raised by Thomas Sowell in his book *Race and Culture* and also by Friedrich Hayek in *The Fatal*

Conceit. Both argue that, historically, because the value created by a merchant (who only transfers goods across time and place, and does not, himself, actually produce anything) is invisible, people who take on the merchant role tend to be abused or discriminated against when they receive their profits. Such profits appear unjust to those who do not personally experience, and thus fail to consider, the importance of the role of transporter in matching producers with consumers. As we debated whether merchants would take a margin for themselves, we considered the possibility that this might inspire the ire of their fellow villagers. Nowhere in the transcripts is this trend apparent; the personal nature of the exchange among the members of the individual villages appears to mitigate any such behavior. Merchants may take their cut, but the role they play in their villages is closer to that of a fellow villager returning from a successful hunt than that of a broker fulfilling orders for clients at the Chicago Mercantile Exchange.

C. Efficiency

Figure 5 reports that the overall efficiency in our economy follows the pattern of growth of the economies reported in CSW. We measure efficiency as the rate of profits realized by the villagers relative to the maximum profits calculated above, counting the profit with each individual at autarky as the baseline (0%). The growth over the first 6 days is fueled by the participants learning to optimize their autarkic decisions and specialize within the village. Following the first rest day, inter-village trade takes off and the *red-blue* and *pink-red* villages become increasingly specialized. This growth continues and then stabilizes after day 28, hovering around 58% of maximum possible gains from trade.

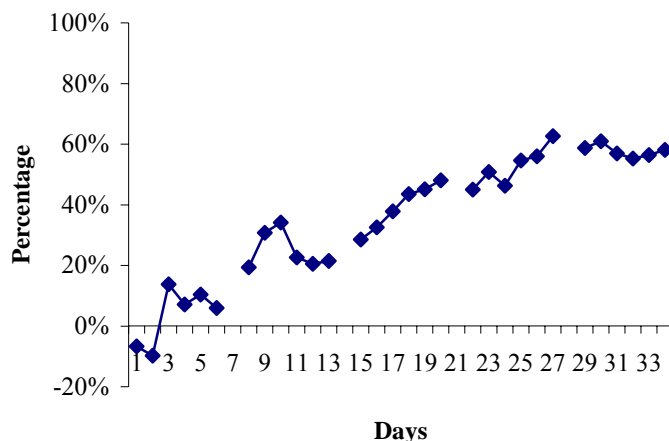


Figure 5. Overall Efficiency Relative to Complete Autarky

Figure 6 explicates the source of the inefficiency. This figure plots the efficiency of each village relative to a baseline in which each subject is fully specialized but without any inter-village trade. Hence, the near 100% efficiency of the *red-blue* village indicates that this village is fully specialized and extracting nearly all of the possible gains from trading for pink from the other two villages. Every village starts out with negative (below baseline) efficiency in the first six-period block; two start to break erratically into positive efficiency in the second six-block period; and thereafter create wealth well above the levels achievable in the village-only economy. The stagnating -50% efficiency of the *blue-pink* village reflects the dearth of specialization in that village combined with a minimal level of inter-village trade (see Figure 3 above). The low blue production in the *blue-pink* village limits the extent to which the *red-pink* village can increase their welfare.

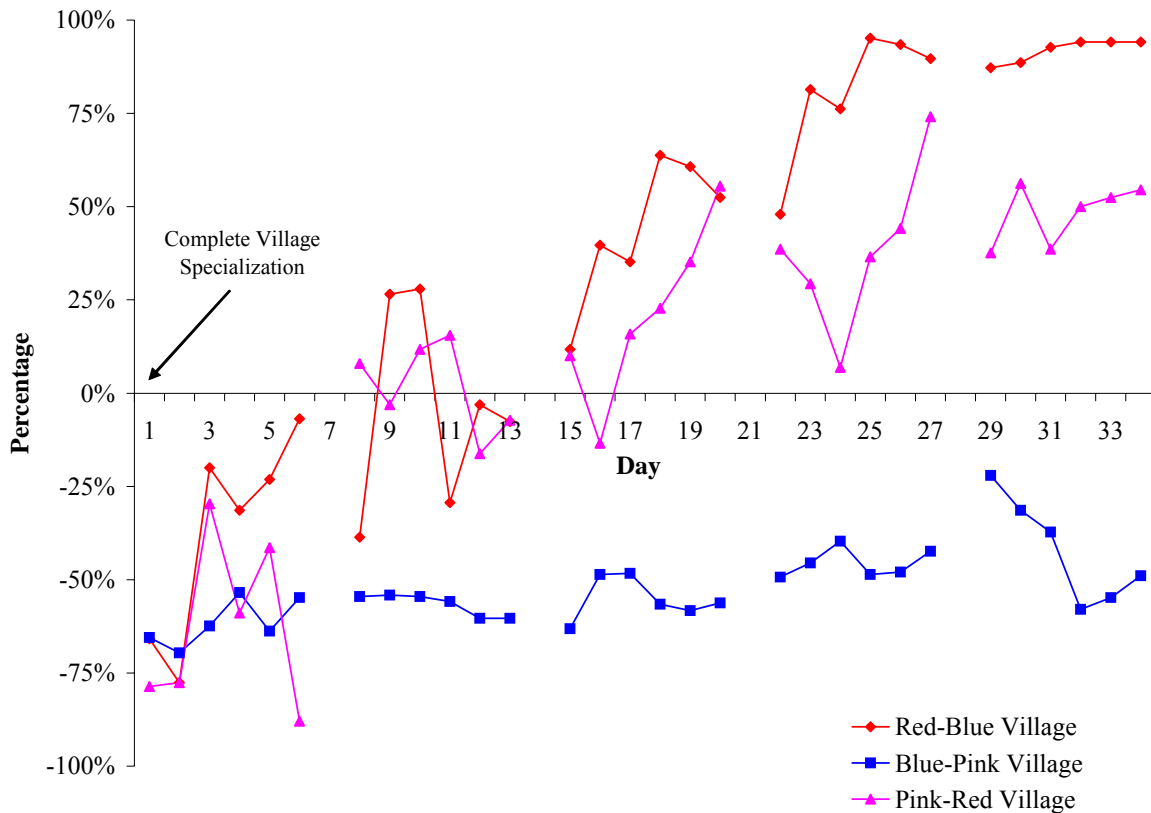


Figure 6. Efficiency of Inter-Village Trade Relative to Isolated but Fully Specialized Village

IV. Conclusion

Since the 18th century we have known that exchange and knowledge specialization create wealth and that the latter is, in turn, limited by the extent of markets. The mystery is how

impersonal market exchange and long distance trade grew out of highly localized forms of personal exchange that fostered only local specialization in small communities. An earlier experiment examined the development of exchange and specialization in an austere virtual village community in which the participants had to discover their comparative advantage in production and also discover and create their own forms of exchange, with explicit instruction only provided as to how they can produce and consume. In that environment, exchange and specialization did emerge, but to a highly variable degree in the form of “giving” blue for red in strictly bilateral voluntary pairing by individuals. Many individuals fail to break out of home production and consumption, and no multilateral exchange, which we associate with the emergence of markets, was observed.

In this paper we report our first session in which we introduce merchants into each of three villages, expand the commodity space from two to three items, and allow for the possible development of long distance trade between three independent virtual villages. As in the earlier study, a chat room allows messages to be exchanged locally within each village, and also locally in the area to which merchants travel. Our primary findings can be summarized as follows:

- We observe no conversation among the merchants during any of the four rest days between the six-period production/consumption sequences in a session, although such consolidating discussion remains active in the villages.
- The personal and casual nature of the conversations among both the producers and merchants is evident; e.g., in the *red-blue* village, the discussion is about how “we need extra blues for pinks.” Hence, the development of an obvious sense of community among the producers and merchants *within* a village.
- Moreover, the tone of the conversation sometimes reveals out-group and in-group attitudes among the village members toward others.
- As in the initiating study, within our three four-person villages, the word “give” is used repeatedly, explicitly invoking the perceived personal nature of giving in order to receive.
- Trust in exchange within the villages is evident but unspoken.
- The use of the pronoun “we” is plainly missing in the merchant chat room. There is no mention of how “we” coordinate production and or how “we” allocate units

among the villagers. The emphasis is on more plainly self-interested expressions: “I need 5 reds” and “i have 12..u want em all.”

- In terms of total earnings, the benefits of all the trade in this experiment are distributed nearly evenly between producers and merchants. The explanation for this result is not that the participants are consciously smoothing their consumption. Rather, as each village explores new consumption and production arrangements and hits upon something that increases their earnings, they stick with what works.
- The fortune amassed by each of the three villages is highly variable. The *red-blue* village achieves nearly 100% efficiency, indicating that it is fully specialized and extracting nearly all of the possible gains from trading for pink from the other two villages. Every village starts out with negative efficiency in the first six-period block; two villages start to break erratically into positive efficiency levels in the second six-block period; and thereafter create wealth well above the levels achievable in a village-only economy. The *blue-pink* village stagnates at 50% *below* the baseline indicating little specialization in that village combined with a minimal level of inter-village trade.

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