Smallholder Identities and Social Networks: The Challenge of Improving Productivity and Welfare

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I. Introduction

Poverty necessarily reflects relatively low productivity per capita. So perhaps the central challenge in the economics of development revolves around how to increase the productivity of the poor. Moreover, since most of the world's poor are engaged in agriculture, one might reasonably focus on understanding the economics of improving agricultural productivity. Slow and incomplete adoption of agricultural innovations has severely impeded productivity growth. A vast literature has therefore explored the factors that impede agricultural technology adoption in low-income agrarian nations, emphasizing in particular four general factors: (i) insufficient initial endowments of labor, land or finance necessary to make adoption attractive and/or feasible; (ii) natural resources management problems, especially those related to common property or open access resources; (iii) market failures that degrade the terms of trade faced by smallholders; and (iv) financial market failures that impede investment in improved production technologies or natural resource management practices characterized by significant sunk costs or higher production or price risk.[1]

Without detracting in any way from these appropriate foci, anyone familiar with rural areas of low-income agrarian nations is immediately struck by economists' general neglect of the social and psychological context in which smallholder make production decisions. It takes only a few hours' immersion in a village to become vividly aware that behavioral expectations, ritual embodied in ceremonies, tradition, and identity along dimensions of kinship, gender, ethnicity, religion, occupation, etc. play a central role in the myriad choices made by smallholders. Indeed, issues of identity and social relations seem to play a far more prominent role in low-income agrarian economies than they do in higher-income or more urban settings.[2] While much of the literature in anthropology, cultural geography, development sociology, and political science emphasizes the central role of identity and agents' social embeddedness in conditioning human agency, economists have been largely (and surprisingly) silent on these issues. This paper proceeds from the premise that this silence may impede our capacity to understand and address the challenge of improving agricultural productivity, whether measured in terms of output per worker, yields per unit area cultivated or per head of livestock, or total factor productivity. Frictions related to identity and social networks may amplify

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[1] See Feder et al. (1985) and Sunding and Zilberman (2001) for surveys of the relevant literature.

[2] Farmers in OECD nations appear relatively more socially detached in their production and marketing decisions than do smallholders in the tropics. For example, where smallholders in the South typically depend to a large degree on kin and neighbors for information, credit, insurance and reciprocal labor, Northern farmers more commonly get information from public sector extension specialists or buy it – explicitly or implicitly, bundled with inputs – from private suppliers, borrow from banks, insure themselves with financial services firms and the government, and hire workers on the open market. As a coarse generalization, it seems accurate to describe economic decisions as more socially detached in the advanced market economies than they are in the low-income tropics. I do not explore the reasons for this here, but just take it as a maintained hypothesis.

the effects of the more conventional economic obstacles on which the technology adoption literature has tended to focus.

At a very coarse, unconditional level, casual observation suggests that productivity is lower and social embeddedness higher in low-income agrarian economies than elsewhere in the world, suggesting a negative association between technological change and social networks. However, such an observation verges on the heretical in contemporary development studies, conflicting sharply with a rapidly growing literature on social capital that posits a favorable, causal link from some indicator(s) of social cohesion and embeddedness – typically associational propensity – to economic performance, commonly measured in terms of expenditures or income, as in Narayan and Pritchett (1999). Knack and Keefer (1997), for example, argue that social cohesion is more important for poorer economies because of imperfect contract enforcement capabilities via formal institutions of the state. Research that has focused more specifically on agricultural technology adoption has similarly emphasized the salutary effects of social relations, particularly in facilitating learning and borrowing from others (Foster and Rosenzweig 1995, Conley and Udry 2001, Bandiera and Rasul 2002, conley and Udry 2002, Isham 2002, Munshi 2003).

The preceding paragraph reveals the core puzzle that motivates this paper: how do we reconcile the mass of recent evidence on the salutary effects of social capital at the individual level with the casual observation that social embeddedness appears negatively correlated with productivity and material measures of welfare at more aggregate scales of analysis? Put differently, can we formulate and empirically validate an analytical framework that not only explains individual productivity or technology adoption behavior as a function of the characteristics or behaviors of others, but that also explains the aggregate properties of social systems characterized by persistently low productivity?

This paper proposes a general framework for beginning to address this puzzle. This framework, building on Akerlof and Kranton (2000), puts social and psychological phenomena on an equal footing with material considerations in trying to understand microeconomic behavior. In the second part of the paper, we introduce a few empirical examples to illustrate the basic points. Ultimately, the objective of the paper is to try to push for a more robust and useful understanding of why more productive technologies and natural resource management practices are often not adopted extensively or quickly in low-income agrarian societies where the benefits from adoption appear especially great and what, if anything, can and should be done to stimulate faster productivity growth in the socio-psychological context of such settings.

II. A General Analytical Framework

While economists have been increasingly taking socio-psychological phenomena into consideration in explaining behaviors observed in low-income agrarian societies, the dominant approach has tended toward treating these as having purely instrumental effects.[3] In the development economics literature, for example, one learns that social networks have value because they provide access to information, credit, insurance or transfers that are imperfectly provided by markets and governments. They also reduce search and transactions costs and help with contract monitoring and enforcement in settings characterized by weak legal systems and high relative costs of market participation. These observations are all surely correct.

Yet they are likely also incomplete. In particular, social networks also have intrinsic value because people care about their relationships and because those relationships help to define individuals' sense of self, the identity on which individual behavior is based. Furthermore, individuals' identity and their social networks may establish behavioral expectations – "norms" – that at least weakly constrain individual choice.[4] The concern motivating this paper is that reducing the social dimensions of smallholder microeconomic behavior to their positive instrumental effects can lead to mistaken inferences about the role and value of social relations in productivity growth and thus to misguided prescriptions for development policy.

The general analytical approach introduced here aims to nest the various instrumental effects found in the extant economics literature into a more encompassing and realistic framework wherein individuals' self-image and social relations are endogenously affected by behavior. This builds on important recent contributions by Kevane (1997), Platteau (2000) and, especially, Akerlof and Kranton (2000), who each emphasize that individuals follow equilibrium strategies based on norms of prescribed or expected behaviors that are conditional on one's (potentially evolving) identity. This opens up possibilities of identity-based rents that accrue to members of particular groups, rents that can be maintained in equilibrium only through processes of social exclusion and hysteresis. This can result in self-reinforcing, separating equilibria that may keep some groups down while facilitating accumulation by others. It also opens up the possibility of rational substitution of social harmony for material gain associated with productivity growth when communities have difficulty coordinating behaviors so as to achieve a "big push" that carries everyone (or most everyone) along together.[5] Tying the results back to the core puzzle that motivates this paper, in this framework, social capital may be

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[3] See Barrett (2003) for a fuller discussion.

[4] In the model developed in the next section, norms appear as constraints on choice, albeit constraints that can be violated at some cost in utility terms. One could alternatively model preferences as influenced by social norms, as in the recent literatures on process-regarding preferences and fairness (Fehr and Fischbacher 2002, Falk et al. 2003, Platteau 2003).

[5] This view of multiple equilibria traces roots its roots back at least to Rosenstein-Rodan (1943) and Myrdal (1957).

positively correlated with economic outcomes in the small, within a community, yet also associated with a lower-level equilibrium in the large, at the level of regions or nations.

In this framework behavior has psycho-social foundations, rooted in one's identities. Individuals typically possess multiple, overlapping identities that jointly determine their self-image. A farmer may at once be male, belong to a particular ethnic group, live in a specific neighborhood, be a secondary school graduate, tall, honest, a good father, etc. Some identities are exogenous. Characteristics such as gender, birth cohort (i.e., age over time), birth family and its history, national origin, race and other physical markings (e.g., deformities) shape one's sense of self and are inherited at birth and essentially immutable.[6] Other dimensions of identity are endogenous, effectively determined (with some lag) by the people with whom one associates and the behaviors in which one engages. These are obviously interrelated, but, more importantly, they are repeatedly chosen.

Identities inherited at birth can have permanent consequences, whether positive (e.g., the son of the village chief, born into relative wealth and power) or negative (e.g., the crippled daughter of a lower caste, illiterate family). As in all systems with multiple equilibria, initial conditions matter. That is no less true with respect to identity and the social networks that flow from the exogenous components of individuals' identities.[7]

However, the endogenous component of identity is not only adaptable, it must be reproduced through social interactions and observable actions. Someone identified as a skilled farmer gradually loses that identity unless they continue to cultivate and produce (more often than not) above-average yields; someone's identity as so-and-so's friend gradually deteriorates unless they spend time with so-and-so, etc. People have to invest in the reproduction of those endogenous identities that bring them satisfaction. They likewise must invest in the transformation of those identities they dislike into some other form they prefer.

Collective, shared identities create groups and communities.[8] Indeed the etymology of the word "community" finds its origins in the Latin *communis*, meaning "shared by all or many". Within communities, affinities emerge that influence the sharing of resources (e.g., cash, food, labor), information (e.g., job leads, observations on third parties, tips on promising new technologies) and responsibilities. The community serves not only as a

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[6] In high-income societies, people can, at great cost, change gender, remake themselves to appear considerably younger than they really are, correct deformities, etc. In the context of rural, low-income communities, these options rarely if ever exist, so inherited characteristics are effectively exogenous and permanent.

[7] LaFerrara (2003) offers a nice demonstration of the role immutably given kinship ties play in determining access to and terms of credit in rural Ghana.

[8] One could draw a finer definitional distinction, that communities are groups that share not just an identity but also resources of value, although we set this issue aside here since it is not especially germane to the present line of inquiry.

resource pool, but also as a mirror on oneself, confirming one's self-image, one's identity. Community relations are therefore not only *productive*, they are also *reproductive* in that they reinforce and thereby reproduce the collective identity that defines and sustains a community. Just as identity is multidimensional and multifunctional, so are the communities that are shaped by individuals' identities. People commonly belong at once to geographic, ethnic, religious and other communities that intersect but do not duplicate each other.

Because communities serve as a mirror on oneself, an individual's actions impact not only their communities and their self-image, but also on those of others within their communities, generating effects such as pride or embarrassment. Individual decisions affect the collective identity, generating a type of pecuniary externality. As a result, communities commonly carry behavioral expectations of their members and enforce these through shared strategies, including sanctions on internal transgressors, discrimination against outsiders, and entry costs for new members.[9] Akerlof (1983), Coleman (1987) and Kevane (1997) identify these identity-based expectations and the associated constraints on behavior as social norms. Although collectively irrational, it may nonetheless be individually rational to adhere to such norms. As a consequence, there may exist multiple equilibria in which behavioral expectations become self-fulfilling, even for individuals adversely affected by the norms. Such patterns are often manifest in separating equilibria in which collective identity – race, gender, religion, caste – serves as a signal of expected behavior, even if the identity and the behavior are not intrinsically linked (Loury 2002, Hoff and Pandey 2003, Fang and Loury this volume).

Social networks are closely related to but distinct from communities. The key distinction between networks and communities is that while the latter are the natural byproduct of a shared identity, the former requires investment to establish and maintain relationships and, moreover, an individual's investment must be matched by her counterparts. Networks are thus the manifestation of a matching process in which people come together voluntarily, and at some gross cost to themselves, while communities are associations that exist irrespective of people's investments in links with others with similar identity. The two can obviously overlap to a large degree, not least of which because shared identities – i.e., common membership in a community -- can reduce the search and transactions costs associated with matching with others. Networks likewise generate pecuniary externalities in the forms of club goods (e.g., for information that is nonrival but excludable) and demand-side network effects for many sorts of goods and services.[10]

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[9] One can even think of social sanctions as a form of optimal tariff, although development of that theoretical metaphor is left for future work.

[10] The classic examples of goods characterized by network effects are fax machines, the value of which depends fundamentally on how many other people one might communicate with via fax, and software programs where compatibility with the application(s) used by others in one's network affects the value of

A. A Behavioral Model

Consider the following dynamic optimization problem by a stylized small farmer, j. Individual j's well-being is a function in part of current expenditure, e_j, out of income earned through a chosen livelihood, savings and net borrowing and transfers. Earned income results from her production technology, resource allocation and marketing choices, c_j. Net borrowing and transfers is a product of her identity and social network. Welfare also depends on others' choices, c_{-j} , that may either affect j's material consumption directly (i.e., pecuniary externalities) or influence the focal point against which she gauges the value of her own material consumption (i.e., positional externalities[11]). Well-being also depends on j's nonmaterial experiences, in particular, one's self-satisfaction, s_j, and social relations, r_j, over the period.

Farmer j possesses a stock of material (physical, natural, financial and human) capital, represented by the composite asset A, expressed in the same units as expenditures. She also has a sense of self, an identity reflected in the vector I describing identification with a variety of characteristics such as gender, age, ethnicity, occupation, skills and other attributes that define individual identity. Identity can be multidimensional and multiscalar; the elements of I are not, in general, mutually exclusive. The flow of self-satisfaction, s, one enjoys can be thought of almost as a dividend generated by one's self-image, I. Farmer j also possesses a stock of knowledge, K, about production technologies and marketing opportunities that affect her productivity, in part by affecting her propensity to adopt improved production or marketing methods. Finally, she is embedded in a set of social networks, N, represented by a vector describing links to others. This network also generates dividends in the form of desired social relations, r.

Using Bellman's method, we can collapse farmer j's dynamic optimization problem into just two periods: current (0) and all the future (1). Given a discount rate of δ, the farmer's problem can be represented as a value function, V(·), encompassing current period utility, U(·)[12], wherein she makes current period choices as follows:

$$\max_{c_{j0},e_{j0}} V(A_{j0},I_{j0},K_{j0},N_{j0}) \equiv U(e_{j0},r_{j0},s_{j0}) + \delta V(A_{j1},I_{j1},K_{j1},N_{j1}) \qquad (1)$$

This specification of the objective function incorporates several effects one finds in the literature, notably intrinsic valuation of identity or status and social relations and the

the software to a prospective purchaser. See Katz and Shapiro (1986, 1994) for an introduction to the fundamentals of network effects.

[11] See Frank (1995) or Platteau (2000).

[12] As modeled here, preferences do not change over time. If one were to choose the alternative modeling strategy of having identity affect preferences directly (see note 4), rather than indirectly through (not strictly binding) constraints on choice, then preferences would necessarily become endogenous, varying as one's identity evolves.

possibility of interpersonal externalities due to altruism or positional externalities (Bernheim 1994, Frank 1995, Kevane 1997, Akerlof and Kranton 2000, Platteau 2000, Moser and Barrett 2003). Of particular importance to questions of technology adoption, mutual interdependence through pecuniary externalities can give rise to coordination problems and resulting multiple equilibria.

Individuals solve such dynamic choice problems subject to multiple constraints. First, as already indicated, the flows of social relations, r, and self-satisfaction, s, that j enjoys are a product of her ex ante stock of N and I, respectively, and the resource allocation choices she and others makes to exploit (or not exploit) those stocks:

$$s_{j0} = s(I_{j0}, c_{j0}, c_{-j0}) \quad (2)$$

$$r_{j0} = r(N_{j0}, c_{j0}, c_{-j0}) \quad (3)$$

Expenditures, e, are subject to the usual dynamic budget constraint. The generalized livelihood function, $\ell(c_{j0}, A_{j0}, K_{j0})$, yields physical output as a monotonically increasing function of each argument, where our interest focuses especially on j's choice of production technology.[13] Let c^{θ}_{j0}, an element of the broader c vector, represent an index of technology choices available that is, without loss of generality, ordered by technologies' total factor productivity, implying that productivity per unit land and labor is increasing in the technology index, or $\partial^2 L/\partial A \partial c^{\theta} > 0$. The standard findings of the technology adoption literature, that the probability and extent of adoption of improved technologies increase in farmers' ex ante asset holdings and knowledge, reflect the observation that $\partial c^{\theta}_{j0}{}^{*}/\partial A_{j0,}\, \partial c^{\theta}_{j0}{}^{*}/\partial K_{j0} > 0$, where $c^{\theta}_{j0}{}^{*}$ is farmer j's optimal technology choice.

Any expenditures in excess of current livelihood earnings and liquid assets, reflected in A_{j0}, must be financed through net borrowing or transfers, $B(I_{j0}, N_{j0})$. People receive loans, transfers and insurance against adverse shocks that depend upon their identity and social networks, as the extant literature demonstrates (LaFerrara 2003, DeWeerdt forthcoming, Goldstein et al. forthcoming).

The net payoffs from assets or current livelihoods, $P(I_{j0}, N_{j0})$, generate monetary value that likewise depend upon j's identity and social networks. Women or members of certain ethnic or racial groups might receive lower wages than men from other groups for the same work. Those with a reputation for honesty or quality may receive premia for their products. People with good connections may get a discount on purchased

[13] This can equally encompass marketing strategies because markets are analytically equivalent to technologies, wherein prices and transactions costs are the "production function" transforming that which one sells into things one buys. This can be seen readily through a bit more formal treatment. Describe a general production technology mapping inputs, X, into output, Y, as Y=f(X). Now, let there be another technology mapping X into another output, Z =g(X). A market provides a medium of converting Z into Y according to the relative prices, p^Z and p^Y, respectively, and transactions costs, T, such that $Y = (p^Z Z - T)/p^Y$. Of course, substitution implies $Y = (p^Z g(X) - T)/p^Y$ and $f(X) = (p^Z g(X) - T)/p^Y$ satisfies all the usual characteristics of a production function.

inputs. Furthermore, payoffs depend on transactions, search and contract monitoring and enforcement costs that are conditional on one's social network and identity (Fafchamps and Minten 2002). Because individuals differ in these dimensions, payoffs from otherwise identical decisions will vary in cross-section. Combining these different sources of disposable assets we get the following budget constraint for current expenditures:

$$e_{j0} \leq P(I_{j0},N_{j0})[\ell(c_{j0},A_{j0}, K_{j0}) + A_{j0}] + B(I_{j0},N_{j0}) - F(c_{j0}) \qquad (4)$$

where

$$F(c_{j0}) \;= 0 \text{ for } \; L(I_{j0}) \leq c_{j0} \leq H(I_{j0}) \qquad (5)$$
$$= \Phi(c_{j0},I_{j0},N_{j0}) > 0 \quad \text{otherwise}$$

The $F(c_{j0})$ term reflects fines or the monetary value of social sanctions imposed for choices, c_{j0}, perceived as transgressions of social norms. Those norms are reflected in identity-dependent higher and lower bounds on behavior, $H(I_{j0})$ and $L(I_{j0})$, respectively. Behavior within the bounds incurs no penalty. Out-of-bounds behavior, however, invites a fine or social sanction that is increasing in the offending choice's deviation beyond the expectational boundaries.[14] Sanctions from within one's own social network are increasing in network size. Punishment from outsiders is a function of one's identity; the same "deviant" actions may be punished differentially by outsiders who deem transgressions by some groups to be more threatening than the same transgression committed by another. This framework captures the fact that norms (and punishments for their violation) reflect the behavioral expectations associated with one's identity. For example, women may be expected to refrain from certain types of labor. Members of particular religious communities may be expected to avoid consumption of particular goods or services or not to work on particular days. Occupational identities likewise create behavioral expectations, as when self-identified organic farmers refrain from using chemical inputs.

Norms only weakly constrain behavior, however. They are not necessarily strictly binding constraints. One can typically violate the behavioral expectations associated with one's identity at a cost, perhaps in the form of social sanctions such as stigmatization, perhaps a physical penalty or a monetary fine.

Such penalties can be advantageous to a community in so far as they create a focal point to coordinate the selection of a relatively desirable equilibrium (Schelling 1960, Kandori et al. 1993). Consider, for example, the penalties some hill communities impose on farmers – especially those near the top of slopes – who do not maintain terraces properly. Because terraces' effectiveness in soil and water conservation depends on the mosaic of structures along the whole toposequence, there are essentially two stable equilibria on a hillside: everyone terraces and enjoys superior productivity, or no one terraces. Penalties for those who fail to maintain their portion of the hillside can be

[14] See Akerlof (1980) and Bernheim (1994) for alternative approaches to thinking about how groups penalize individuals who deviate from social norms.

understood as a means to focus all members of the community on the more desirable equilibrium. They are a coordination mechanism.

Of course, rule enforcement creates a second order free riding problem, in that everyone would rather that others enforce the rules than that they do it themselves, so long as their nonenforcement is not known to others. Hence the place of public punishment. The social ritual of sanctions or fines ensures everyone knows not only who adheres to the rules, but also who enforces the rules. If adherence to and enforcement of rules helps define identity, the free riding problem gets resolved by making it in each person's interest to enforce rules.

In addition to the constraints on current expenditure, choice is made subject to an understanding of the laws of motion for the endogenous A, I, K, and N stocks. A central observation that undergirds this general framework is that the farmer's current choices affect the assets she carries into the next period, her sense of self, the accumulated knowledge on which she can draw, and the social networks of which she is a member. Put more succinctly, our choices have psychological and social consequences as well as informational or physical effects. Farmer j takes this into account, as discussion with virtually any small farmer in the tropics would confirm. The law of motion on A written here in quite general form, is quite standard:

$$A_{j1} = a(A_{j0}, e_{j0}, c_{j0}, c_{-j0}) \qquad (6)$$

Asset stocks evolve in response to j's choices and those of others around her, with current expenditures having an especially prominent effect through both financial savings and consumption that doubles as an investment in productive assets, as is the case with food consumption that contributes to good health.

The more interesting dynamics for present purposes emerge from I, K, and N. One's future identity, I_{j1}, depends on not only one's self-image at the start of the current period, I_{j0}, but also on one's choices over the course of the period, others' choices and one's social relations, each of which could either reinforce or threaten one's sense of self. This implies

$$I_{j1} = i(I_{j0}, r_{j0}, c_{j0}, c_{-j0}) \qquad (7)$$

If identity is mutable and well-being depends on one's sense of self, then this law of motion may limit farmers' willingness to choose new technologies that would conflict with one's self-image and social relations. Conversely, if others in one's social network are trying new production or marketing methods, one may be inclined to follow in the interests of social conformity.

The literature has increasingly admitted the importance of the endogeneity of social networks in villages. Let the law of motion for social networks take the form

$$N_{j1} = n(N_{jo}, I_{j1}, c_{j0}, c_{-j0}) \qquad (8)$$

A significant empirical literature establishes that social networks form endogenously around collective identities associated with gender, church affiliation, ethnicity, kinship neighborhoods, etc. (Grimard 1997, Conley and Udry 2001, Bandiera and Rasul 2002, Hogset 2002, Murgai et al. 2002, Santos and Barrett 2004, De Weerdt forthcoming, Goldstein et al. forthcoming). So one should expect social networks to adapt in part to changes in individuals' identity, as when one changes churches, jobs or residences. Moreover, as was emphasized previously, the distinction between membership in different communities, which occurs costlessly as a by-product of the identities one shares with others, the size of one's social network depends on the resource allocation choices one makes and the corresponding choices others make, perhaps especially with regard to how people spend time. Those who allocate an increasing share of their labor to work on their own farm typically have to reduce the time they spend with others, implicitly depreciating their social network capital in order to invest in greater on-farm physical output. If the value of maintaining network size is great, the opportunity cost of even uncompensated labor may be considerable and impede the adoption of labor-intensive technologies.

New technologies or management practices almost always require significant new learning in order to achieve maximal productivity. We capture this effect by endogenizing j's stock of productive knowledge about different livelihoods. K evolves in response to social relations that bring potentially informative interactions with others, one's own experiences and the activities of others:

$$K_{j1} = k(K_{j0}, I_{j0}, I_{-j0}, r_{j0}, c_{j0}, c_{-j0}) \tag{9}$$

with $k(\bullet)$ weakly increasing in K_{j0}, reflecting classic concave learning curve effects. Knowledge is produced in part through social interactions within a village as farmer j is exposed to experiments within her social network to the extent she relates with them (r_{j0}) and they innovate (c_{-j0}).[15] This formulation underscores that social learning can have mixed consequences for an individual farmer's incentive to adopt more productive methods, as Foster and Rosenzweig (1995) and Bandiera and Rasul (2002) emphasize. People have better access to information about a new technology the more extensive their social interactions and the greater the similarity amongst them, ceteris paribus (Pomp and Burger 1995, Rogers 1995, Conley and Udry 2002, Romani 2002). But they also then have a greater incentive to delay their own costly experimentation with a new technology in order to free ride on others' experiments.

The quality of the communication, and thus of knowledge transmission, further depends on j's identity and the identities of the others in her social network because the nature of

[15] Feder and O'Mara (1982) and Feder and Slade (1984) provide some early economic evidence on social learning's role in technology adoption. Rogers (1995) provides a brilliant summary of the literature from other social sciences on the diffusion of innovations, emphasizing especially the importance of social relationships, norms and intra-community similarity, which Rogers terms "homophily", defined as (p. 286) "the degree to which a pair of individuals who communicate are similar. The similarity may be in certain attributes, such as beliefs, education, social status, and the like." The opposite is "heterophily", the degree to which two or more individuals who interact differ.

ties matters to the diffusion of knowledge.[16] Rogers (1995) emphasizes that more effective communication occurs when individuals are homophilous – possessing similar attributes – and that effective communication leads to greater homophily, in a reinforcing feedback loop. Homophily therefore accelerates the diffusion of innovations *within* a network.

Yet homophily may also limit initial innovation within networks because there are few openings through which new methods can enter the community. Consistent with Granovetter's (1973) notion of "the strength of weak ties," heterophilous interactions are essential to transmission of information regarding innovations *between* networks and to the organization of individuals into politically based movements to advance collective goals (Granovetter 1982). Yet a high degree of heterophily often implies less interpersonal trust, which may make interpersonal communications relatively inefficient and thus slow diffusion *within* a network.

This suggests a delicate balance in the nature of social networks and identity within villages. Innovation ought to occur more quickly and diffuse more broadly within relatively homophilous networks containing a few individuals whose multiple identities link them "weakly" to other networks, providing a bridge for information transmission between networks whose internal social structure – bonds or strong ties – then promotes rapid transmission. These bridges – labeled "opinion leaders" or "change agents" by Rogers (1995) – play a central role in diffusion by initiating change within their network(s). The early innovator benefits from reinforcement of his self-image as a leader, while members of his social network benefit from the information his experiments with the new technology generate. Early adoption and rapid diffusion are an equilibrium outcome in such networks. By contrast, a high degree of homophily in a system can inhibit information transmission between networks, generating something akin to autarky, manifest in separating equilibria, with some networks in a low-level equilibrium of low productivity. As Granovetter (1982, p. 106) puts it, "social systems lacking in weak ties will be fragmented and incoherent. New ideas will spread slowly, scientific endeavors will be handicapped, and subgroups that are separated by race, ethnicity, geography, or other characteristics will have difficulty reaching a *modus vivendi*."

The preceding system of equations (1)-(9) thus specifies a reasonably general dynamic behavioral model that nests within it all of the key instrumental effects attributable to individuals' social attributes and identifying characteristics that one can find in the literature on economic development. Such a general analytical framework is admittedly unwieldy for exploration of specific micro-level topics that require more structure and simplification to become empirically tractable. Nevertheless, this broader

[16] Romani (2002) offers a nice empirical demonstration of this point, showing how rural Ivorien farmers' ethnic identity conditions access to information not only from extension agents bringing in information from outside the community, but also from neighbors with a different ethnic identity.

contextualization of the socially embedded choice problem faced by smallholder farmers in low-income agrarian settings, that takes seriously both the material constraints and incentives they face and the endogenous evolution and intrinsic valuation of self-image and social relations, enables some reconceptualization beyond the limits of much of the current literature. This is necessary if we are to begin to answer the core puzzle that motivates this paper: how do we reconcile micro-level empirical evidence in support of the claim that social capital stimulates technology adoption and productivity with what seems a negative correlation between these outcomes and social embeddedness at the macro-level?

B. Some Implications of the Framework

The preceding behavioral model offers merely a reasonably precise structure for thinking through how individual identity and the social networks to which people belong influence individual behavior, especially with respect to choices to improve physical productivity. I leave detailed, formal exploration of the model for future work. Here I merely want to highlight several intriguing and intuitive implications about the relationship between social embeddedness and smallholder agricultural productivity and welfare that merit brief comment.

(i)Productivity and expenditures are increasing in one's density of social networks and for those possessing particular identities (e.g., men, racial or ethnic elites) that grant them preferential access to information, finance or better net terms of trade. Differentiation of the system of equations (1)-(9) with respect to I_{j0} and N_{j0} yields these familiar hypotheses regarding the instrumental benefits of social networks and privileged identities. Productivity differences arise due to differences in net payoffs, $P(I_{j0},N_{j0})$, and faster learning. Expenditure differences arise not solely due to productivity gaps, but also from improved access to informal finance in the form of loans, social insurance and gifts. In low-income agrarian communities where formal financial systems routinely fail to provide the services needed by smallholders, this informal finance role of social networks and identity can generate significant benefits.

(ii) Social networks and identity nonetheless confer intrinsic benefits, not just the instrumental value manifest in increased productivity and expenditure. It's not only true that friends make gifts; it is equally true that gifts make friends, even family (e.g., through dowry payments). People routinely make tradeoffs between the two. For example, Osterloh (2002), studying microfinance institutions in rural Kenya, finds that local credit committees are commonly much more concerned about maintaining cohesion within the social network, and especially with not offending powerful members of the community, than with rejecting risky credit applications or enforcing loan repayment, as the theory of peer monitoring and group lending posits (Stiglitz 1990). People's desire for social acceptance and confirmation of their own self-worth affect behaviors. Behavioral change can create switching costs because of the endogeneity of social relations and identity. Many of the narratives assembled in the World Bank's recent *Voices of the Poor* project emphasize that material deprivation – poverty – may make affirmation of one's proper place in society, through costly religious rituals, gifts, entertainment and others acts of hospitality, that much more important (Narayan and Petesch 2002).

(iii) Identity-dependent behavioral expectations constrain choice, especially where financial market failures constrain individuals' ability to absorb the short-term costs of both technology adoption and social sanctions. Farmer j's best response functions are thus necessarily based on her identity – how she and others see herself – and on others' subjective expectations on how those possessing her identity will act. Consider the following stylized example based on several real cases I have observed in different countries. An uneducated woman is expected to tend to her family's food crop. She is not expected to cultivate a high-value cash crop. Therefore, no one bothers to tell her about it or to help her learn how she might break into this promising new market. Knowing others' expectations, and not wanting to suffer the embarrassment of shocking or even offending people by asking about the crop or by struggling with it on her own, she rationally opts not to adopt the crop, even though there is no biophysical reason why she couldn't cultivate it and even though the returns to the crop are manifestly superior to the food crop she grows instead. Just as social networks can facilitate communication of valuable new information, so too can they facilitate the flow of erroneous or unnecessarily restrictive behavioral expectations that, when responded to rationally, effectuate precisely the anticipated outcome, even if they embody errors of judgement. Social networks can thus reinforce adverse equilibria associated with social control through identity, just as they can facilitate movement to superior equilibria.

This framework offers another lens through which to view the standard positive relationship between ex ante material wealth and one's propensity to adopt a new technology or product. As A_{j0} increases, j can better afford to incur the identity and social network costs associated with behavioral change, including necessary future investments in creating new social relationships and in reinforcing a new identity (e.g., as a French bean contract farmer for a European supermarket chain rather than as a maize producer like her neighbors). Those who start out poor may find it difficult to finance such change. As a consequence, the poor must often take their inherited identity as given and operate within that less remunerative and more restrictive nexus.

(iv) Movement to a higher productivity equilibrium then often depends on bold individual action or coordinated action among a critical mass of members within a community. People can and will break out of ex ante social norms when the associated sanction costs are low, their capacity to absorb those costs is high, or the attractiveness of breaking free of the behavioral bounds of their identity becomes too great to resist. If enough people violate behavioral norms, the shared identity shifts and social norms evolve endogenously.

This is a classic coordination problem. The key to coordination is communication, commonly through social processes such as public ritual (Chwe 2001). The value of public ritual comes not from unidirectional transmission of information, as we commonly think of information flow, but from the production of common knowledge, from letting all members know what the other members know, that they know that they now, and so on *ad infinitum*. If an individual's return to an action – weed or pest control, water management, terracing, starting up production of a high-value but perishable crop requiring coordinated, bulk evacuation, etc. – increases in the number of other people taking the same action, then multiple equilibria arise naturally. One equilibrium commonly involves no one adopting, because the action has negative payoff in isolation. Another involves coordinated adoption of the choice because the payoff to each individual participant is positive only so long as others do likewise.[17] Where networks based on "strong ties" are relatively weaker in accessing knowledge from outside the network, they function more effectively in generating common knowledge.[18] Common knowledge is essential to cooperative behavior to resolve collective action problems (Ostrom 1990, Baland and Platteau 1996, Chwe 2001, Bowles and Gintis 2002).

Yet one must guard against an overly romanticized view of social networks and common knowledge, since communities can equally prove exploitative or dysfunctional (Agrawal and Gibson 1999). The more bounded the network, meaning the greater the role of strong ties – also known "social closure" in the sociology literature – the greater the power conferred on individuals in position of internal authority. Such power can be exercised directly or indirectly, through one's influence over third parties who independently interact with a partner (Basu 1986). The result may be unwanted regimes that persist because of interpersonal conjectures and an absence of outside contacts. Researchers and development practitioners have not yet developed any reliable rules of thumb for telling the difference ex ante between those communities whose social structures prove hospitable to promoting innovation and those that prove inimical.

In many low-income agrarian settings, public ritual is commonplace. Religious ceremonies, taboos, exacting social protocols, and the like have evolved over long periods of time as means to coordinate individual activity. The ritual life of villagers can create a strong focal point around established production practices, making it more difficult to coordinate mass movement to a different set of practices. Homophilous communities within which information flows relatively quickly and accurately can

[17] The industrial organization literature on network externalities revolves around similar phenomena and the existence of multiple equilibria. See Economides (1996) for a good survey.

[18] Chwe (2001, p.65) offers this insightful contrast, "[T]he idea that weak links are always better for communication relies on the assumption that communication is about 'first order' knowledge only and not about knowledge of what others know. Weak links might be better for communicating widely, but strong links are better at forming common knowledge locally. When there is no issue of coordinated action and hence common knowledge, weak links are better … For social coordination, however, strong links have an advantage."

therefore be somewhat impervious to the introduction of new technologies if these are not individually rational in isolation from others' behaviors. This likely helps explain why it has been so difficult to promote many improved natural resources management practices – such as terracing, rotational grazing, biological control of pests and weeds – that exhibit considerable pecuniary externalities without either (i) creating large group work parties that coordinate the work across many farms, (ii) securing the enthusiastic support of the community leadership, or (iii) relying on very large farms almost exclusively (Barrett et al. 2001).

(v) Strong social networks often contain within them the seed of egalitarian pressures that can impede investment by creating very high *de facto* marginal tax rates. Strong social networks depend on highly personalized relationships which naturally engender regular interpersonal comparisons to establish status. In such environments, relative positions commonly matter, perhaps as much as or more than absolute levels. Positional externalities permeate behavior within networks, but are commonly absent when comparing across networks. In the presence of positional externalities, socially inefficient equilibria can emerge as efforts to keep up with the neighbors induce mutually offsetting individual investment in the production of status, often through symbolic sacrifices in lieu of physically productive investments (Frank 1995, Platteau 2000). Positional externalities also naturally give rise to redistributive norms that "may be interpreted as a form of taxation designed to curb positional race for status, that is, as a device that compels them to take positional externalities into account in their choices" (Platteau 2000, p. 196).

Such social taxation creates an incentive to hold wealth in forms suboptimal for growth. Cash holdings tend to be most vulnerable to social claims, so members of egalitarian networks often consciously limit their liquidity as a means of defending themselves against claims from other members of the network (Platteau 2000). This can involve investment in relatively illiquid physical assets (e.g., land, livestock) or in extensive, costly ceremonial activities that seem excessive on their surface. The induced portfolio structure then exacerbates working capital constraints to production and investment, hurting productivity, and leaves few liquid assets with which to handle serious shocks.

In summary, when payoffs may depend on individual identity and social networks that also carry intrinsic value, there may be rents associated with membership in particular communities. These rents need not be equalized across communities because of nontrivial barriers to changing one's identity and leaving or joining new social networks. The social and psychological context of village life thus matters to the task of improving the material productivity of low-income rural communities. A serious challenge arises because the spontaneous introduction of new ideas, methods, practices and technologies into a community depends on weak ties, as does individuals' freedom to seize new opportunities without either imposing welfare losses on others, due to positional externalities, or incurring prohibitive social taxation. Yet rapid and accurate transmission of such information within the community and resolution of coordination problems depends on strong ties. Maintenance of homophily can be valuable but can also come at a cost of parochialism because it implies barriers to trade – in ideas, finance, labor and products – with other groups. Intuitively, there is some optimal balance of inclusion and exclusion, of weak and strong ties. From a practical standpoint, however, we currently know next to nothing about what the right balance is nor how to bring it about or maintain it once it is achieved.

The strong ties that typify many low-income agrarian communities can generate the puzzling pattern that motivates this paper. Productivity and welfare can be increasing in the small, i.e., within a community, the larger an individual's social network density. Yet in the large, i.e., across communities and nations, homophilous communities with rich traditions of ritual that coordinate behaviors and impede communication with and trust of outsiders, productivity and welfare can be negatively correlated with social embeddedness. Since most econometric work (rightly) employs community-specific fixed effects to control for unobservable inter-community variation in prices, agroecological conditions, physical infrastructure and the like, these studies inherently estimate only the within-community effects of social networks, hence generating the customary, positive estimated effect of social networks on productivity or welfare measures. Yet, between-community variation – perhaps especially in preferences and expectations – may hold the key to understanding differences in performance more generally, as Henrich et al. (2001) suggest in studying variability in individuals' response to bargaining, dictator and ultimatum games played in 15 different communities in 12 different countries.

III. Some Sample Puzzles

The preceding approach is far too general to lend itself to specifying and estimating econometric models in an attempt to identify specific effects, especially given the considerable identification problems plaguing social interactions models (Manski 1993, 2000, Brock and Durlauf 2001). The framework is nonetheless useful as a guide for thinking through the prospective determinants of cross-sectional variation in agricultural productivity between households and villages and around the world and for informing more qualitative empirical research.[19]

In that spirit, I employ this framework to explore some particular puzzles I have encountered in rural Africa regarding adoption or nonadoption of improved technologies and natural resources management practices. The following examples help

[19] It can also help guide data collection so as to provide appropriate controls and instruments in order that quantitative researchers might properly test for particular social or psychological effects using model specifications sufficiently general so as not to conflate related but distinct phenomena (e.g., mimickry or social conformity) with hypothesized phenomena (e.g., social learning).

illustrate why people might freely choose not to engage in behaviors that could prove materially beneficial or to undertake others that cause manifest material loss, sacrificing predictable productivity gains due to the psycho-social context in which they find themselves. These are followed by examples of strategies I have observed that seem to facilitate the development of identity and social relations that help foster productivity gains.

A. Foregoing significant productivity gains

Smallholders' identities and the social networks in which they participate have an inherently complex relationship with the adoption of productivity enhancing technologies or practices. The following two brief examples of large prospective gains foregone offer contrasting perspectives, the first illustrating how identity and social networks can impede adoption, the other how the absence of strong social ties can be a barrier to productivity improvements.

(i) Conformity, tradition and rice intensification in Madagascar

Madagascar is a rice economy, with more than half of all cultivated land planted in the grain and some of the world's highest rates of per capita rice consumption in spite of also being among the world's poorest countries. In spite of the Malagasy obsession with rice, yields are very low. As a consequence, the nation's rice farmers are in aggregate net buyers of rice (Barrett and Dorosh 1996). Quite a few different methods of rice intensification have been promoted in Madagascar over the past twenty or so years, but none has yet gained a sufficiently solid foothold to improve productivity appreciably. Over more than a decade of research in rural Madagascar, I have gradually come to the conclusion that Malagasy smallholder identities and social networks are one of several key factors that inhibit productivity gains.

Among rural Malagasy, the invisible is often more important than the tangible. They care not only about material satisfactions, but also about spiritual, social and moral phenomena. And they willingly pay dearly for these. Although highland Malagasy farmers say they cannot afford inorganic fertilizers or improved seed, they routinely pay extraordinary sums to exhume and reshroud dead ancestors every 3-5 years – an elaborate ceremony known as *famadihana* – and to travel long distances and contribute significant sums for *famadihana* for even distant relatives' ancestors.

Further underscoring the social and spiritual importance of death rituals among the Malagasy, several ethnic groups have strong behavioral expectations that households will sacrifice cattle when a household member dies. But because rice productivity is strongly increasing in cattle ownership due to manuring and animal traction services that are imperfectly tradable, livestock sacrifice implies a long-term productivity decline for the household, thereby increasing the probability of subsequent undernutrition and illness leading to death, creating a vicious circle. Freudenberger (1999) describes the sorts of spirals into which families descend when infectious disease strikes a household , concluding that "[t]he practice of zebu sacrifice is a fairly certain guarantee that almost no families will be able to accumulate sufficient cattle to adequately fertilize their fields and almost all are condemned to a vicious circle of inexorable and (for some) deepening poverty" (p.21). Perhaps most surprisingly, there is great resistance to change this behavioral expectation in spite of its obvious, and sometimes catastrophic, cost. The numbers of cattle sacrificed seems to have decreased very slowly over the years, as people have become poorer, gradually lowering the range of socially acceptable sacrificial behavior. But the strength of ethnic and spiritual identity has induced astonishingly high tolerance for productivity loss in the name of conformity with behavioral expectations.[20]

Malagasy rice cultivators have also resisted productivity improvements associated with Green Revolution technologies – improved seed and chemical fertilizer use – due to cultural practices that help reproduce collective identity.[21] The Malagasy practiceelaborate systems of taboos (*fady*) regarding work rhythms, and these *fady* constrain adoption of improved rice technologies. For example, due to a precolonial history of extensive slavery on the island and a colonial history of forced labor by the French, manual labor for others is considered demeaning among some of Madagascar's ethnic groups, particularly the Sihanaka of the Lac Aloatra region, Madagascar's granary. Because its adverse effect on one's self-image and social standing made wage labor relatively unattractive, local labor supply was sparse and seasonal migrants from other ethnic groups – less averse to wage labor, more desperate, or both – began arriving in Alaotra. Landowners found cheap migrant workers to be very effective, gradually replacing reciprocal work groups with seasonal hired labor. But the commodification of labor dealt a blow to social interaction within the Sihanaka community, leading to the invocation of ancient taboos limiting the days one may work in rice fields and when outsiders may enter a village. Agricultural extension agents and researchers typically view such taboos as indicative of the backwardness of the Sihanaka because they impede adoption of improved production technologies that fundamentally change work rhythms, perhaps especially for women. But Jarosz (1994) makes a strong and logical case for the rationality of taboos as an instrument for enforcing the allocation of time to women's rainfed crops and, especially, to socialization. Taboos embody behavioral expectations and penalties for transgressions, as well as the intrinsic value of social relations, all of which serve to cement collective identity. As Jarosz (1994, p.448) puts it, "[a]dherence to taboo days expresses what it means to be human: taking time to socialize at the market, to drink rum, to braid one another's hair, and to rest."[22]

[20] Cattle sacrifice for funerals has similarly been linked to productivity declines and households' fall into poverty in western Kenya (Kristjanson et al. 2003, Mango et al. 2004).
[21] This paragraph draws heavily on Jarosz (1994).
[22] Taboos, perhaps especially the keeping of a large number of days of religious observance during which it is forbidden to work, can be found in many other places as well. Ethiopian religious holidays, to pick just one example, are a notoriously great drain on household labor endowments.

Most recently, hopes for improvements in Malagasy rice productivity have hinged on adoption of the system of rice intensification (SRI), a suite of agronomic principles and practices requiring no purchased inputs (i.e., SRI uses standard seed and no chemicals). SRI was developed in Madagascar in the late 1980s by a French missionary priest and has been shown repeatedly to generate double (or more) the yields of traditional rice methods on farmers' fields.[23] Yet in spite of aggressive efforts to extend the technique around the island, adoption rates remain very low. While there are several economic explanations for this,[24] when I have posed this puzzle to Malagasy, even to scientists with western graduate training, by far the most common hypothesis I hear is that SRI's visibly different transplanting, weeding and water management practices conflict with the "ways of the ancestors". Given the centrality of lineage to Malagasy self-image, tradition becomes important, reflecting one's ancestral identity, and may well impede sharp, rapid changes in cultivation practices, although I would expect these to evolve over time, much like practices of zebu sacrifice. Moreover, Moser and Barrett (2003) find economically and statistically significant social conformity effects once one controls for learning from one's neighbors and from extension agents. Malagasy smallholders appear to choose their cultivation practices in part to conform to local behavioral norms, even if it means sacrificing gains in expected rice output.

Because Malagasy patterns of material consumption and production indeed obey the basic laws of consumer and producer theory, respectively, it is tempting to rely exclusively on that framework, as I have in the past. Yet one cannot help but liken this to the problem of a fat lady in a corset;[25] the result may be sparse and elegant, but it is nonetheless so restrictive that it does violence to the underlying reality. So many different cases of persistently low rice productivity in Madagascar seem to have some partial explanation in the psycho-social context of village life in that wonderful island nation that it seems imperative to admit such phenomena into any credible economic model intended to inform agricultural productivity policy in the country.

(ii) Striga control in Kenyan maize systems

In contrast to the preceding case, let me now describe a case where the *absence* of strong social networks poses a serious barrier to improved agricultural productivity. Nutrient-depleted soils in sub-Saharan Africa are becoming infested with the parasitic weed *Striga hermonthica*. CIMMYT (2003) and Kim (1991) report estimated yield losses of 20-90% on fields blighted by *Striga*, generating cumulative productivity losses of more than US$1 billion annually from more than 100 million people in maize, millet, sorghum and cowpea farming households across sub-Saharan Africa. Prevention of *Striga* encroachment depends on maintaining high soil fertility and moisture, which is difficult

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[23] Econometric evidence indicates that shifting to SRI, holding all field and farmer conditions constant, yields, on average, an output increase of more than 84% (Barrett et al. 2004).

[24] See Moser and Barrett (2003) and Barrett et al. (2004).

[25] Image drawn from Monroe (1994).

in rainfed lands with infrequent rotation or fallowing. Once established, "witchweed", as it is understandably called in the western and central Kenyan farms where I have most frequently encountered it, has proved resistant to conventional methods of weed control via herbicides and hand or mechanical weeding, not least of which because a single *Striga* plant produces thousands of seeds that can remain dormant but viable in the soil for many years. *Striga* is difficult to eradicate because a single surviving plant can recolonize a large area in a single season. And with so many seeds, it spreads readily from farm to farm.

The most promising current method of eradication involves planting a non-host crop, such as the multi-purpose fodder legume *Aeschynomene histrix*, which provides soil nutrient replenishment services through atmospheric nitrogen fixation, as well as nutritious feed for grazing livestock. *A. histrix* is, however, completely resistant to *Striga* and thus functions effectively as a "trap crop", inducing suicidal germination by witchweed seeds that cannot parasite it and thus die (Tarawali et al. 2003), cleansing the soil of the weed in fields that are planted wholly in *A. histrix*[26] for a fallow period of one or two years. A rotation of the leguminous fodder over the whole farm can substantially and sustainably reduce *Striga* infestation, thereby generating significant yield gains. Yet I have only seen a few farms try this and only one community where it was widespread.

Striga control poses a classic coordination problem that is difficult to resolve in heterogeneous communities because of households' differential incentives to invest in weed eradication (Hogset 2003). The efforts of an individual small farmer working to block the entry of (or to eradicate) *Striga* on his fields are an increasing function of neighboring farmers' efforts at weed control, either through maintaining soil fertility and moisture prior to the entry of *Striga* or through rotational planting of *A. histrix* to induce suicidal germination by established witchweed. It has proved exceedingly difficult to organize communities to combat *Striga* in spite of the weed's considerable costs. This seems to be especially true in villages with large numbers of recent immigrants, inter-clan frictions and other social phenomena that dampen the strong ties necessary to resolve such coordination problems. The one village in which I heard of widespread, coordinated (and seemingly effective) efforts at *Striga* control is an ethnically homogeneous community where a charismatic local elder gathered all the adult men to talk about the problem and to make each of them commit publicly to working in teams to seed a trap crop on a portion of every farm. Absent establishment of coordinated traditions of soil fertility replenishment and crop rotation involving a trap crop, it may be difficult to achieve considerable maize yield gains from improved cultivars or market access.

[26] Another non-host crop (e.g., soybean) can serve the same function.

B. Strategies to facilitate gains

The preceding two examples underscore the nonmonotonic relation between social embeddedness and low productivity: too little social cohesion can lead to coordination failures while too much can impede uptake of novel cultivation practices. The next two examples similarly illustrate strategies I have seen smallholders follow to improve productivity, the first relying on the escape from incumbent social entanglements, the second based on exploiting social networks and reshaping farmers' sense of self.

(i) Boarding schools for poor children

Poor rural families commonly spend stunningly large shares of their disposable income to educate their children. As a father of five children educated in free public schools, I have always been struck by the effort and resources many poor farm families put into funding their children's attendance at distant boarding schools when much cheaper, local options are available.

Surely, school quality differences are a part of that story. But some utterly unsystematic, qualitative empirical evidence suggests to me that school quality differences do not wholly explain this pattern, indeed they might not even be the most important explanation. I came to this realization in a conversation a couple of years ago with a farmer in central Kenya who expressed surprise at my assumption that the boarding school his son was attending must be markedly better than the nearby government school. No, he explained, the local school was quite good. But if his son had stayed here, he would become acculturated in local ways. The father wanted to remove his son from the local social environment and to embed him in one characterized by greater ambition and higher expectations for performance. In effect, he wanted to shape his son's emerging identity so that he would think of himself as productive and ambitious, measure his self-worth by material performance, and establish a social network of others with similar self-images and motivations. The cost to the father of breaking from his social milieu himself was prohibitive, so he dismissed out of hand the possibility of moving or breaking ties with family and friends. But he wanted to mark his son with an identity other than that of his birth community and in order to do so, he had to invest a significant sum in sending him off to a good-but-not-great boarding school.[27]

(ii) Farmer field schools

The field of adult and extension education has gone through dramatic philosophical change over the past two decades, owing in large measure to the disappointing

[27] The contemporary literature on schooling in the U.S. underscores some of these same patterns. For one recent example in the popular press, see the *New York Times* op-ed piece by Herbert (2003). The concern is that in some social communities, often defined by racial collective identity, investing effort in acquiring a good education can cost a child his identity and induce social sanctions. In this view, kids slough off at school because they face an identity-conditioned behavioral expectation – by others and themselves – that performance will be low. Peer effects and the biases of outsiders both create expectations to which people respond in equilibrium (Loury 2002, Hoff and Pandey 2003).

performance of old transfer-of-technology models of agricultural extension in the low-income world.[28] Currently, there exists great enthusiasm for the "farmer field school" (FFS) model, although it seems to have been subjected to limited careful performance evaluation to date.

The farmer field school method emphasizes shared experiential learning and experimentation intended to boost people's confidence and their ability to learn about their own system. FFS methods have been employed widely in promoting integrated pest management (IPM) and integrated soil fertility management (ISFM) practices in southeast Asia. My experience with them has mainly come in east and southern Africa.

From my casual observation, and according to FFS philosophy,[29] FFS do not aim to impart new technologies to farmers, so much as to change farmers' sense of self, in particular to stimulate their eagerness to experiment on their own farms and to build their confidence in their own capacity to learn and adapt methods suitable to their specific circumstances. This, of course, is not an easy transformation to ignite. Part of the secret of FFS' apparent success in some places likely lies in the creation of common knowledge about experimentation within the community.

By drawing farmers together on a weekly basis for mutual discussion and observation, the FFS not only enables them to acquire first-order knowledge about others' experiments, perhaps more fundamentally it transfers second-order knowledge that many others also know this, and that they know that they all know this, thereby validating a new approach to agriculture through the social ritualization of experimentation. Based on my limited observation of FFS in action and discussions with a number of agricultural researchers and NGO field staff with greater operational familiarity with FFS, most of the farmer instructors in FFS do not teach very well. So it seems unlikely that neighbors learn much in the way of new methods from one another directly, at least not more effectively than from trained extensionists under old transfer-of-technology methods.

Yet the evidence keeps pouring in that FFS work, albeit not in all settings.[30] Yields appear often to increase in the neighborhood of 10-20 percent or so among participants, as compared to control groups, while expenditures on inputs such as chemical pesticides and fertilizers fall, generating net gains in excessive of gross output gains (Barsman and Desilles 2002, Jones 2002). Moreover, measured rates of diffusion beyond FFS

[28] In a similar spirit to what follows, Munshi (2003) uses data on adoption of high yielding rice and wheat varieties in India to argue that first-order social learning is weaker in heterogeneous populations, especially when the performance of the technology in question depends on adopters' unobservable individual characteristics.

[29] See, for example, FAO (2000), Barrett et al. (2001), Barzman and Sesilles (2002), Jones (2002), or any number of issues of LEISA magazine.

[30] See Rola et al. (2002) and Feder et al. (2004) for studies that use quantitative survey data to question the efficacy of farmer field schools in the Philippines and Indonesia, respectively.

participants have been extraordinarily high. Jones (2002), for example, reports that for each FFS participant introduced to IPM methods, roughly 13 were estimated to take up the practice ultimately due to the launch of the FFS program. If FFS indeed prove effective, as they often seem to, I hypothesize that much of the efficacy can be attributed not to first-order learning about technologies from others, but rather from the production of second-order learning associated with common knowledge that facilitates collective identity transformation with the support of extant social networks. FFS seem to create an effective coordination mechanism.

These few, brief, informal examples illustrate how social embeddedness can indeed foster significant productivity and welfare improvements, as in the examples of coordinated action for *Striga* control and farmer field schools. But they also illustrate how social embeddedness can impede productivity gains, in the cases of rice intensification in Madagascar and the social impetus to send children away to boarding schools. Smallholder strategies appear heavily conditioned by the psycho-social context in which they make crucial production, marketing and investment decisions, with that context as often as not impeding productivity growth in spite of the common finding of the salutary effects of "social capital" in the empirical literature.

IV. Conclusions

The general analytical framework developed in this paper has two key features that depart from more standard specifications in economics. First, individuals intrinsically value not just material well-being, but also the friendships that result from their social networks and the self-image that comes from their identities. People therefore routinely invest in the reproduction or transformation of identity and social networks. Second, identities mark people, creating expectations for others and for themselves. As a result, they may be cautious about behaving "out of bounds", creating a behavioral status quo bias that can retard uncoordinated transformation of production processes.

In this framework, as in many other formulations in the current development economics literature on social capital, payoffs are conditional on identity and networks, creating local gains to greater social embeddedness. These gains arise due to the various immediate, instrumental roles identity and social networks play in the lives of rural villagers around the world: as sources of altruism, credit, insurance, information, contract monitoring and enforcement services, in reducing search and transactions costs, establishing social norms, proscribing and reinforcing gender roles and ethnic or racial discrimination. The social capital literature has documented such phenomena well, albeit with perhaps excessive focus on these instrumental values of social relations.

A. Implications for research

What we understand less well are (i) the degree to which people value identities and social networks intrinsically – and thus the material opportunity costs they are willing to pay for psycho-social benefits – (ii) how important coordination failures, conformity effects or power relations are as impediments to technology adoption, (iii) the degree to which degree behavioral expectations constrain individual activity and investment choice, and (iv) the dynamic effects of current behaviors on endogenous social networks and individual identity and how different social coordination mechanisms mediate their evolution. The framework laid out here points to these as key topics for future exploration if we are to enrich our understanding of how psycho-social factors condition productivity growth and poverty reduction in low-income agrarian societies.

Two major problems face economists wishing to explore these issues: definition of appropriate reference groups and observational equivalence. Exceedingly few data sets provide information sufficient to identify individual respondents' social networks accurately.[31] As a consequence, analysts have to rely on village averages or other crude proxies, although geographic proximity is only one factor – and, it seems, a relatively weak one (Conley and Udry 2002, Santos and Barrett 2004, DeWeerdt forthcoming) – in establishing the interconnections between agents. Errors in defining networks bias the parameter estimates of models that assume correctly specified networks.[32] Moreover, even if network definition is correct, it is terribly difficult to disentangle (i) correlated effects due to unobserved or omitted factors (e.g., the quality of a local extension officer), (ii) effects exogenous to the social network (e.g., all members of the network graduated from the same elite school with a strong biology program), and (iii) effects that are truly endogenous to the social network (e.g., coordination due to interdependence or social learning from one another), as Manski (1993, 2000) emphasizes.[33] In econometric work, we commonly employ models that assume away one or two of these effects, leading to overstatement of the importance of the remaining one(s). As a consequence, the literature likely overstates somewhat the magnitude of social insurance – which is essentially identical in data to altruism, identity-based transfers, and gifts for the purpose of generating social relations – and of learning from others, which is observationally equivalent to mimickry or conformity.[34] In sum, it is difficult to identify the pathways of social influence in standard econometric studies. This puts a premium on (i) improved data collection that pays explicit attention to network definition and

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[31] The data from Ghana used by Conley and Udry (2001, 2002) and DeWeerdt's (forthcoming) from Tanzania are important exceptions.

[32] For example, Santos (2003) uses Monte Carlo methods to demonstrate the considerable bias in established econometric tests for intra-village risk-sharing when insured contracts are actually agreed within social networks that are not equivalent to the (typically geographic) sampling cluster and are not wholly interconnected.

[33] See also the excellent review paper by Brock and Durlauf (2001).

[34] Moser and Barrett (2003) offer one highly structured approach to try to disentangle social learning from social conformity in panel data with at least three periods.

controls for confounding factors, and on (ii) qualitative data collection to shed light where survey data regrettably keep us in the dark.

B. Policy Implications

The framework mapped out in this paper implies a potential role for policy to facilitate productivity growth, particularly through efforts to help communities coordinate activities, such as through farmer field schools or concerted efforts for *Striga* control. The policy opportunities arise from two basic features of the model. First, multiple equilibria arise naturally in this setting as social frictions (especially when combined with liquidity constraints) and coordination failures lead naturally to low productivity equilibria. Small, short-lived interventions can have persistent effects by inducing endogenous shifts from low-level to higher-level productivity equilibria. Absent appropriate interventions, social differences can persist indefinitely (Akerlof and Kranton 2000, Loury 2002, Hoff and Pandey 2003). Second, the existence of pecuniary externalities in a system characterized by market failures leads to significant but remediable inefficiencies (Greenwald and Stiglitz 1986). When individual choices are framed by others' decisions, modest changes to private incentives that induce behavioral change by just a few people can have significant effects on community-level behavior. Finding the tipping points or thresholds at which such changes can be induced is a central task for applied researchers.

The possibilities arising from the existence of such tipping points may be achievable through standard economic instruments: subsidies, taxes and similar finitely-lived interventions that can make it worth people's while to deviate from traditional practices, initially, after which time inertia will prevent reversal after the intervention ends. Improving poor farmers' access to financial services may also enable them to overcome the short-term costs of social sanctions in order to undertake desirable investment in long-term productivity gains.

The prospect of thresholds due to identity and social networks also raises crucial questions about targeting. In particular, one may want to employ community-based or indicator targeting without worrying excessively about traditional income-based indicators of targeting efficacy. If it takes a village to change a farmer's cultivation and husbandry practices, then the efficacy of community-level or indicator targeting may be high even if there is high initial leakage of short-term program benefits to unintended beneficiaries. In order to change the behavioral expectations associated with a particular collective identity, one needs to find change agents or opinion leaders (Chwe 2001) and they typically will not be the poorest members of a community.

Although this framework highlights the potential of assistance to communities that are having difficulty resolving coordination problems to realize available productivity gains within extant social networks and identities, it also casts some doubt on donors' current enthusiasm for creating groups in the expectation that this will build valuable social capital. If social networks are the endogenous product of matching processes between people drawn together by their identities and self-interest, then it seems unlikely that group creation could create durable communities capable of transforming production patterns. This is a hypothesis desperately in need of rigorous testing. Using creative partnership designs to reinforce extant groups with demonstrable-but-unrealized capacity to facilitate intra-community or inter-community coordination would seem to offer a higher likelihood of success.

One core prediction of the above model is that productivity will increase as identities become based more on innovativeness and material performance or as preferences adapt to place more emphasis on physical satisfaction and less on nonmaterial sources of well-being. The pace and desirability of such cultural transformations are open to question. This framework's emphasis on the intrinsic value of things nonmaterial underlines the need for caution in holding out productivity growth or advances in material measures of welfare as the sole metric by which we gauge well-being. By a simple revealed preference argument, if people choose not to adopt a technology that is manifestly more productive than that they presently use, we ought to explore whether that is because adoption would conflict with their sense of self or would threaten others with whom they identify closely. If so, then the sacrifice of material improvement may be a small price to pay for the nonmaterial gains associated with the maintenance or reproduction of an individual's identity and social networks.

In this paper I have attempted to broaden somewhat economists' conceptualization of the challenge of stimulating agricultural productivity growth within low-income agrarian communities. The analytical framework informally sketched out and the few brief examples offered are meant to provoke further, less speculative theoretical and empirical research. They nonetheless offer a first, tentative attempt at reconciling the puzzling inconsistency between widespread empirical findings of the beneficial effects of measures of social embeddedness in micro-level data sets and the casual empirical observation that social embeddedness appears negatively correlated with productivity at macro-level. Analytical frameworks that cannot reconcile these facts should be treated with some suspicion.

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