Monetary versus In-Kind Exchange: A case of Demonetization

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Abstract: *Demonetization is a dominant feature of transition in Russia and Ukraine. This paper studies a mechanism of decentralized trade and examines possibility of the development of in-kind trade as a consequence of difficulty to trade at the anonymous monetary market. In-kind trade allows to a group of agents, inefficient in production, to overcome the difficulty of direct barter providing them with an instrument which substitutes money.*

Keywords: decentralized trade, search, production inefficiency, in-kind exchange, demonetization.

1. Introduction

Demonetization has become a distinctive feature of transition in Russia and Ukraine. This is a complex phenomenon but commonly it is identified with proliferation of barter. Different estimates show that demonetization in Russia and Ukraine reached unprecedented in economic history levels, the share of non-cash payments in 1998 was 60 percent of total sales in Russia and 50 percent in Ukraine.

The process of demonetization was puzzling. The number of non-cash transactions started to increase in both countries starting from 1994, when inflation was under control, and continued in the following four years in spite of relative macroeconomic stability. Non monetary transactions started to decrease right after the financial crisis in the August of 1998 when both countries had to devaluate strongly their currencies. These stylized facts do not allow us to explain demonetization as a flight from money which commonly occurs in the periods of hyperinflation. In fact there were many Latin American countries which experienced long and repeated periods of hyperinflation, but they did not see demonetization analogous to Russia and Ukraine.

The most well-known and influential explanation of this phenomenon is virtual economy due to Gaddy and Ickes (1998). According to it, the root of the problem was the desire of countries to appear more productive than they really were. The practice of over-reporting of economic results was already very diffuse in the last years of the Soviet Union and it continued in the first decade of transition. Influential groups in economy - government and industrial lobbies - pretended that old manufacturing sector was producing a valuable output while it was not. Keeping in life value-subtracting productions required pulling resources from the value-adding sectors. It was done by means of barter or non-cash transactions which allowed to the inefficient sector to sell its output to the value-adding sector at a higher price.

Barter, seen from this prospect, is definitely a "bad" thing. Old manufacturing sector is not a victim of transition but is its active player. It invests in good relations with authorities (rent-seeking) rather than in restructuring. Virtual economy, however, is subject to critics. One of them is that it does not explain clearly how it is possible that a value-adding sector decides to subsidize an inefficient sector. Furthermore, it does not take in consideration that restructuring option was not realistic for many enterprises anyway. They invested in creation of non-cash chains but it was the only way to survive. Being some production always better than no production at all, barter then is not only a "bad" thing.

Among other explanations of demonetization there is a lack of liquidity and credit. According to it, the growth of nonmonetary transactions can be explained examining closely the measures which were used for stabilization scope in that countries: sharp tightening of monetary policy and fiscal

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correction. In Russia monetary and fiscal policies were apparently tightened. In the period from 1995 to 1998 the primary deficit was decreasing but consolidated deficit - increasingly composed of interest payments - remained constantly at the level of 6 - 8 per cent of GDP. In the same period the stock of outstanding government treasury bills increased from 4 to 17 per cent of GDP. The recourse of government to the treasury bills seems to be a key factor for the explanation of demonetization.

Firms were facing strong credit squeeze consequence of stabilization programs. They resorted to the increased use of trade credit, but being credit squeeze general, in a short time growth in trade credit resulted in accumulation of arrears. Initially, the firms were possessing more or less the same quantities of overdue payables and receivables which confirms the hypothesis of credit chains. With time the composition of overdue payables and receivables changed, there was seen an increase in the share of overdue payables that firms had versus budget. All this suggests that government was redistributing credit, taking it from banks and giving it to the real sector under the form of toleration of overdue payables. This mechanism was commonly used till the financial crisis in 1998.

In this paper I construct a stylized model of decentralized trade in which agents trade bilaterally and randomly. They run risk of non-trade and of going out of existence. It reproduces the liberalization of trade and prices at the beginning of transition. It is assumed that at the beginning of time one part of economic agents is not efficient in production. In-kind trade begins because inefficient agents find it difficult to trade at monetary market. Once a part of economic agents drop monetary trade, the quantity of money decreases. Economy is demonetized.

The first part of the model is a description of a decentralized trade process, of trade strategies of single agents and of equilibrium condition. In the second part of the model it is assumed that the part of agents are not production efficient. They are not able to produce enough for quid pro qua trade, and in certain conditions efficient agents reject to trade with them. Inefficient agents, being unable to trade at the anonymous monetary market, invest in creation of in-kind mechanism of trade.

2. A Stylized Model

The economy is populated by a large number of agents which can live infinitely if they manage to consume at least once during a period. The total population is normalized to one. Time is discrete. Each period is subdivided in two sub periods with two independent trades: morning and evening.

The economy is modelled from t=1, considered the beginning of transition. At this moment population is composed of agents that lived in the pre-transition time and those who begin their existence at t=1. The main difference between pre-transition and transition is that in the previous time trade was centrally coordinated, in-kind exchange in which money was not necessary and every agent was guaranteed an exchange. With the beginning of transition central coordinator is removed and agents must trade bilaterally according to a pair wise random matching process.

Agents must trade in order to consume, produce and survive. There are many consumption goods traded in this economy, but any given agent can consume only a fraction x of it, with $0<x\leq 1$. This parameter captures the extent to which preferences of agents are differentiated. x equals the proportion of goods that can be consumed by any given agent, and x also equals the proportion of agents that can consume any given good. If a good can be consumed by the agent, then this is his consumption good and by consuming q of it he enjoys u(q) utility, while consuming q of non consumption good he gets utility 0. The smaller is x, the less substitutable are the commodities, the more specialized is economy. It is assumed that agents cannot consume their own output, thus there are always benefits to trade over autarky.

Consumption is the only input for production. For the moment we study the case in which all agents have the same technology which is by consuming q of own consumption good, each of them produces y=q of own production good. In the second part of the model we consider the case in which some agents - a group which lived in the pre-transition time - are endowed with different technology.

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At t=1 all population is divided in two fractions. Fraction μ is composed of agents endowed with one unit of money - buyers. Fraction 1-μ is composed of agents endowed with one unit of own output - sellers. Trade frictions in this economy are such that agents, when buyers, arrive to trade with intensity β_2 of Poisson process, and when sellers they arrive with intensity β_1 of Poisson process, $\beta_1 < \beta_2 \leq 1$.

It is convenient to study a case in which each trade is one-to-one swap. The probability that a buyer meets during a sub period one right seller during equals $(1-\mu)\beta_1 x$. The probability that a seller meets one right buyer during a sub period $\mu\beta_2 x$. At any moment of time agent can be either sellers or buyers.

2.1. Trading Strategies

Since nobody can consume what produces in this economy, agents will benefit from trade. Two types of trade are possible. The first one is barter in which both traders - sellers - find their consumption goods, its probability is x^2. Since both agents benefit from barter, whenever possible, they should barter for a good they want to consume. The second possible trade is good-for-money. After this trade only one agent - buyer - can consume, seller receives money which is useless for consumption. Thus, while barter is undoubtedly traded, it is to be determined whether good-for-money trades are processed.

Let π_0 denote the probability that seller trades goods for money, and let π_1 denote probability that buyer trades money for goods. Let assume that money is used as a medium of exchange, or circulates, if and only if $\pi_0 \pi_1 > 0$. Herewith we describe trading strategies of agents and then verify whether money-for-good or good-for-money trades are processed in equilibrium.

Representative buyer starts morning searching his consumption good. If he meets an agent who has his consumption good, which occurs with probability $(1-\mu)\beta_1 x$ and if both of them want to trade, which occurs with probability π in equilibrium, buyer will consume, produce and switch to the seller1. Otherwise, morning buyer remains buyer in the evening as well. The value function of morning buyer is,

$$rV_b^m = (1-\mu)\beta_1 x\pi[U + V_{s1}^e - V_b^e] + V_b^e \qquad (1)$$

equal to the payoff from trade: utility from consumption plus the value of switching to the evening seller1, V_{s1}^e; plus the value of non trading and remaining buyer in the evening, V_b^e.

In the morning representative seller searches to meet an agent with whom to barter. If he meets him, which occurs with probability $(1-\mu)\beta_1 x^2$, morning seller consumes produces and goes to the evening as a seller1. Differently morning seller may meet a buyer who likes his output. It occurs with probability $\mu\beta_2 x$. If both agents want to trade, which occurs with probability π, then morning seller takes money and switches to the evening buyer. If morning seller does not meet neither of the mentioned agents, he goes to the evening as evening seller2. The value function of the representative morning seller is,

$$rV_s^m = \mu\beta_2 x\pi[V_b^e - V_{s2}^e] + (1-\mu)\beta_1 x^2[U + V_{s1}^e - V_{s2}^e] \qquad (2)$$

The expected value function of the evening buyer is,

$$rV_b^e = (1-\mu)\beta_1 x[U + V_s^m] \qquad (3)$$

which is equal to the payoff from trade: utility from consumption plus the value of living to the next period as morning seller, V_s^m. The payoff from non trade in the evening is not considered because it is equal to zero. If agents that find themselves to be evening buyers, do not trade in the evening, they die.

There are two types of evening sellers. Evening sellers1 are those i) who were sellers in the morning and have already bartered; and ii) those who were morning buyers and already traded. Such agents

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in the evening may barter or sell output for money or may not trade at all. In all of these cases they live to the next period. Their expected value function is,

$$rV_{s1}^{e} = (1-\mu)\beta_1 x^2 U + \mu\beta_2 x\pi[V_b^m - V_s^m] + V_s^m \quad (4)$$

Evening sellers2 are those agents who were sellers in the morning and did not trade at that time. They have a chance to live to the next period if they barter in the evening,

$$rV_{s2}^{e} = (1-\mu)\beta_1 x^2 [U + V_s^m] \quad (5)$$

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