Real Asset Backed Coins*

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1 Introduction

Productive communities in developing economies face severe problems along the entire productive value chain. Unbanked small producers lack access to formal credit markets, face high costs of financing, often find it extremely difficult to participate in the factors market due to high contractual costs, and have limited access to final consumers as they cannot participate in existing distribution channels. Generally, the root of these problems lays in the asymmetric information that prevails between the small producers and the rest of participants in the value chain or ecosystem. In the presence of these problems an underinvestment problem arises, which results in a lower overall society's output.

We develop a theoretical model that integrates a digital ecosystem, in the context of a Community Value Chain (CVC), with an Real Asset-Backed Coin (RABC), often referred as an asset-backed community token. This token facilitates all payments by and to producers and providers, enhances credit access, and therefore alleviates the underinvestment phenomenon. This results in an increase in community production and an overall benefitial impact in the economy, a reflection of the community-induced cooperation that prevails in the CVC. In addition, the model shows that the existence of an asset-backed token supported by digital plataforms for information distribution and resource coordination (logistics' management) - a Clearing House - results in participants having a more effective monitoring of contractual obligations.

The paper is developed as follows. In section (2), we present the first part of the model and show that in a traditional financial market, production does not take place when producers lack the resources to costly signal their type. This is a standard result in the spirit of Leland and Pyle [1977]. In section (3), we extend our basic model introducing a Real Asset-Backed Coin in a CVC and discuss the roles of its participants. In section (4), we discuss the payoffs to the CVC particpants and analyze their participation constrains. Section (5) concludes the paper.

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2 A model of costly signaling

We begin with a simple game between a miner in need of external funding and a potential investor. The investor in this game can not observe if the miner owns a high-potential mine or a low-potential mine, and thus this is a game of incomplete information. But, following a large tradition starting with Harsanyi [1967], we turn this into a dynamic game of imperfect information by introducing a new player, Nature, whose action is to assign a type to miner type and is an action hidden from the investor. The sequences of moves begins with Nature choosing randomly the type of the miner, then the miner learns her type and take action by sending a signal to the uninformed investor. Based upon the signal he observes, the investor choose whether to invest or not in this mine. We solve this game by requiring, first, that any equilibrium must be a perfect Bayesian equilibrium [1] and later we find conditions on the model primitives such that the signal sent by the miner perfectly separate both types of miners. [2]

The main result is that a separating equilibrium where the investor can tell based on the signal which mines are profitable, which are not, and invests exclusively on the latter, is possible and is possible to make it the unique equilibrium of this game, provided that, as is common in signaling games, the miner has enough resources to send a sufficiently costly signal.

Without the possibility of sending a signal that cost something to the sender, there is no production in any mine and the markets shuts down.

2.1 Mines, reserves and investment

There is a miner/entrepreneur owner of a silver mine. The mine could be sold, unexploited, at at price V_r or it could be exploited to produce silver. This owner has some resources, K to invest in her own mine (say, to implement improved lightning and ventilation inside the mine), but are insufficient to achieve any level of production whatsoever. An external investor must decide whether to commit or not a fixed amount I which allows the mine to bear positive production (say, heavy equipment like mining trucks and drills, and standard equipment). If, in addition to this investment I, the Miner adds her own funds, K, the production of the mine increases. It is public knowledge that reserves are either High or Low, but the type of reserves it is private information of the owner. Reserves are easy to imagine, but are a stand in for any combination of features that yield higher or lower quantities of quality-adjusted volumes of silver: a higher mineral law, easier access to veins, actual size of reserves, etc. High reserve mines generate profits for the investor, but low reserve mine can not.

[1] Perfect Bayesian equilibrium is the basic refinement of Nash equilibrium used in dynamic Bayesian games of incomplete information.

[2] Signaling games have been extensively used in the economics and finance literature, e.g. the seminal job-market signaling model by Spence [1973], the corporate finance model of Myers and Majluf [1984] and the monetary policy in Vickers [1986]

The external investor must decide whether to invest or not, based on observing the miner's behaviour: she either invested K of her own wealth into the project or not. In terms of a game, it is player in three stages: first Nature selects the type of miner: High reserves owner (H) or Low reserve owner(L)s. The miner learns his type and decides which public signal/message to send: to invest K or 0 into his own mine. If the external investor invests I there will be production. Exactly how much will depend of the level of reserves and on the amount pre-invested by the miner: higher reserves and higher pre-investment result in higher production.

We show that for a separating equilibrium to exists, where high reserve mines -the ones socially valuables– are exploited and low reserve ones are not, depends on the ability of the owner to invest an amount K at least as large as the value of an exploited mine V_r. Such requirement can be prohibitive for a typical small scale owner and therefore socially valuable production would remain unrealized.

2.2 Game description

In this section, we describe the players, payoffs and structure of the signaling game

2.2.1 Players and actions

- Nature has two available actions $(high, low)$. Nature chooses the level of silver reserves present in the mine. It is public knowledge that Nature's picks a high level of reserves with probability t and a low level of reserves with probability $1 - t$. But only the Miner can observe nature's choice in the first period. Following the usual device of signaling games, we say that natures chooses instead a type of Miner (high or low) and each type has associated high and low reserves, respectively.

- Miner has two available investment actions (IF, NIF). There are two types of Miner: high and low, and each has available the same actions. First, she can partial internal funding (IF) the mining project by spending an K amount of dollars in an efficiency-increasing good (or activity) that increases the output of a functioning mine but cannot by itself produce any output. Second, she can choose not to provide internal funds (NIF).

- Investor has two available investment actions (EF, NEF). After observing IF or NIF by the Miner (but not the level of reserves or, equivalently, the Miner's type), the Investor can either invest (I) or not invest (NI) a fixed amount of dollars. This investment can sustain positive amounts of outputs by itself, but the precise quantity will vary with the levels of reserves and the good provided or not by the Miner.

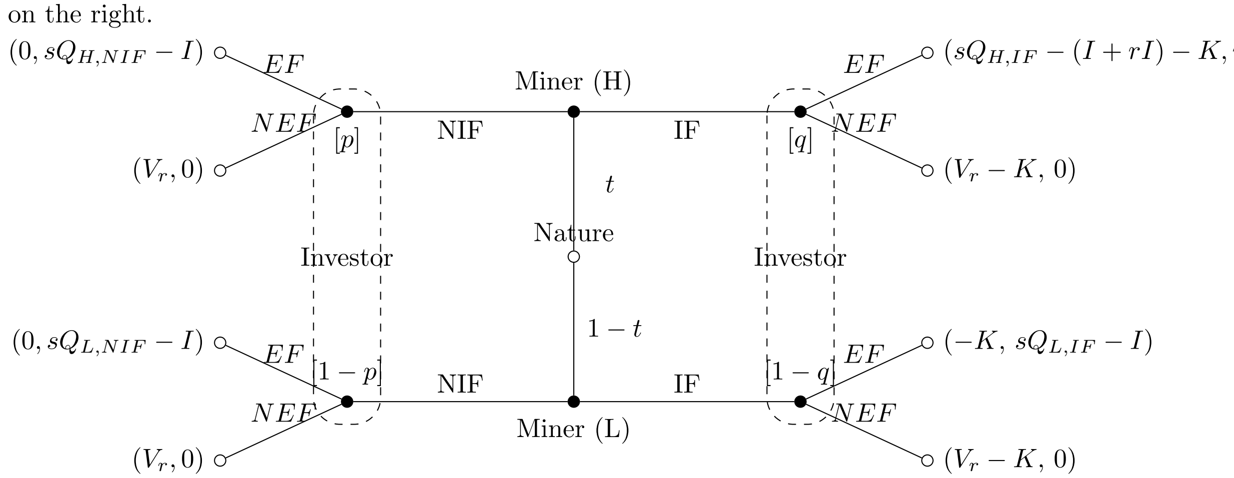
2.2.2 Pure strategies

The strategies for the Investor are conditional on the observed signal and strategies of the Miner are conditional on his type. A strategy for the Miner is a pair *(message if type is high, message if type is low)* and a strategy for the Investor is a pair *(investment decision if message is K, investment decision if message if NF)* and can be enumerated as follows:

- Miner strategies can be written as (m_H, m_L), where the first component, m_H, is the action taken (or *message* in a signaling game) if Nature chooses H, and the second , m_L is the action to be taken if Nature chooses L.
- Investor's strategies can be written as (a_{NIF}, a_{IF}), where the first component, a_{NIF}, is the action to be taken should he observe the message NIF, and the second , a_{IF} is the action to be taken if the observed message is IF.
- Possible equilibria in pure strategies: a set $[S_M, S_C, p, q]$ consistent in one strategy S_M for the Miner, one strategy S_I for the Investor, and one set of beliefs for the Investor, (p, q). Since there are four S_M that can be combined with each of the four S_I, we have sixteen pairs $[S_M, S_I]$.

2.3 Extensive form representation

The following extensive form representation of the game shows the initial play by Nature, choosing a high type Miner (H) with probability t and a low type Miner (L) with probability $1-p$. The dotted lines as usual represent information sets, where the Investor can not tell whether the game has reached an upper node or a lower node. The only thing the investor can tell is whether IF or NIF has been played, therefore he knows if he is at information set on the left or the one on the right.



We make the following assumptions about payoffs:

- $s\ Q_{L,NIF} < s\ Q_{L,IF} < I < s\ Q_{H,NIF}$ therefore

$$s\ Q_{L,NIF} - I < s\ Q_{L,IF} - I < 0$$

  and

$$s\ Q_{H,NIF} - I > 0$$

- $s\ Q_{H,IF} - (I + rI) - K > 0$

In words, if reserves are low, the value of production will be insufficient to pay the investor in full, regardless of any internal funding invested by the miner. Also, a minimal assumption is that an externally and internally funded mine with high reserve can deliver positive profits for the miner. Another assumption states that if reserve are high, the value of production covers the external investment even if the miner does not invest some internal resources into production.

2.4 Solving for equilibria

We will not examine all 16 combinations of pure strategies implied by this game. That can be found in a separate appendix. But we will exemplify how to check whether a profile of strategies and beliefs satisfy or not the conditions to be a perfect Bayesian equilibrium.

Let us examine, to ilustrate how one proceeds, the situation described by $[(m_h = NIF, m_l = NIF), (a_{nif} = NEF, a_{if} = EF), p, q]$. This means that the strategy of the miner consists in signaling NIF if her type is high and also signaling NIF if her type is low. The investor, for his part, follows a strategy where whenever the observed signal is NIF, he will not provide external funding, but upon observing the signal IF, he will. Both players know those are the strategies and take each other's strategies as given when assessing the relative merits of one action over another. Also, under this solution concept, only belief that are on the equilibrium path need to comply with Bayes rule: beliefs off the equilibrium path are in principle unrestricted.

For $[(m_h = NIF, m_l = NIF), (a_{nif} = NEF, a_{if} = EF), p, q]$ to be an equlibrium then

- Given the Investor's strategy $(a_{nif} = NEF, a_{if} = EF)$, it must be optimal for type low miners to choose NIF over IF

- Given the Investor's strategy $(a_{nif} = NEF, a_{if} = EF)$, it must be optimal for type high miners to choose NIF over IF

- Given the Miner's strategy $(m_h = NIF, m_l = NIF)$, it must be optimal fot he investor to choose NEF over EF when the observed signal is NIF

- Given $(m_h = NIF, m_l = NIF)$, it must be optimal for the investor to choose EF over NEF when the observed signal is IF

- Since in this candidate equilibrium both types choose NIF, the posterior belief p is on the equilibrium path. Bayes rule implies that p is equal to the prior probability t.
- Since q is not in the equlibrium path there are no restrictions on q.

Notice that if this were a separating equilibrium where high types choose IF and low types choose NIF then both $1-p$ and q would be on the equilibrium path, and Bayes rule imply $p = 0$ and $q = 1$.

The previous points can be conveniently summarized in two tables of payoffs, one for the mines and her two types and another for the investor and the two signals he might observe:

type	**Miner's** payoff if follows	payoff if deviates	deviates if
high	V_r	D	$V_r < D$
low	V_r	$-K$	$V_r < -K$

where $D := sQ_{H,IF} - I(1+r) - K$

m	**Investor's** payoff if follows	payoff if deviates	deviates if
NIF	$t0 + (1-t)0$	$tA + (1-t)B$	$0 < tA + (1-t)B$
IF	rI	0	$rI < 0$

where $A := sQ_{H,NIF} - I$, $B := sQ_{L,NIF} - I$.

From the investor's response to NIF, we see that this will not be an equilibrium as long as $0 < tA + (1-t)B$ which can be rewritten as $t > \frac{(-B)}{A+(-B)}$ ($B < 0$ by assumption).

But more fundamental is the condition for the type-high miner: this will not be an equilibrium as long as his best scenario gains when exploiting the mine (D) are greater than the sale price of the unexploited mine.

The same analysis is done to all other configurations and it acan be found in a separate appendix. Of course, the third column in each table is trivial to change to get instead the conditions under each player find optimal to follow the proposed strategy.

Next, we look into two more possible equilibria because they imply restrictions on the K, the amount of money the miner must co-invest if she decides to do so.

2.5 Efficient separating equilibrium

We seek conditions that ensure this game has a unique separating equilibrium where only high-reserve mines emit the signal and only miners who emit the signal get external funding. In terms of the strategies of our players, we require that $[(m_h = IF, m_l = NIF), (a_{nif} = NEF, a_{nif} = EF), p = 0, q = 1]$ is the unique perfect Bayesian equilibrium in pure strategies.

Some conditions are needed to allow such a profile to be an equilibrium some other are needed to exclude other, undesirable, equilibria.

To make $[(m_h = IF, m_l = NIF), (a_{nif} = NEF, a_{if} = EF), p = 0, q = 1]$ a rational choice for the players involved, we need to consider, as befoe, the payoff involved in deviating vis-a-vis following each action given the strategy of the opponent, summarized in tables 3 and 4:

type	**Miner** payoff if follows	payoff if deviates	condition to not deviate
high	D	V_r	$V_r < D$
low	V_r	$V_r - K$	$V_r - K < V_r$

msg	**Investor** payoff if follows	payoff if deviates	condition to not deviate
NIF	0	B	$B < 0$
IF	rI	0	$0 < rI$

So all these conditions, $B < 0$, $K > 0$, $rI > 0$ and $D > V - r$ must be true.

The first term expresses that the Investor must incur in a loss if invest in a low reserve mine which has not receive internal funding. The second states that is has to cost something to send the signal and the third means that for a high reserve owner, exploit the mine has to be more profitable than just selling the unexploited property, even taking into account the cost of the internal funding and the retribution to the investor.

One interesting condition that is needed to rule out some undesirable equilibria is

$$K > V_r$$

in particular, when we examine the following pooling situation where high and low reserve miners send the high reserve signal: $[(m_h = IF, m_l = IF), (a_{nif} = EF, a_{if} = NEF), p, q]$

type	**Miner** payoff if follows	payoff if deviates	condition for deviation
high	$V_r - K$	0	$V_r - K < 0 \Longleftrightarrow K > V_r$
low	$V_r - K$	0	$V_r - K < 0 \Longleftrightarrow K > V_r$

msg	Investor payoff if does not deviates	payoff if deviates	condition for deviation
NIF	$pA + (1-p)B$	$0p + 0(1-p)$	$pA + (1-p)B < 0$
IF	$t0 + (1-t)0$	$trI + (1-t)C$	$trI + (1-t)C > 0$

Notice that we have written the conditions for deviation. So, we need either $K > V_r$ or $\pi_p < -\frac{B}{A}$ or $\pi_t > -\frac{C}{rI}$ where $\pi_t = \frac{t}{1-t}$ and $\pi_p = \frac{p}{1-p}$

But the conditions on π_t and π_p violate inequalities needed elsewhere to rule out some other equilibria, thus we need $K > V_r$ to be true.

3 A model with a Real Asset Backed Coin

In the previous section, we develop a signalling game and we show that there exists a **pure strategy perfect Bayesian equilibrium** in which a Miner / entrepreneur cannot exploit her mine unless she provides a costly signal of her type, a result in the spirit of Leland and Pyle [1977]. The basic problem that the Miner faces is that she cannot access the traditional credit market. In this section, we extend our basic model to solve the credit constraints faced by the Miner. This extension is based on the existence of a Community Value Chain that uses a Real Asset Backed Coin (RABC), often referred as an asset-backed community token. As we will show, this token, together with the existence of a **Clearing House**, facilitates all payments by and to producers and providers, allows for credit access, and therefore alleviates the under investment phenomenon that arises in financial markets characterized by asymmetric information and hidden types.

3.1 The Basic Model

We consider a two period model: $t = 0$ and $t = 1$ 1. In $t = 0$ the miner announces the intention to exploit the mine. She has no access to financial markets and her own type is not know to outside investors. We assume that the miner has a limited amount of wealth, W_E, that is not high enough to signal her type in the financial markets outside the community. Inside the CVC, there exists a Clearing House that issues a token which value is based on the unknown reserves of the mine. We will assume that the Clearing House serves many productive communities, issuing different coins for each one of them, depending on the product that will be exploited. We will also assume that within each community producers, providers and customers interact independently of the activities of the other communities. In our model, the Clearing House charges a fixed amount h to the producer.

From the results on section 2, the existence of a separating equilibrium guarantees that only miners with high reserves are willing to provide internal funding, and the corresponding value of the reserves is $Q_{high,if}$. For ease of notation, we will call this value Q^*. The basic problem of the miner is that her wealth is lower than the required amount need for signalling her type, $W_E < K$.

This problem, however, it is solved inside the CVC by the Clearing House, which issues an amount of silver coins whose total value is equal to the total expected value of the production of the mine plus the amount provided by the investor.

3.1.1 The Clearing House

Inside the CVC, all parties -miner, contractor and investor- agree to write contracts between them using the silver coins issued by the Clearing House rather than outside money (”dollars”). It is the Clearing House the institution that regulates transactions and enforce written contracts. Its the embodiment of intelligent contracts made possible by blockchain technology. At time $t = 0$, the Clearing House provide the miner the silver coins issued, which in turn are used by the miner to pay for the required inputs and services.

3.1.2 The Miner and the Contractor

As discussed in section 2, the Miner must commit resources in a (dollar) amount of K to signal her type. We assume that that this amount is used to pay for some of the resources required for operation. As we mentioned above, the miner gets all the coins issued by the Clearing House and use them to pay for all the productive inputs. The main resources to exploit the mine, (labour, equipment, etc..) are provided by a contractor, which represent the supplier of intermediate goods and services to operate the mine. The dollar value of these resources is Z. The contractor can exert costly effort, ϵ, to improve the total production of the mine if he engages in the transmission of his expertise in the use of his inputs(we can think of this as training, for instance).

3.1.3 Investors

It is possible for ”outside” investors to enter the community and provide the funds required for production. Investors provide an amount of funds equivalent $I = Z - K$ and he charges the miner an interest rate r_c in silver coins.

3.1.4 The Silver Coins

At time $t = 0$, the NPV of the mine is given by:

$$sQ^* - Z \tag{1}$$

Since the contractor can exert effort to enhance the value of production, the NPV of the mine can be expressed as follows:

$$NPV = sQ^*(\phi) - Z_i \tag{2}$$

where ϕ is an indicator value that takes the value of 1 if the contractor exerts effort and 0 other wise. If he decides to do so, he charges a higher price for the inputs, Z_1 and the total production of the mine is increased by a factor $\theta > 1$.

If he does not, he charges an amount Z_0, with $Z_1 > Z_0$. So, depending on the effort exerted by the contractor, the NVP of the mine will be given by:

$$NPV = \begin{cases} sQ^*\theta - Z_1 > 0 \\ sQ^* - Z_0 > 0 \end{cases} \tag{3}$$

The Clearing House issues an arbitrary amount m of coins. The dollar value of each is coin is then given by:

$$c = \frac{sQ^*(\phi) + I}{m} \tag{4}$$

4 Payoffs

The main feature of the CVC is that payments are made in the silver coins issued by the Clearing House. In this section, we analyze the payoffs that the members of the CVC receive.

4.1 Payoff to Contractors

Let m_c be the amount of coins that the contractor receives as payments for his good and services. If he decides to exert effort ($\phi > 0$), the net payoff in dollars that the contractor expects to receive at the end of time $t = 1$ is given by:

$$m_c E(c_1) = m_c(\frac{sQ^*\theta + Z_1 - K}{m}) - \epsilon \tag{5}$$

where $E(c_1)$ is the expected dollar value of the silver coins at time $t = 1$. If the contractor exerts no effort ($\phi = 0$), his expected payoff at $t = 1$ is given by:

$$m_c E(c_1) = m_c(\frac{sQ^* + Z_0 - K}{m}) \tag{6}$$

For the contractor to exert effort, it is clear that equation (5) must be larger than equation (6):

$$m_c(\frac{sQ^*\theta + Z_1 - K}{m}) - \epsilon > m_c(\frac{sQ^* + Z_0 - K}{m})$$

Rearranging terms, this condition can be written as:

$$\frac{m_c}{m}(sQ(\theta - 1) + (Z_1 - Z_0)) > \epsilon \tag{7}$$

According to equation (7), the higher the increase in the production of the mine due to the effort of the contractor, the more likely is that he will be willing to exert effort. In the same way, the higher the premium in the price of his products that he receives when exerting effort ($Z_1 - Z_0$), the more likely is that he will do so. We will assume that equation (7) holds.

4.2 Payoffs to Investors

The fact that the Miner must signal her type can be understood as co-investing. Actually, the amount of K is used to hire or buy other services from the contractor. In the model, once the type of the Miner is signaled and the signal is understood by market participants, it is common knowledge that the reserves of the mine are high. Furthermore, since we are ssuming that condition (7) holds, the dollar value for the silver coins remain constant between $t = 0$ and $t = 1$. Therefore, $E(c_1) = c_0 = c_E$, where c_E is the value of the coin when the contractor exerts effort

Let m_I be the amount of coins that the investor is entitled to receive at $t = 1$:

$$m_I = \frac{(Z_1 - K)(1 + r_c)}{c_E} \tag{8}$$

For the investor to be willing to provide funds, it must be true that the dollar amount that he receives from his investment inside the CVC must be larger than investing that amount in the traditional financial markets:

$$m_I c_E \geq (Z_1 - K)(1 + r) \tag{9}$$

Accordingly, for investors to be willing to provide funds, $r_c \geq r$

4.3 Payoffs to the Miner / Entrepreneur

The Clearing House issues an amount m of coins. As we discussed, the value of each coin is given by $c_E = \frac{sQ^*\theta + Z_1 - K}{m}$. The miner reserves the coins and make the payments to all involved parties, such that at the end of time $t = 1$ he ends up with a number of coins given by:

$$m_M = m - m_h - m_c - m_I \tag{10}$$

where $m_h = \frac{h}{c_E}$, $m_c = \frac{Z_1}{c_E}$ and $m_I = \frac{(Z_1 - K)(1 + r_c)}{c_E}$. Since the project of exploiting the mine when it is a high reserves is positive and $K \geq V_r$, the dollar amount of the coins that are left for the Miner is $c_E m_M > V_r$. Accordingly, under truthful revelation, it is in the interest of a high reserve mine to participate in the CVC and exploit the mine.

4.4 Payoffs and the value of cooperation

In this model the value of cooperation is captured by the parameter θ that represent the gross increase in production when the contractor is engaged in an intimate way with the production process. This kind of cooperation could be pontentially very difficult to write into a contract, but since the payment to the contractor is made in coins, IT is in the contractor's best interest to maximize the value of production, provided it compensates for the disutility of his effort, as seen in a previous subsection. This is a interesting feature that is robust to more complicated models, for instance one with stochastic production of silver or with several contractor and types of contractors, where the cooperation relationship will be impractical to govern by a contract.

As a reminder that each party is better off when $\theta > 1$, lets revisit the equilibrium payoffs with and without cooperation.

$$Miner:\ C_E m_M > C_{NE} m_M$$

$$Investor:\ C_E m_i(1 + r_c) > C_{NE} m_i(1 + r_c)$$

$$Contractor:\ C_E m_c > C_{NE} m_c$$

$$House:\ C_E m_h > C_{NE} m_h$$

4.5 Out of Equilibrium

As we discussed above, and from the results in section (2), it is convenient for a high value mine owner to coinvest and exploit the mine. CVC participants are willing to participate and production takes place. This result; however, is valid only for a traditional economy, where all payments and investments are made in dollars. Instead, once the coins are issued, the payments for the contractor and the investor are due on silver coins, and not in the dollar value of these coins. So, it could be argued that it is possible that the owner a low value firm might try to mimic the behaviour of the owner of a high value firm and enter the CVC. After paying the investor and the contractor (in silver coins), he will be left with a positive amount of coins, $m_M = m - m_h - m_c - m_I$, even though the reserves of the mine are low. We need to impose a condition on the amount of reserves of a low value mine to rule out this possibility.

From the discussion on section (2.3), if a low value Miner provides internal funding (IF), given that that signals a high value type, investors will provide funds, but the value of the reserves of the mine will be $sQ_{L,IF} < I$.

Let $sQ_{L,IF} = sQ^{**} < I$. At $t = 0$, given that CVC participants believe the mine is a high reserves one, the value of the m issued coins will be given by:

$$c_E = \frac{sQ^{*}\theta + Z_1 - K}{m} = \frac{sQ^{*}\theta + I}{m} \tag{11}$$

At time $t = 1$, when the true value of the reserves of the mine is revealed, the value of the coins will be reduced. Let c_B the value of the m coins when the miner lies about her own type:

$$c_B = \frac{sQ^{**}\theta + Z_1 - K}{m} = \frac{sQ^{**}\theta + I}{m} \tag{12}$$

It follows that:

$$\frac{c_B}{c_E} = \frac{sQ^{**}\theta + I}{sQ^{*}\theta + I} \tag{13}$$

From equation (10), the amount of coins left for the miner is given by:

$$m_I = \frac{sQ^{*}\theta + I}{c_E} - \frac{h}{c_E} - \frac{I(1+r_c)}{c_E} - \frac{Z_1}{c_E} \tag{14}$$

The dollar value of this amout of coins is therefore:

$$c_B m_I = \frac{c_B}{c_E}(sQ^{*}\theta - h - Ir_c - z_1) \tag{15}$$

The low value Miner will not have incentives to mimic the high value Miner as long as $c_B m_I < V_r$. Lets define the profits of a high value Miner as $P^* = sQ^*\theta - h - Ir_c - Z_1$. From equation (15),

$$\frac{c_B}{c_E} P^* < V_r \tag{16}$$

From (13), it follows that we obtain a truthful revelation outcome as long as:

$$sQ^{**}\theta < V_r(\frac{sQ^{*}\theta + I}{P^*}) - I \tag{17}$$

This equation imposes a cap on the value of low reserves mine so that we obtain a separating equilibrium in the CVC economy.

From equation (13), a no-bluffing condition, we can conclude a few interesting facts about this upper limit on Q^{**}: first, a higher I –which, ceteris paribus, implies a higher proportion of external funds– reduces the RHS keeping the LHS constant, therefore it requires lower values of Q^{**} . Second, a higher value of θ also reduces the maximum allowed value of Q^{**} in (13), and third, a higher residual value of the unexploited mine makes it easier for (13) to hold, in the sense that a higher V_r increases the RHS and higher value of Q^{**} become compatible with this truthful revelation condition. [3]

5 Conclusion

We develop a theoretical model that captures a digital ecosystem or community value chain environment and the existence of a Real Asset-Based Coin (RABC), often referred as asset-based community token. We show that many of the common sources of underinvestment problems faced in environments of asymmetric information are eliminated with the use of the RABC. In the model, the Entrepeneur must invest in the project in order for the signal to be credible. The RABC and the Clearing House in the model allows the entrepreneur to provide the correct signal, community cooperation ensures and the overall production in the economy increases.

[3] Is straitforward to take partial derivatives of (13) against V_r, I and θ to obtain the signs mentioned in this paragraph.

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