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TRADING IN NAMES UNDER MORAL HAZARD

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Abstract

Does the possibility of selling one's reputation (name) improve the average quality sold in an economy by reducing incentives to cheat towards the end of an interaction? It is shown, in various economies with finite number of overlapping generations and imperfectly informed buyers, that not only does trade in names not lead to improved trade outcomes, it can even worsen them.

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1 Introduction

When an owner-operator sells his or her firm, the buyer often continues operating the business under the original name. Moreover, consumers are seldom in a position to keep track of the change in ownership. In such cases, the new owner has purchased not only the physical assets that make up the firm but, in effect, also its reputation. This even though the new firm lacks one ingredient of the old firm, namely, the services of the original owner-operator. In so far as these services represent an essential determinant of the quality of the firm's product, the firm's name or reputation is no longer necessarily a good predictor of its future performance. On the other hand, provided sold reputations do not completely loose value, the possibility of selling a firm's name can counter eventual incentives to run down a business' 'good will' prior to its sale. It is not a priori clear then whether the feasibility of selling a business' name (arising out of consumers' limited ability to track changes in ownership) is a good thing or not. The purpose of this paper is to try and throw some light on this question[1].

In order to do that, this paper studies an imperfect information reputational model (á la Kreps-Wilson 1982) of repeated sales in bilateral random matchings among overlapping generations (continua) of two-period-lived sell-

[1] It is perhaps interesting to note the affinity of this problem with the wider class of problems concerning incentives for efficient use of long-lived assets owned by shorter-lived agents. The market economy offers a solution to this problem by allowing short-lived asset holders to sell those assets at the end of their lives. As is well known, in the absence of asymmetric information and other frictions, this leads to efficient exploitation of those resources.

ers, and a sequence of one-period-lived generations (continua) of customers (as in Tadelis 1998). This goods' trading is interrupted at regular intervals by 'track record'('names')[2]-trading sessions among exiting and entering sellers of goods (or operators). A key feature of the model will be that customers will not be able to keep track of 'names' transfers (tough they will be aware that 'names' can be sold). This will allow for the possibility that 'track records' might have value in the eyes of entering operators by allowing them to 'blend in' with middle aged operators who have actually supplied high quality in the first period of their lives, and whose track records, are, hence, really indicative of their type[3].

It will be assumed that the economy itself has a finite horizon, that is, that trading of any sort eventually stops. This in order to exclude from consideration norm-type equilibria which might arise when trading goes on forever.

This work shows that name-trading, even when feasible, is unlikely to lead to actual improvements in the average quality supplied. In fact, in all the scenarios considered here, trade in names will not improve trade outcomes,

[2] This notion of 'name' is taken from Tadelis 1998 who studies trade in such 'names' in a pure adverse selection environment. Obviously, it is very special. One could instead take a 'name' to correspond not to the record itself, but just to the beliefs such sequence would induce (as in Mailath and Samuelson 1998 who study trade in this alternative class of names in a moral hazard environment), and the results will most probably change as a consequence. And, just as evidently, this notion of 'name', as well as the alternative one just mentioned, should be taken as some sort of reduced-form representations of what actual names achieve in practice.

[3] Other key assumptions in this regard will be, first, that customers cannot observe sellers' ages, and, secondly, that they cannot observe who trades in the market for names.

and often it will worsen them (relative to the situation that would have emerged in the absence of names' markets).

While it is not difficult to figure out how trade in names might adversely affect incentives to develop a good track record ('track erasing'-cheating and then buying a good name in order to continue trading, and 'watering down' of reputations -since customers are aware that names can be sold), the real issue is rather why such adverse effects are not compensated by the positive effects that name trading presumably has on the incentives of exiting agents to behave in the last period of their lives.

The intuition behind this failure is, roughly speaking, the following: In order for trade in names to provide incentives for an operator not to cheat in the period prior to his death, good names must command a positive price. But good names can only command a positive price if some operators are actually cheating (if all sellers provide good quality, a good name is just not informative in any way), or if the composition of the pool of name buyers is biased towards good types. The latter bias cannot arise in the absence of a natural separating structure between honest and dishonests, which the present model lacks[4]. The other avenue for making names valuable represents a catch-22 situation: While old operators can be prevented from cheating, this can only be achieved at the cost of having some young operators cheat. And, as the analysis makes clear, in the set-up studied here the cheating by youngs will invariably offset the good behavior of olds.

[4]This lack of the 'right' separating structure is the crucial difference between this type of set-up and the adverse selection model of Tadelis 1998, or the noisy outcomes setup of Mailath and Samuelson 1998. See literature discussion below.

Finally, the analysis of the various scenarios serves to emphasize that the exact overlap pattern and the exact timing of 'names' transactions within a seller's life are crucial in determining whether the market for names is active or not. So, under certain demographic and name-trading constellations, 'blending' might not result even if customers cannot keep track of names' transfers directly[5] Also, the feasibility of 'erasing one's tracks' will depend on these considerations: If only newborns can buy names, it will obviously not operate. Closely related is the question of the opportunity cost of buying a name. Someone who already has a good name has no incentives to buy one at a positive price (or even at a zero price, when participating in the names' market is costly)[6].

The paper is organized as follows: After a discussion of related literature, the benchmark model is presented. Section 3 looks at what, a priori, would appear to be the environment most conducive to trade in names and less cheating. In section 4 it is shown that 'blending' is a necessary condition for trade in names. Afterwards, an infinite horizon equilibrium is presented in which trade in names does not lead to improvements in quality. Finally, the feasibility of 'erasing ones' tracks' is evaluated, and its effects on trade outcomes are considered. Conclusions are then presented.

[5] For example, if only two-period names can be bought, and only by new-borns, but all currently active operators are known to be at most one-period old.

[6] Tadelis 1998 specifies that only new borns can buy names and only olds can sell them, while at the same time starting the economy off with an exceptional generation of operators that lives only for one period. In this way, blending must result while buyers of names are assured to have very low opportunity costs of buying names (since, being new born, they cannot possible own a good name when entering the names' market).

1.1 Literature Overview

The key reference for the present paper is the work by Tadelis 1998, which deals with the pure adverse selection case in an overlapping generations environment similar to the various scenarios considered here. The emphasis in Tadelis' work is on obtaining an active names' market, and on the make-up of the pool of names' buyers as between good and bad types. It shows, in particular, that good agents will not be able to fully separate themselves by buying good names. This due to the interplay of what he calls the 'Reputation Maintenance Effect'(good types can maintain a reputation more easily -makes buying a name relatively attractive for a good type) versus the 'Reputation Start-up Effect' (good types can build up a reputation more easily -makes it relatively unattractive for a good type to buy a name). The intuition is that if only good types buy names then those names will be hard to depreciate in the eyes of buyers. Consequently, maintaining the name will be relatively easy, making it very attractive to bad types, but not so attractive to good types, who can more easily build up their own good name.

Fang 1998 extends Tadelis' model by introducing a cost of production, and then shows that trade in names might improve the efficiency of the economy by excluding bad types from producing. Fang also studies whether in a version of the Tadelis' model with moral hazard high effort can be implemented uniformly across generations. In contrast to the conclusions of this paper, he obtains a positive result. In my view, the reason for the contrasting results lies in the fact that in his model a high outcome is always informative (in fact, revealing of the type of an operator, as bad types never succeed); while in my model it is cheating that is revealing. This result emphasizes the importance of the specific form of the reputation mechanism at work.

Another recent contribution on the subject of names' trading is the one by Mailath and Samuelson 1998 in which they deal with the moral hazard case but in a model with noisy product signals, compulsive cheaters instead of compulsive do-gooders, and long lived agents. Also, they work with the different concept of name mentioned in the previous section, instead of the name as history, they take names to correspond to beliefs. First thing to note is that such models display much richer reputational dynamics (protracted reputation buildup and rundown) than the class of models used in this paper, which follow Kreps-Wilson 1982b and Milgrom-Roberts 1982. Mailath and Samuelson emphasize the types of names bought by each type of agent, and show that good agents will tend to buy moderately good reputations, while bad ones will prefer very good ones. Interestingly, seemingly because of the noisy signals and compulsive cheating by some agents[7], a substantial part of the intuition in Tadelis 1998 seems to carry over to Mailath and Samuelson's environment with moral hazard. Good types will prefer to buy moderate reputations because they will be able to build them up more easily, while bad types will buy very good reputations since they are hard to depreciate.

In the set-up of this paper, these two effects do not operate at all, as

[7]It is much more difficult for a compulsive cheater than for normal agents to build up a good reputation. If instead of compulsive cheaters one works with compulsive do-gooders, then building up and maintaining a reputation for rationals is just as easy as for the automaton types. By the way, note that, in this infinite horizon model, the issue of commitment does not play a role. The only problem is for normal agents to separate themselves from the cheaters.

both good and bad types are just as good at building a good name. In fact, in the analysis that follows the absence of such a structure inducing differential incentives between types (even though never full separation) will play a very important role. This and the particular reputation mechanism at work constitute the main differences between the papers just quoted and the work presented in this paper. Else, the modelling here follows Tadelis 1998 in adopting the concept of track record as name and an overlapping generations structure.

The above are the papers closest to the work presented here but there are, of course, other (but not many) papers that bear on the issues this paper deals with. There is Kreps 1990 that reinterprets norm equilibria in infinitely repeated games in terms of name trading. Salant 1991 studies norm equilibria in overlapping generations set-ups. Further, there is Aoyagi 1996 who studies how firms' sales under asymmetric information affects incentives to behave aggressively in an infinitely repeated entry deterrence game. In this work, though, what is sold is the firm rather than just its reputation.

2 The Model

Time t is discrete, and the horizon T finite.There will be two classes of agents: Two-period-lived operators and one-period-lived customers. Each period a unit measure of each will be born. Generations of operators (G_t denoting operators born at time t) will be assumed to overlap (the exact demographic configuration at the start and end of the game will vary).

It is useful to think of each period as made up of two stages: A product-sale stage and a names-sale stage.

In the product-sale stage, operators will be matched 1:1 with customers. Each operator-customer pair proceeds then to play the following extensive form stage-game: A price p_t is exogenously set equal to the expected value of the good in the eyes of the customer. Then, customer and operator simultaneously decide whether to trade or not. If there is agreement, trade takes place. In this case, the operator, if of rational type ($\tau = R$) (of which there will a measure b_0 in each generation), decides whether to produce high ($Q = H$) or low quality ($Q = L$), at a unit cost of c_H or c_L, respectively, with $c_H > c_L$. If the operator is an automaton ($\tau = A$), he supplies high quality. The customer pays the price and consumes the good, and only then finds out the quality of the item bought.

The remuneration to the operator in this stage is the price minus the cost. The remuneration to the buyer is her reservation value for the item (v_H for a high quality item, v_L for a low quality one, with $v_H > v_L$) minus the price. The relationship between all these parameters is given by $v_H > c_H > c_L > v_L$. This implies that customers would never knowingly acquire a low quality product at a price that covers its cost of production. In other words, it is not efficient to supply low quality in this economy.

Operators will be 'named' in the sense that they will carry in each period t a 'track record' n_t, which will correspond to a sequence $(H, L, 0)^{t-t'}$, with $t' \leq t$, where this sequence represents the list of actions undertaken by the bearer of the name in the corresponding period,(H (L) stands for a high quality (low quality) sale, while (0) denotes the absence of a sale).

It will be assumed that customers are aware that operators might be rational or automata, and know the proportion b_0 of rationals in a generation, but are not able to tell directly whether an operator is of one or the other type. All what they can observe prior to trading and consuming is the track-record or name of the operator they are matched with[8]. The price (expected value) of the item offered by an operator bearing name n_t is then given by $p(n_t)$.

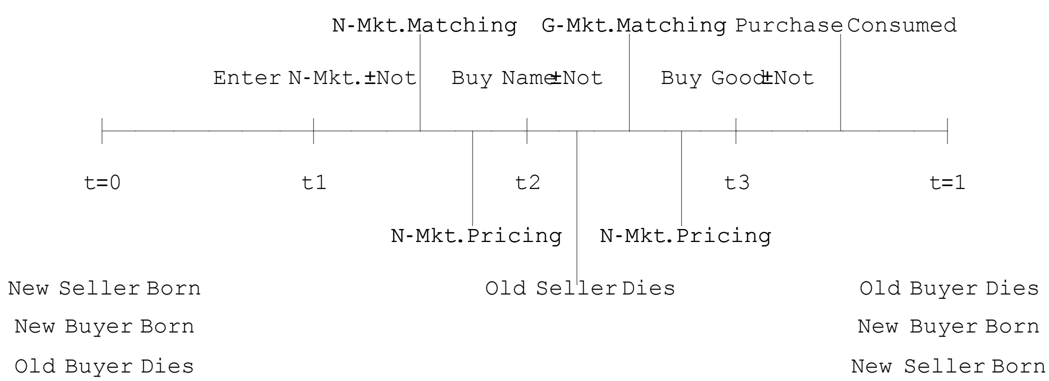
This product-sale stage is then followed by a name-selling stage along the following lines: There is a names' market for each possible track record with the exception of the empty history (though in the examples dealt with here, I will assume for simplicity that there is only a market for good names). Operators, after having supplied buyers in the preceding product-sale stage, decide whether and which name-market to enter (subject to participation restrictions to be specified). The suppliers of names are then matched randomly with the demanders of names within each market. In each match a non-negative price $p_t^N(n)$ (price at t of name n) will be set according to some exogenous rule (which is common knowledge among all players in the game), and then the buyer of names has to decide whether to buy or not. If a purchase takes place, the name is transferred and a new product-sale stage starts. If no purchase takes place, or if the demander remains unmatched, then this operator keeps her or his previous name. The remuneration to a buyer of a name from this stage will be negative, and equal to the purchase price of the name bought, while that to the name-seller will simply be the name-price.

[8] Since prices are not set by operators, it is not really necessary to specify in detail the information available to them.

In order to exclude some equilibrium outcomes that hinge on very extreme specifications of out-of-equilibrium beliefs, it will be assumed that there is always an $\varepsilon > 0$ sub-sample of each generation (with the same composition as the overall sample) that cannot participate in the names' market. It will also be assumed that there is a $\sigma-$cost of entering the names' market. Again, this is done to exclude certain rather 'artificial' equilibria.

The overall remuneration of a 2-period-lived operator will then be the discounted sum of the payoffs in each stage of the game, where the discounting will take place from one product sale stage to the next (with discount factor β). That is, a period for discounting purposes will include the product-sale stage and the subsequent name-trading session.

The following diagram illustrates the time-line of the game:



A word about pricing: Taking the division of surplus in the market for names to be constant and exogenously given, without specifying it precisely, is unsatisfactory, as it obviously contributes to blur the equilibrium predictions of the model. On the other hand, though, it allows one to focus on the conditions for trade in names more generally, that is, independently of particular bargaining procedures that might induce particular surplus divisions. Also, it considerably simplifies the analysis[9].

2.1 Equilibrium

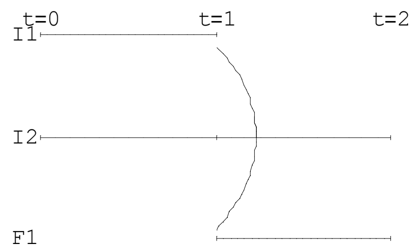
The solution concept will be the notion of sequential equilibrium (Kreps and Wilson 1982a).This concept will be supplemented by a 'refinement', namely the assumption of an arbitrarily small ε-subsample of any generation of operators allowed to enter the names' market who have to stay out of the names' market, where this subsample is postulated to have the same composition as the overall sample. Also, it will be supplemented by a tiny cost of participating in the names' market σ, in order to eliminate inessential indifferences.

3 A Best Scenario for Name Trading

The first economy considered corresponds essentially to the basic case in Tadelis 1998 (p.12), which in a way represents a best case scenario (amongst the finite horizon scenarios considered here), both for there to be active trade in names, and for such trade to lead to improved outcomes.

The diagram below illustrates the demographic composition of the population:

[9] I think it is still reasonable to call this names'assignment procedure a market, in as far as the assignment respects the individual rationality constraints of the participating agents.



There is one initial one-period lived generation, denoted by $I1$, one initial two-period lived generation, denoted by $I2$, and one final normal one-period lived generation, denoted by $F1$. (In this notation, for example, $I1\,(R)$ would designate generation $I1$ rationals). Moreover, only olds are allowed to sell names, while only new-borns are allowed to buy them. In other words, there is only one name-trading session at the start of $t = 1$, and the middle-aged are not allowed to take part in it. In order to complete the specification of the economy, one must define the pricing rule in the market for names. It will be assumed that name-buyers are charged a proportion of the value of a given name to an automaton demander. Also, for convenience, I will assume that there is only a market for good names, i.e., (H) names.

This environment is most favorable in three respects: First, it is just not feasible for a rational seller to cheat and then avoid the consequences by buying a name[10]. Second, 'blending' is built into names' trading (that is

[10] In Tadelis 1998 it is assumed that all surplus goes to the sellers of names, so, even if

the role of the two-period-lived initial generation). Third, the fact that the only participants on the demand side in the market for names are new-borns, favors trade for names in as far as new-borns can only get a 'good' name by buying it (middle-aged participants would have the option of building their own 'good' name instead of buying it).

The first proposition shows that even in this scenario, which can be considered the most favorable to improving (product) trade outcomes via trade in names, under a reasonable restriction on names' market pricing, there is no equilibrium that leads to an improvement relative to the situation that would have resulted in the absence of names' markets. Actually, trade in names might worsen trade outcomes relative to that benchmark, as Proposition 3 shows.

The restriction is the following:

Definition 1 *At any stage, all surplus accrues to one side iff it is the short side.*

Proposition 2 *Under the previous restriction, and in the presence of σ-cost of entering the names' market, there is no equilibrium in which $I1\left(R\right)$'s supply high quality.*

Proof. Let $\lambda^{EB}\left(n\right)$ designate the measure of operators in generation $F1$ who enter the market for n-names (necessarily, as suppliers) ; similarly, $\lambda^{ES}\left(n\right)$ would refer to the measure of operators in generation $I1$ who enter the n-names' market (necessarily, as demanders). So, an operator of generation

middle-aged operators are allowed to enter the names' market, it would just not pay for them to cheat in the hope of then buying a good name.

$I1$ entering the (H)-names' market can expect to be matched with a name buyer with probability

$$\alpha = \min(\frac{\lambda^{EB}((H))}{\lambda^{ES}((H))}, 1).$$

It follows that an $I1(R)$ will only supply H iff

$$\alpha p^{N}((H)) \geq c_H - c_L$$

(with strict inequality if the postulated σ-cost of entering the names' market is taken into account).

Take the case with all $I2(R)$'s supplying high quality: Let $pr(A|(H))$ denote the posterior probability a customer assigns to the event that an operator bearing a name (H) is an automaton. If $F1$'s enter the names' market, it must be that

$$pr(A|(H)) \geq pr(A|\emptyset) = b_0$$

The above inequality must be satisfied since there is always an ε-subsample of the final generation that cannot participate in the names market, and, hence, buyers must belief in any equilibrium that a seller bearing a $\{\emptyset\}$-name after the last round of name trading must be an automaton with probability b_0. Since the name-price must be strictly positive (from the initial inequality), the last inequality must hold strictly. On the other hand, if all $F1$'s enter, it would have to be that

$$pr(A|(H)) = b_0$$

This follows from the hypothesis that all $I2$'s supply H in the first period, and the fact that it is not possible to skew the composition of the sample of

(H)-names' bearers towards automata types by pricing appropriately (and thus affecting the name-buying decisions), except by making rationals and automata simultaneously indifferent between purchasing and not. This is impossible in the presence of costs of entering the names market: Let $p((H))$ denote the price at which the good is expected to be bought from an operator carrying an (H)-name in the following product-sale stage; with an analogous interpretation for $p(\emptyset)$ and $p(b_0)$. Assume that

$$\beta(p((H)) - c_H) - \sigma - p_N \geq \beta(p(\emptyset) - c_H)$$

i.e., it pays to enter the names' market. To make both rational $F1's$ and automata $F1's$ simultaneously indifferent between purchasing a name or not in case of a positive match, after having entered the names' market, it must be that

$$p^N((H)) = \beta(p((H)) - p(\emptyset))$$

This contradicts the condition for entering the names' market[11].

It must be then that a subsample of $F1$'s, including both rationals and automatons, and such that the proportion of automatons is strictly higher than in the original $F1$-pool, enters the names' market. Letting $\lambda^{EB}(F1(A),(H))$ stand for the measure of automaton generation $F1$ operators entering the (H)-names' market, it must be that

$$\frac{\lambda^{EB}(F1(A),(H))}{\lambda^{EB}(F1(R),(H))} > \frac{b_0}{1-b_0}$$

[11] In the absence of costs of entering the names' market, the condition for making rationals and automata indifferent between purchasing a name or not, coincides with the condition for making these two classes of agents indifferent between entering the names' market or not.

In other words, some $F1$'s of each type must not enter the names market[12]. Given the continuum assumption, $F1$'s of both types must be indifferent between entering and not entering. This implies that the condition for entering must hold with equality. In other words, all expected surplus must go to the suppliers of names. The short side restriction implies then that there must be an excess demand for names. But this circumstance, under the restriction on pricing (now taking the implication in the opposite direction), implies that

$$p^N((H)) = \beta(p((H)) - p(\emptyset))$$

which, in the presence of σ-costs of entering the names' market, is incompatible with all expected surplus accruing to the sellers of names.

Now, if some $I2(R)$'s cheat, then it must be that

$$c_H - c_L \geq \beta(p((H)) - c_L)$$

By rationality of names' purchases, it must be that

$$\beta(p((H)) - p(b_0)) > p^N(H)$$

(with strict inequality because of the σ-cost). Moreover, by the hypothesis that some $I2(R)$'s are cheating, it must be that

$$p(b_0) \geq c_L$$

Putting all the inequalities together,

$$c_H - c_L \geq \beta(p(pr((H))) - c_L)$$

[12]Note that it cannot be that only automata stay out, for then it pays for rationals to deviate and remain outside the names' market as well.

$$\geq \quad \beta\left(p\left((H)\right)-p\left(b_0\right)\right) >$$

$$p^N(H) \quad \geq \quad \alpha p^N(H) \geq c_H - c_L$$

A contradiction. ■

Regardless of whether the short side restriction being used is persuasive, the lesson from the previous result, seems to me, is that equilibria in which $I1\,(R)$'s refrain from cheating are very fragile. Perhaps even more important is the fact that a general intuition appears to underlie this feature of the analysis, one that might very well emerge in similar set-ups, independently of modelling details:

In order for (H) names to be informative, some $I2\,(R)$'s must be cheating. That implies that the gain from cheating today exceeds the revenues that can be obtained from cheating tomorrow. But then, as names' prices are bounded above by these revenues, neither can it pay for an $I1\,(R)$ to refrain from cheating. Given this, the only other way for names to be informative is for the composition of names' buyers to be skewed towards honesty. As this cannot be achieved by pricing (or only via fragile arrangements), a skewed pattern of entry into the market is needed. Again, it turns out that though it is possible to implement such a pattern in equilibrium, this can only be achieved via very fragile constructions. Note that the key to the difficulties in implementing this specific entry pattern is the absence of the right 'separating structure' between automata and rationals, unlike what happened in the adverse selection model of Tadelis 1998, or in the moral hazard model with noisy outcomes of Mailath and Samuelson 1998, where some such separation structure existed[13].

The following proposition characterizes equilibrium behavior in this environment:.

Proposition 3 *If (full) reputation building is feasible to start with, i.e., if*

$$\beta\left(p\left(b_0\right)-c_L\right) \geq c_H-c_L$$

then all equilibria involve a zero price of names, with all $I2\left(R\right)$'s supplying high quality.

If (full) reputation building is not feasible, i.e., if

$$\beta\left(p\left(b_0\right)-c_L\right) < c_H-c_L$$

then there might exist equilibria in which some $I2\left(R\right)$'s cheat (i.e., in which names are informative, and, hence, command a positive price).

Proof. If all $I2\left(R\right)$'s supply high quality, it must be that

$$\beta\left(p((H))-c_L\right) \geq c_H-c_L$$

Also, it must be that

$$p\left(b_0\right)=p(p\left(H\right))$$

since, as argued in the proof of the preceding proposition, good names cannot be informative in this scenario. From this equality it follows that the price of

[13] Note that existence of an equilibrium is straightforward here: If there would have been reputation building in the absence of name trading, then there is always an equilibrium with reputation building in the presence of name trading since entry into the names' market is simultaneous. If no reputation building was possible to start with, then by the same logic there is only an equilibrium with all rationals cheating always.

names must be zero. Note that if there is reputation building to start with, the initial inequality must be satisfied in such an equilibrium; and, if there is not, such an equilibrium cannot result.

If not all $I2\,(R)$'s supply high quality, then it must be that

$$\beta\,(p((H)) - c_L) \leq c_H - c_L \qquad (*)$$

and

$$b_0 < pr\,(A|\,(H)) \qquad (**)$$

In order for at least some $I2\,(R)$'s to supply low quality, it must then be that reputation building was not feasible to start with, as, otherwise, $(*)$ could not be satisfied, given $(**)$[14]. The σ-cost of accessing names' markets then eliminates trading in names ■

So, when reputation building is feasible to start with, all $I2\,(R)$'s will supply high quality, while all $I1\,(R)$'s will supply low quality, just as in the absence of names' markets.

If, on the other hand, (full) reputation building is not feasible in the absence of names' markets, then, as before, all $I1\,(R)$'s will supply low quality, but now at least some $I2\,(R)$'s might supply low quality.

How does this last type of equilibrium compare with the situation in which there are no names' markets?

Proposition 4 *Say an equilibrium in which some $I2\,(R)$'s supply low qual-*

[14]Existence (for appropriate parameter values) of an equilibrium of the first type is straightforward. Existence of an equilibrium of the second type is less obvious, but it can be shown that it will exist for sufficiently low discount factors.

ity exists in the economy with names' markets[15]*, then such an equilibrium exists in the economy without names' markets, with the measure of* $I2\,(R)$*'s supplying low quality in the equilibrium of the economy with names' markets being higher than the corresponding magnitude in the case of the economy without names' markets.*

Proof. If only some (but not all) $I2\,(R)$'s supply low quality, then it must be that

$$c_H - c_L = \beta\,(p\,((H)) - c_L)$$

Now, the posterior probability that an (H)-nameholder is an automaton in the economy with names' markets is given by

$$pr^N\,(A|\,(H)) \quad = \quad \frac{b_0}{b_0 + \left(1-\lambda^L\right)} b_0 + \frac{1-\lambda^L}{b_0 + \left(1-\lambda^L\right)} \frac{b_0}{\left(1-\lambda^L\right)} =$$

$$\frac{b_0\,(1+b_0)}{b_0 + \left(1-\lambda^L\right)}$$

with λ^L designating the measure of $I2\,(R)$'s supplying low quality[16]. The corresponding expression for the economy without names' markets is

$$pr\,(A|\,(H)) = \frac{b_0}{\left(1-\lambda^L\right)}$$

[15] Such an equilibrium, if it exists, must be unique due to this indifference condition and the monotonicity of posteriors in the measure of $I2\,(R)$'s supplying low quality.

[16] The first term in the sum, for example, stands for the probability that an (H)-name be bought by an automaton $F1$. It is the product of the probability that an (H)-name is sold by an $I1\,(A)$ operator (the first term in the product), times the probability that an $I1\,(A)$ operator is matched with an $F1\,(A)$, b_0. Since matching is random and incentives both to enter the names' market as well as to purchase a name do not differ across types, a representative sample of $F1$'s will purchase the available mass of (H) names supplied by $I1\,(A)$'s.

Note that

$$pr\left(A|\left(H\right)\right) \quad > \quad pr^{N}\left(A|\left(H\right)\right) \quad \forall \lambda^{L} \in (0,1]$$

$$\frac{\partial pr^{N}\left(A|\left(H\right)\right)}{\partial \lambda^{L}} \quad > \quad 0, \frac{\partial pr\left(A|\left(H\right)\right)}{\partial \lambda^{L}} > 0$$

Defining $\overline{\lambda}^{L}$ as the measure of $I2\left(R\right)$'s such that

$$c_{H} - c_{L} = \beta\left(p\left(\left(H\right), \lambda^{L}\right) - c_{L}\right)$$

with $p\left(\left(H\right), \lambda^{L}\right)$ denoting the price of a good sold by an (H)-name bearer when a measure λ^{L} of $I2\left(R\right)$'s supply low quality.

Defining $\overline{\lambda}_{N}^{L}$ in an similar fashion for the economy with names' markets, it is immediate that

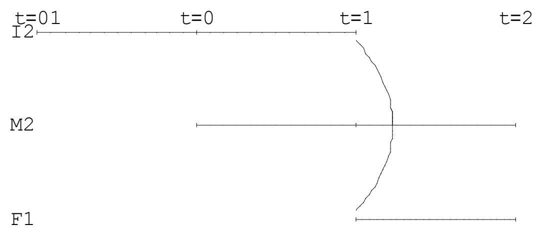
$$\overline{\lambda}_{N}^{L} \geq \overline{\lambda}^{L}$$

Note that there is no equilibrium with no names' markets and all $I2\left(R\right)$'s supplying low quality (an $I2\left(R\right)$ by deviating would convince customers that he or she is an automaton), tough an equilibrium with all $I2\left(R\right)$'s cheating might exist if names can be traded. ■

Trade outcomes actually worsen relative to the situation without trade in names. This is clearly due to the 'watering down' of good track records that trade in names induces.

4 No Trade in Names in the Absence of 'Blending'

In this section, I consider the scenario illustrated by the following diagram:



The purpose is to show how, in the absence of 'blending', there cannot be trade in names. In this economy, instead of there being one -period-lived and one two-period-lived initial generations, as in the set-up considered in the previous section, there is only one two-period-lived initial generation. In other respects, the environment is as before; in particular, only exiting agents are allowed to sell names; only new-borns are allowed to purchase them.

Proposition 5 *In this economy there is no trade in names.*

Proof. Take any two-period name. In the second and last round of product trading, any buyer confronted with an operator bearing such a name will know that it must have been bought. Consequently, this buyer's belief that the seller bearing such a name is an automaton will be given by the ratio

$$\frac{\lambda^{EB}\left(F1\left(A\right),\left(H\right)\right)}{\lambda^{EB}\left(F1\left(R\right),\left(H\right)\right)+\lambda^{EB}\left(F1\left(A\right),\left(H\right)\right)}$$

Since all $F1$'s must enter (if any enter)- by the impossibility of making automatons and rationals in equilibrium simultaneously indifferent under the short side restriction on pricing, and all buy (if any buy) -for the same reason, this ratio must equal the ratio in the original population. Now, since there is always an ε-subsample of the final generation that cannot participate in the names' market, buyers must belief in any equilibrium that a seller bearing a $\{\emptyset\}$-name after the last round of name trading must be an automaton with probability b_0. This immediately implies that the price of the two-period name under consideration must be zero. The σ-cost of entering the market prevents trade in names at a zero price. ■

Note that this result is robust to lengthening the game[17]. This reflects what appears to be a general feature of this type of models: The importance of initial conditions. In a steady state analysis this kind of problem disappears, as one can just proceed from the premise that there has always been trade in names, and, by this device, generate 'blending' in each period. In other words, it would seem that in this type of models name-trading steady states might not always be stable.

4.0.1 Longer Horizons

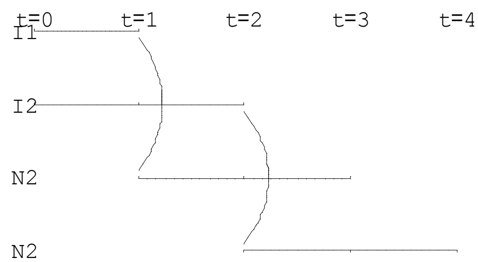
The question as to whether trade in names might become more likely as the horizon lengthens, and, moreover, whether longer game horizons allow this trade to induce less cheating (even relative to situations with reputation

[17] It might be objected that, in a more flexible model, sellers could induce 'blending' by not selling in the first period. This objection really concerns the extent to which an agent's track record is observable by buyers. In certain environments, the above objection could be met by expanding the observable track record of an agent to include all of his actions at each stage of his or her life (instead of having the observable track record include solely certain type of decisions, as is done here).

building in two periods) is, of course, a most interesting one, but one that will be left for future work.

Here I just present a simple proposition that suggests that longer horizons will not fully invalidate the above conclusions[18]:

Take the infinite horizon economy illustrated below,



Proposition 6 *If reputation building was feasible to start with, and there is a σ-cost of accessing names' markets, then there is an equilibrium in which there is no trade in names regardless of the horizon of play.*

Proof. The conditions analogous to those in the proof of proposition 1 (for the initial period) are:

Condition for some $I2(R)$'s to cheat:

$$c_H - c_L \geq \beta V((H), R)$$

[18] An obvious case in which there cannot be trade in names is the one in which customers can only observe records of length one. This follows immediately because of the absence of 'blending', and costly market access.

Condition for $I1(R)$'s to supply high quality:

$$\alpha p^N \geq c_H - c_L$$

Condition for names to be valuable:

$$\beta(V((H), R)) - V((\oslash), R)) = \beta(V((H), A)) - V((\oslash), A)) \geq p^N$$

Individual rationality conditions:

$$V((.), R) > V((.), A) \geq 0$$

where the strict inequality follows since a rational type can always mimic an automaton up to the last period, cheating then.

Combining these again leads to a contradiction, implying again that $I1(R)$'s will not supply high quality in the first period:

$$\begin{aligned}
c_H - c_L &\geq \\
\beta V((H), R) &> \\
\beta V((H), A) &\geq \\
\beta(V((H), A)) - V((\oslash), A)) &\geq \\
p^N &\geq \\
\alpha p^N &\geq c_H - c_L
\end{aligned}$$

Now, assume there is no trade in names in the future (from $t = 2$ on). Then we are practically back to the previous scenario, and we know that, when reputation building is feasible, trade in names can only take place at zero prices[19].But, then, due to the $\sigma-$cost of accessing names' markets, there won't be any trade in names to start with. If there is no trade in names to start with, there cannot be trade in names later on, as there won't be blending[20]. Thus confirming the premise we started with. ■

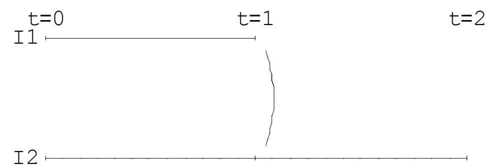
Note the importance of there being trade in names to start with. If names were initially traded then 'blending' might have resulted later on (i.e., customers might not be able to tell straight away whether a record was bought or not). More on this in the next section.

5 Erasing One's Tracks

This section looks at a worst-case scenario for trading names (short of no 'blending' scenarios).

[19]The scenario is not exactly the same, as now the final generation will live for two periods. This difference does not alter the conclusion, as, after $t = 2$, buyers will infer that anyone who carries a two-period name must have bought it, and will, hence, disregard its first entry.

[20]Note that blending just prevents trade of names at positive prices. But given that there is a cost of accesing names' markets, there cannot be trade of names under these conditions.



As the diagram above shows, there is an initial one-period-lived generation and one initial two-period-lived generation. They overlap in the first period of their lives. This allows for 'blending', but it also allows for a strategy of 'erasing one's tracks', that is, of cheating in the first period, then purchasing a 'good' name as one reaches middle-age in order to trade again in one's old age (a strategy that was not feasible in the set-ups studied previously). Moreover, it gives potential name buyers (i.e., $I2$'s) the possibility of 'constructing' their own good name as an 'alternative' to purchasing one; a possibility new-born buyers of names did not have. To simplify the arguments, I will assume that there is only a market for (H)-names, and that $I2$'s can only enter that market as buyers[21].

The question this section tries to answer is whether name trading is feasible under these circumstances, and whether, if feasible, it might worsen

[21] These assumptions do not seem to have any bearing on the substance of the claims made below, but they do rule out equilibria that look rather artificial. Say, situations where agents trade (L)-names at zero prices, etc.

trade-outcomes (via 'track erasing'), instead of improving them.

Definition 7 *A strict equilibrium is one in which agents entering the names market strictly prefer to do so. A mixed equilibrium is one in which those agents are indifferent between staying out or entering*[22]*.*

Proposition 8 *Under short-side pricing and a small positive cost of accessing names' markets, there are only two possible types of equilibria:*

1) Strict equilibria involving 'erasing of tracks' and market balance. Such equilibria result in the same level of cheating as in a situation without names' markets and reputation building.

2) Mixed equilibria with 'erasing of tracks' and market balance. Such equilibria do not change trade-outcomes relative to a situation in which there was reputation building to start with (reputation building in the absence of names' markets is necessary for this type of equilibrium behavior to obtain).

Proof.

Since, in the presence of a $\sigma-$cost of entering the names' market, no $I2$ holding an (H)-name will enter the names' market, the question is really what kind of equilibria involving $I2\,(R)$ supplying low quality and then purchasing a good name, are there, if any. The two relevant conditions in this respect are given by

Condition controlling $I1\,(R)$'s quality decisions:

$$c_H - c_L \lesseqgtr \min(\frac{\lambda^{EB}\,(H)}{\lambda^{ES}\,(H)}, 1)p^N\,((H)) - \sigma \tag{1}$$

[22] Because of the continuum of agents feature, any mixed strategy equilibrium is equivalent to a pure strategy equilibrium in which appropriate proportions of agents behave in a certain way.

Condition for $I2\,(R)$'s to choose to 'erase tracks':

$$c_H - c_L \;\geq\; \min(\frac{\lambda^{ES}(H)}{\lambda^{EB}(H)},1)p^N((H)) + \left[1-\min(\frac{\lambda^{ES}(H)}{\lambda^{EB}(H)},1)\right]\beta\,(p\,((H))-c_L)-\sigma \tag{2}$$

I will divide the argument in two parts: 1) Consider all potential equilibria with $I1\,(R)$'s supplying high quality; 2) All candidate equilibria with $I1\,(R)$'s strictly preferring not to supply high quality. In each case, I will consider three sub-cases: Excess Supply (ES), excess demand (ED), and market balance (MB).

1) $I1\,(R)$'s supply high quality: This means that

$$c_H - c_L \leq \min_{I1} p^N((H)) - \sigma \tag{1}$$

with

$$\min_{I1} \equiv \min(\frac{\lambda^{EB}(H)}{\lambda^{ES}(H)},1)$$

i) ES: This means that

$$\min_{I1} < 1; \min_{I2} = 1 \tag{4}$$

Hence,

$$c_H - c_L \leq \min_{I1} p^N((H)) - \sigma < \min_{I2} p^N((H)) - \sigma \leq c_H - c_L$$

The first inequality follows from (3); the second from (4); the third from (2) and (4). Clearly, this cannot be.

ii) MB: This means that

$$\min_{I1} = \min_{I2} = 1 \tag{5}$$

Hence,

$$c_H - c_L \leq \min_{I1} p^N((H)) - \sigma = \min_{I2} p^N((H)) - \sigma \leq c_H - c_L$$

$$\therefore\ p^N((H)) - \sigma = c_H - c_L$$

For a positive price, one needs

$$pr(A|(H)) > pr(A|(L)) = 0$$

This must be since here $pr(A|(H)) \geq b_0$ (the pool of (H)-nameholders will be made up of b_0 two-period-lived automatons, and, at most, $(1 - b_0)$ two-period-lived rationals). Note that in such an equilibrium the measure of high quality (goods') sales is always unity (since there is market balance, and demand for names comes from track erasing). Note further that reputation building in the absence of markets in names is necessary for such an equilibrium to exist, as

$$c_H - c_L = p^N((H)) - \sigma < p^N((H)) \leq \beta(p((H)) - c_L)$$

This is the equilibrium referred to in 2) of the proposition.

iii) ED: Given that there is a cost of accessing the names' market, and given that

$$p^N((H)) = \beta(p((H)) - c_L)$$

(by short side pricing), it is immediate that it is best for an $I2(R)$ to provide low quality, and not access the market for names.

2) If $I1\left(R\right)$'s do not supply high quality, i.e.,

$$c_H - c_L > \min_{I1} p^N\left(\left(H\right)\right) - \sigma \tag{6}$$

and there is 'track erasing'.

i) ES: All surplus goes to buyers, so it does not pay for $I1\left(A\right)$'s to access the market for names.

ii) ED: Analogously to the situation under ED in 1) above, $I2\left(R\right)$'s would prefer to supply low quality, and not access the names' market.

iii) MB:

$$\min_{I1} = 1 = \min_{I2} \tag{7}$$

From (6) and (7), it must be that

$$c_H - c_L > p^N\left(\left(H\right)\right) - \sigma$$

From this, all $I2\left(R\right)$'s must enter the names' market and 'erase tracks'; thus, $\lambda^{EB}\left(H\right) = 1 - b_0$. Hence, since no $I1\left(R\right)$ provides high quality, for MB it must be that $b_0 = \frac{1}{2}$. As $pr\left(A|\left(H\right)\right) = b_0 > pr\left(A|\left(L\right)\right)$, it can be that $p^N\left(\left(H\right)\right) > \sigma$. If $p^N\left(\left(H\right)\right)$ leaves some surplus to buyers of names then this can be an equilibrium under appropriate parameter values.

Note that trade outcomes do not improve even relative to a situation where there was no reputation building to start with (as only $I1\left(A\right)$'s are supplying names) [23]. This is the equilibrium referred to in 1) of the proposition ■

[23] It can be shown that for $v_H - v_L$ sufficiently large these two types of equilibria - 1) ii) and 2) iii)- will exist. In addition, for the first type of equilibrium to exist it must be that $b_0 < \frac{1}{2}$.

Here the only case in which 'erasing of tracks' does not worsen trade outcomes has agents indifferent between various courses of action, and, in so far, represents rather fragile behavior.

6 Conclusions

Obviously, there are plenty of alternative scenarios which have not been explored here (for example, what if names could be sold to the middle aged as well as new-borns?), and, more importantly, only a very tentative start has been made at studying how the results might vary as the horizon of play lengthens. However, it is still striking that, at least in the scenarios explored here, it is hard to achieve a net improvement in trade-outcomes via names' markets. What is more, the results of the last section suggest that name-trading can even be counterproductive. In fact, it is often rather difficult to get names' markets to operate at all. And all this broadly independently of any particular division of surplus (modulo the short side pricing restriction).

Admittedly, many of the features of the basic model presented in this paper are quite special, for example, there is practically no scope for smooth responses (agents either cheat or do not, enter or do not, etc.), cheating is revealing, there are compulsive do-gooders but no compulsive cheaters[24], to mention three that most likely account for the more extreme results in this paper. Nevertheless, the basic message would seem robust to all these

[24] Clearly, if there were compulsive cheaters then the trade-off between cheating by current young and cheating by current old could be weakened, as now names could be informative without there being cheating by rational youngs. This would merely amount to substitute one form of cheating for another, though.

considerations: In this type of reputational model, in attempting to improve trade outcomes via names' markets, there will be a trade off between old agents' incentives to supply high quality and youngs' incentives to do likewise. This trade-off justifies a certain scepticism regarding the ability of markets in reputations to neutralize the incentives to cheat by exiting agents.

Another feature of the analysis which might seem troubling is the posited exogenous surplus division in the names' market (note, however, that the results in the paper will obtain under **any** exogenous division of the surplus -modulo short side restriction). It seems to me, though, that in set-ups with endogenous names' pricing, one should expect the resulting 'price' effects to reinforce the'quantity' effects mentioned in the text . This in so far as in most market structures, the greater the supply of names, the lower the price names will command. This will tend to dampen the incentives to participate in the names market, and, hence, the incentives not to cheat before one's retirement. Similarly, the more cheaters there are, the higher the demand for good names, and, presumably, the higher the price those names command. Thus, here again, incentives for sellers not to cheat in their last period will be positively correlated with cheating behavior by younger sellers.

Finally, it is worth noting that some of the issues identified here would seem to carry over to pure adverse selection environments, namely, the need for 'blending' to get active trade in names, the instability of steady state outcomes, and the importance of initial conditions.

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