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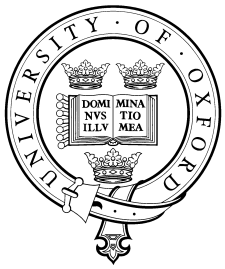
Queen Elizabeth House (QEH), University of Oxford



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Human Recognition and Economic Development:

An Introduction and Theoretical Model

Tony Castleman*

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Abstract

This paper introduces the concept of human recognition, defined as the extent to which an individual is acknowledged by others to be of inherent value by virtue of being a fellow human being. Following a qualitative exposition of human recognition, a formal model is presented that describes provision and receipt of human recognition, its contribution to utility, its effects on health, and its role in development programs. Key predictions from the model are that human recognition receipt has a positive, causal relationship with utility and health outcomes; that multiple equilibria for human recognition can exist; and that only accounting for human recognition's instrumental effects on material outcomes while ignoring its direct, psychic effects on utility leads to suboptimal programs. By defining and formally modeling human recognition and its role in economic development for the first time, the paper identifies a new component of economic development and offers an example of how such intangible components can be formally modeled.

Keywords: human recognition, economic development, health, wellbeing, dignity, respect, dehumanization, humiliation

JEL classification: I31, O15, I14, O10

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* Institute for International Economic Policy, Elliott School of International Affairs, George Washington University, Washington DC 20052

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The Oxford Poverty and Human Development Initiative (OPHI) is a research centre within the Oxford Department of International Development, Queen Elizabeth House, at the University of Oxford. Led by Sabina Alkire, OPHI aspires to build and advance a more systematic methodological and economic framework for reducing multidimensional poverty, grounded in people's experiences and values.

Oxford Poverty & Human Development Initiative (OPHI)
Oxford Department of International Development
Queen Elizabeth House (QEH), University of Oxford
3 Mansfield Road, Oxford OX1 3TB, UK
Tel. +44 (0)1865 271915 Fax +44 (0)1865 281801
ophi@qeh.ox.ac.uk http://www.ophi.org.uk

Before…I was treated like an animal – by my employer, by my husband, by my village. Now I am treated like a human…I am not afraid anymore.

– Tobacco worker, Gujarat, India

In recognizing the humanity of our fellow beings, we pay ourselves the highest tribute.

– Justice Thurgood Marshall

Introduction

The first quotation above attests to a reality observed by development practitioners: how individuals are viewed, valued, and treated by others can influence and be influenced by development programs and their outcomes. This paper explores that observation by modeling the extent to which individuals are viewed, valued, and treated as fellow human beings – defined here as 'human recognition' – and modeling the role this plays in development outcomes, program effectiveness, and individual wellbeing. The paper introduces the concept of human recognition, provides a qualitative exposition, and develops a theoretical economic model that describes human recognition behavior and generates predictions for empirical testing. By defining and formally modeling human recognition and its role in economic development for the first time, the paper identifies a new component of development and offers an example of how such intangible components can be formally modeled.

Human recognition is defined as *the extent to which an individual is acknowledged by others to be of inherent value by virtue of being a fellow human being*. Human recognition can be positive or negative. Provision of positive human recognition refers to actively acknowledging an individual to be of value simply because s/he is a human being. Provision of negative human recognition refers to viewing an individual as lacking inherent value as a human being or not acknowledging this value. The concepts closest to negative human recognition are objectification and dehumanization.

Two distinctions help to elucidate the nature of human recognition. The first distinction is between valuing an individual because he is a fellow human being and valuing an individual because of his characteristics, skills, or actions. Human recognition refers to the former source of value, though in some cases the latter may have a stronger influence on behaviors and wellbeing. While human recognition may not dominate other sources of value in many situations, it is a distinct source of value that influences behavior, development, and wellbeing. The second distinction is between viewing or valuing an individual and treatment of the individual. While valuing and behaving are

closely related, they are distinct. One can devalue another individual as a human being but still treat her well for other reasons, such as increasing productivity or avoiding penalties for breaking laws. Conversely, one can value an individual as a human being but still treat her poorly for other reasons. How someone values another individual affects one's behavior toward them, and in some settings this can be a bidirectional relationship, with one's behavior influencing how one views and values others.

Provision of human recognition entails an *intrinsic* valuing: acknowledging another individual's inherent value as a human being. However, it is worth noting that providing (positive or negative) human recognition can lead to material outcomes; for example, an employer's provision of positive human recognition to employees may increase productivity and profits. To the extent that consideration of these material outcomes influences the provision of human recognition, there can be *instrumental* motivations for providing human recognition to others. This subject is treated formally in the model of human recognition provision below.

Traditionally, analyses of economic development and poverty alleviation have focused on measurable, material components such as income, physical health, and education. In recent years, however, the study and practice of economic development have expanded to focus on intangible components such as capabilities (Sen 1985/1999), freedom (Sen 1999), mental health (Patel and Kleinman 2003), human psychology (Mullainathan 2005), empowerment (Narayan 2005), and social capital (Narayan and Pritchett 1999). These components are not usually the primary, explicit objectives of development programs or policies, but they have been found to be important underlying factors in the processes and outcomes of successful economic development. My review of the literature finds that the concept of human recognition has not been explicitly identified and examined in the economic development literature. However, related concepts have been addressed in the literature, and some of that work provides a background and basis for the study of human recognition

Economists as far back as Adam Smith identify acknowledgement and sympathy as motivations for economic behavior. In response to the questions, "What is the end…of the pursuit of wealth? … What are the advantages…[of] bettering our position?" Smith responds that the purpose extends well beyond material acquisitions:

> To be observed, to be attended to, to be taken notice of with sympathy, complacency, and approbation, are all the advantages which we can propose

to derive from it.

The burden of being poor is

> …[Poverty] either places [the poor man] out of the sight of mankind, or, that if they take any notice of him, they have, however, scarce fellow-feeling with the misery and distress which he suffers. He is mortified on both accounts.
>
> - Smith 2000

This early work by Smith identifies the link between economic behavior and receipt of others' acknowledgment and "fellow-feeling" and articulates with startling clarity the negative impact such lack of acknowledgement has on the wellbeing of poor individuals.

Building on Smith's insights, Offer (1997) points out that gaining "regard" from fellow human beings is a fundamental motivation and objective of economic behavior. In a review of economic history, Offer suggests that a key reason for the persistence of non-market exchange is people's pursuit of regard. He defines regard to include a range of positive qualities and interactions: "acknowledgement, attention, acceptance, respect, reputation, status, power, intimacy, love, friendship, kinship, sociability." These interactions all involve the receipt of positive acknowledgement from others. While regard is difficult to measure, Offer warns that if only material and easily measurable factors are considered and issues of regard are ignored, policies will not be optimal because desire for regard affects preferences and because regard is "a good in its own right" with direct psychological benefits, in addition to its instrumental role influencing terms of trade.

In his treatment of freedom, Sen (1999) similarly identifies its twofold role in development as an instrument and as an objective of development. An increase in an individual's freedom is "1) significant in itself…and 2) important in fostering the person's opportunity to have valuable outcomes." To distinguish these two functions, Sen introduces the distinction between freedom's constitutive role and instrumental role. This distinction applies to human recognition, which – as modeled below – also has both constitutive and instrumental roles in development.

Sen's capabilities approach (Sen 1985) is based on the insight that individuals' wellbeing hinges on their capabilities to perform key functionings, which include "being" (e.g., safe, healthy) and "doing" (e.g., productive labor). In this framework, human recognition provision can be understood to be a functioning that involves "doing," or perhaps more precisely "viewing." Sen points out that an individual's happiness depends not only on one's own functionings but also on

others' functionings (Sen 1985). Provision of human recognition is a functioning that is inherently about how an individual views and interacts with others, so human recognition provision is a functioning that influences the happiness of others, as well as one's own. When a particular functioning is feasible for an individual, the individual possesses the corresponding capability. The ability to provide positive or negative human recognition can be viewed as a capability, one that affects the wellbeing of those receiving the recognition. This is similar to, though distinct from, "external capabilities" that Foster and Handy (2008) identify as capabilities an individual possesses as a result of a relationship with other individuals.

While most of Sen's work on capabilities focuses on individuals' capabilities, he does discuss capabilities related to interpersonal interactions and includes the "ability to go without shame" as a basic capability (Sen 1983; Sen 1985). Building on this insight, the Oxford Poverty and Human Development Initiative (OPHI) identifies and measures missing dimensions of poverty, including the ability to go without shame (Alkire 2007; Reyles 2007). Human recognition is an underlying factor of the ability to go without shame and is also relevant to the other identified missing dimensions: quality of employment, empowerment, physical safety, and psychological and subjective wellbeing.

Sen's recent work has extended into issues of interactions, examining how individuals' views of their own and others' identities influence conflict and violence (Sen 2006). He points out that exclusive focus on singular identities such as religion, ethnicity, or nationality can facilitate violence, "savagely challeng[ing]…our shared humanity," whereas consideration of other identities that people share can help reduce identity-based violence. Sen points to Iraqi prisoner abuse at Abu Ghraib as an example where "a hardened line of divisive identities…seems to crowd out…among other things, their shared membership of the human race."

Human recognition fits into this framework as an act of affirming shared identity as a human being. Sen presents shared humanity as the most basic of shared identities and focuses on seeing "the plurality of our identities" as the most important means for preventing divisiveness and violence. Shared humanity is a fundamental identity that people have in common, and recognition of this shared humanity may be a powerful means of preventing violence. Examples of individuals from Rwanda and from the Holocaust who stood against the tide of genocide and protected potential victims at great personal risk suggest that, consistent with Sen's thesis, they resisted the divisiveness of singular identities such as ethnicity. Yet accounts indicate that they were motivated not by other shared identities of nationality, profession, or social interests, but by clear-sighted

views of those they saved as human beings (Gourevich 1998; Rusesbagina 2006; Gushee 1993; Oliner and Oliner 1988). Recognizing someone as a fellow Rwandan or Pole or engineer may be less likely to deter one from cruelty or motivate kindness than recognizing someone as a fellow human being.

This paper's treatment of human recognition builds on and extends approaches used to study the concepts cited above. The theoretical model describes the flow and stock of human recognition, determinants of human recognition provision, the contribution of human recognition to utility, and human recognition's role in development programs. Primary predictions from the model are that human recognition levels significantly affect health, consumption, and utility; that these relationships are positive; that complementarity exists in human recognition provision, which can lead to multiple equilibria; and that full consideration of human recognition in the design of interventions improves program outcomes. Related work (Castleman 2011a; Castleman 2011b) builds on the theoretical model to develop an empirical measure of human recognition and test hypotheses about human recognition's association with health, wellbeing, and program interventions.

The next section provides a qualitative exposition of human recognition, its sources, effects, and role in development. Section 3 presents the formal model of human recognition, and Section 4 offers concluding remarks.

1. Qualitative Exposition of Human Recognition

1.1. Related Concepts

Distinguishing between human recognition, defined above, and other related concepts helps to deepen understanding of human recognition. Human recognition is related to *respect* but is conceptually distinct. Respect can be based on recognition of one's inherent value as a human being, but respect can also be based on other foundations, and some types of respect can exist in the absence of positive human recognition. One's particular skills can be respected while at the same time one is not respected as a human being, for example manual laborers whose employers value their production of outputs but treat them inhumanely. Therefore, while human recognition underlies certain types of respect, it is not related to other types.

Human recognition transactions affect *dignity*, but dignity is also conceptually distinct from recognition. Dignity refers to a quality an individual possesses or a feeling she experiences, while

human recognition refers to the interactive process of how an individual views and values another. Furthermore, dignity is a broad concept that encompasses a number of different qualities beyond those rooted in human recognition. For example, some types of dignity are associated with pride such as unemployment's impact on an individual's dignity, and other types are associated with personal modesty such as when public embarrassment affects one's dignity. While changes in some types of dignity can be an outcome of human recognition transactions, other forms of dignity do not involve human recognition at all.

Empowerment, defined as an increase in individuals' capacity to make key choices affecting their lives (Kabeer 2001), occurs within individuals whereas human recognition occurs between individuals. In some cases positive human recognition can lead to empowerment. For example, a teacher's respectful treatment of a student from a socially marginalized ethnic group may empower the student to pursue endeavors she was previously excluded from and to gain greater control over aspects of her life. However, recognition is neither necessary nor sufficient for empowerment, and each can occur without the other. For example, a woman who begins earning income and is thereby empowered by her contribution to household earnings to take a greater role in household expenditure decisions is an example of empowerment that may not involve changes in human recognition. Conversely, when health care providers view destitute and terminally ill patients as valued individuals and humanely meet their basic needs, it is an example of human recognition that may not lead to empowerment.

Both *social capital* and human recognition inherently involve interactions among individuals or groups. There is a certain degree of overlap between the two concepts, and in some situations human recognition contributes to social capital. For example, acknowledgement by a dominant ethnic group of the commonalities between themselves and a minority or marginalized group can generate greater trust, cooperation, and social capital among members of the two groups. However, human recognition and social capital are conceptually distinct, and one can occur without the other. Collaboration among neighbors to help identify or entrap a local burglar is an example of social capital that does not involve human recognition. Soldiers' acknowledgement of their shared humanity with prisoners of war and subsequent humane treatment involves human recognition but not necessarily production of social capital.

1.2. Sources of Human Recognition

Individuals receive human recognition from multiple sources, and these sources can be organized into three domains:

1) *household* and family relationships, roles, interactions, and behavior;
2) *community* norms, and interactions among neighbors, community leaders, and friends;
3) *organization and institution* norms and systems, and interactions within institutions such as schools, places of employment, places of worship, health care facilities, and other service delivery points.

The quotation at the beginning of this paper is a woman's testimony to the poor – and subsequently improved – human recognition she received in each of these three domains: her employer (organizations and institutions), husband (household), and village (community).

1.3. Effects of Human Recognition

Human recognition is hypothesized to affect the utility or wellbeing[1] of the individual receiving it in four distinct ways, which can be categorized into psychic and material effects.

Psychic effects

1) The level of human recognition an individual receives directly affects her wellbeing: the psychic effect of being objectified or viewed as "less than human" reduces one's utility while the psychic effect of being acknowledged and valued as a human being increases one's utility.
2) Human recognition can lead to changes in dignity, self-respect, empowerment, and empathy, which in turn affect one's utility, independent of material outcomes that these changes may enable. For example, increased empowerment may increase an individual's wellbeing due to the satisfaction of increased control, independent of any material improvements gained from actualizing increased capacities.

Material effects

3) The level of human recognition an individual receives can affect the individual's behaviors and actions, which in turn affect material outcomes such as health status, income level, and educational attainment that contribute to the individual's utility. For example, the recognition a woman receives from health care workers may lead her to return more regularly to the health care facility for services that improve her health.

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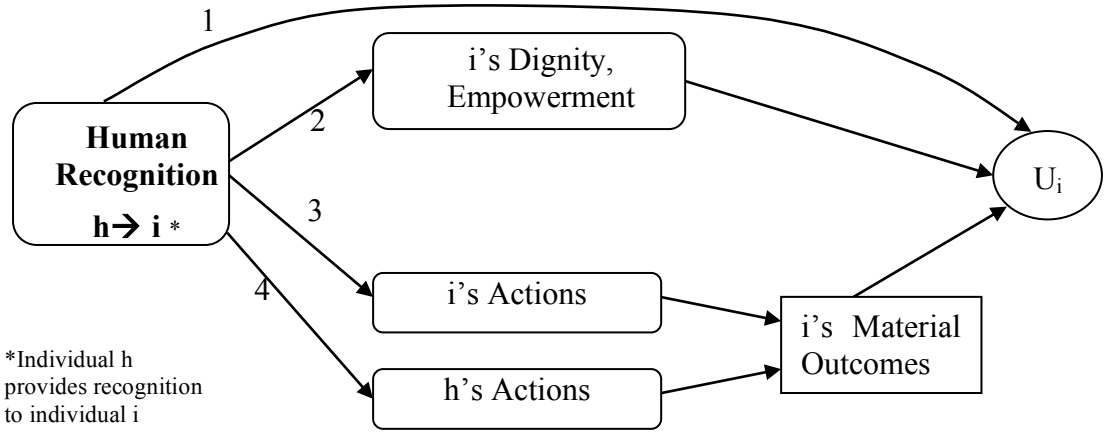
[1] I collapse the concepts of utility and wellbeing here, using the two interchangeably and assuming a utility function that captures both material and psychic components of an individual's wellbeing. For an analysis of the distinctions between wellbeing and the economic concept of utility, see Sen (1992).

4) The level of human recognition provided to an individual can also affect the actions and behaviors of those *providing* the recognition, and these actions can affect material outcomes for the individual receiving the recognition. For example, negative recognition of a woman by her husband may manifest itself in mistreatment and abuse such as domestic violence, which decreases the health and wellbeing of the woman.[2]

Figure 1 diagrams these four effects. Applying Sen's terminology, the psychic effects represent its constitutive role, and the material effects represent human recognition's instrumental role.[3] These effects refer to impacts on the wellbeing of the individual receiving human recognition. There are also likely to be psychic and material effects of providing a given level of human recognition on the *provider's* wellbeing. These effects are discussed in the model of human recognition provision below.

Figure 1: Effects of Receiving Human Recognition on an Individual's Utility



1.4. Human Recognition in Development

Human recognition is hypothesized to play multiple roles in economic development. As modeled below, human recognition affects development outcomes such as health and consumption. Such

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2 Some effects of human recognition may involve a combination of 3) the receiving individual's behavior and 4) the providing individual's behavior. For example, studies have found that women in South Africa who experience domestic violence – a manifestation of negative human recognition – are at greater risk of contracting HIV (Jewkes et al. 2010, Dunkle et al. 2004). This may be the result of both the women's own limited bargaining power to demand behaviors that protect them from infection (influenced by the negative recognition the women are receiving – effect 3) and their partners' violent behavior toward them (influenced by the negative recognition their partners are providing – effect 4).

3 Strictly speaking, effect 2 can be viewed as an instrumental effect: recognition influences dignity, self-respect, or empathy, which in turn affects utility. But because the psychic utility obtained from dignity, self-respect, or empathy is in many ways similar to that obtained directly from human recognition and is distinct from the utility obtained from material outcomes, the two psychic effects are categorized as constitutive and are combined in the model.

effects can occur through various pathways, including human recognition's impacts on behavior and on access to opportunities and services. Human recognition can also influence the effectiveness of program interventions, for example by affecting school attendance or adherence to health services. In addition to recognition's effects on material development outcomes, it can directly affect the wellbeing of program participants through psychic effects.

Conversely, development programs and policies can influence human recognition transactions. The quotation at the beginning of the paper attributes the improved human recognition a woman in India receives to joining a trade union established for poor women, the Self-Employed Women's Association (SEWA). In other cases, development programs can reduce human recognition levels among participants, for example through service providers' dehumanizing behavior toward clients. Programs' effects on human recognition occur through the *content* of interventions or through *how* interventions are implemented. Table 1 summarizes these channels. Most of these channels are endogenous aspects of the design and operation of program services, suggesting that those designing, managing, and implementing the programs can influence how programs affect human recognition.

Table 1: Pathways by which Development Interventions Affect Human Recognition

Program Element	**Channel**	**Example**
Implementation approach	Systems	Client privacy and consent procedures
	Processes	Seating and waiting arrangements for services
	Interpersonal approaches	Teacher treatment of students
	Organizational norms	Employee conditions and rules
Content of interventions	Directly improve human recognition transactions	Education and law enforcement to prevent domestic violence
	Improve material development outcome, which leads to improved human recognition transactions	Girls' education that increases human recognition girls receive in the household, community, and institutions

2. Model of Human Recognition

2.1. Receipt of Human Recognition

The total quantity of human recognition an individual receives is a function of the recognition received from each of the individuals who provide recognition to her. Based on the characteristics of human recognition described above, the expression for an individual's received human recognition should satisfy four sets of properties.

> Property 1 – MONOTONICITY: *For an individual i who receives recognition from a vector of individuals*[4] *(1, 2 …n) where each providing individual provides a quantity of recognition, q_h, h = 1…n and q∈*R, *an increase in the quantity of human recognition q_j provided by one individual j, holding all other values of q_h constant, increases the total recognition received by i, r_{i_r} .*

A corollary property applies to the special case in which an individual receives the same quantity of recognition from all individuals who provide recognition to him/her.

> Property 1A - MONOTONICITY: *For an individual i who receives a given quantity of human recognition, q, from each of a vector of individuals (1, 2 …n) such that q∈*R, *and q is the same for each individual ($q_1=q_2…=q_n$), the magnitude of the total human recognition received by i, r_{i_r} , increases in the number of individuals, n, providing recognition to him*.

For example, receiving five units of positive recognition from 20 people will result in a higher level of total received recognition than receiving five units of positive recognition from only one person. Note that the property refers to magnitudes and in the case of negative recognition (q < 0), increasing the number of individuals will decrease the level but increase the magnitude of total recognition received.

> Property 2 - DIMINISHING RETURNS TO ADDITIONAL PROVIDERS: *For an individual i who receives a given quantity of human recognition, q, from each of a vector of individuals (1, 2 …n) such that q∈*R *and q is the same from each providing individual ($q_1=q_2…=q_n$), the effect an additional input of q quantity of recognition from an additional individual, n+1, has on the magnitude of total human recognition received by i, $|r_{i_r}|$, is less*

4 Groups, organizations, or institutions that provide recognition through processes other than interpersonal interactions can also be included, but for simplicity the model refers to individuals.

the more individuals there are providing recognition to him, i.e, the magnitude of the change in r_{i_r} *will be smaller for larger n.*

The intuition behind this property is that receiving recognition from a larger number of people insulates an individual, dampening the effect of any single human recognition transaction. This property can also be expressed in terms of a given quantity of recognition received.

Property 2A – DIMINISHING RETURNS TO ADDITIONAL PROVIDERS: *For a given quantity, Q, of human recognition received by individual i from a vector of individuals (1, 2 ...n) such that* $Q = \sum_{h=1}^{n} q_h$ *where* $q \in \mathrm{R}$, *the magnitude of the total human recognition received by i,* r_{i_r} *, decreases in n.*

This property means, for example, that receiving one unit of human recognition from each of ten people leads to less total recognition received than receiving ten units of recognition from one person. The intuition behind this property is that receipt of large magnitudes of positive recognition (e.g., an empathetic sacrifice) or negative recognition (e.g., violence or severe humiliation) from fewer individuals has a greater effect than receipt of small quantities of recognition from more individuals.

Property 3 – EQUIVALENCE OF PROVIDERS NOT REQUIRED: *If individuals j and h each provide the same quantity of recognition, r, to individual i, the effects of j's and h's provision of recognition on the total level of recognition that individual i receives,* r_{i_r} *, will not necessarily be equal.*

This property allows the impact of recognition provision to depend on the relationship between the providing individual and the receiving individual. For example, the same quantity of recognition may have greater impact if provided by a spouse or parent than if provided by a shopkeeper or stranger.

Property 4 – INCREASING EFFECTS OF DIFFERENCES IN RECEIVED RECOGNITION: *For an individual i who receives a quantity, Q, of recognition from a vector of individuals (1, 2 ...n) such that* $Q = \sum_{h=1}^{n} q_h$ *where* $q \in \mathrm{R}$, *the magnitude of the effect that recognition provided by an additional individual,* q_{n+1}, *has on total human recognition received by i,* r_{i_r} *, is larger the greater the magnitude of the difference between the new*

recognition received, q_{n+1}, and the net quantity of recognition currently received, Q, for all cases in which $|q_{n+1}| > |Q|$.[5]

That is, if $|q_{n+1}| > |Q|$, then $| q_{n+1} - Q| \uparrow \Rightarrow |\Delta r_{i_r}| \uparrow$,

where $\Delta r_{i_r} = r_{i_r}(1 \ldots n+1) - r_{i_r}(1 \ldots n)$.

This property is particularly relevant in development programs where provision of positive recognition may have the greatest impact on individuals who otherwise receive significant negative recognition from others. Consider a poor woman who toils under inhumane conditions at a factory and is the subject of regular domestic abuse at home. If a health care worker provides her a large magnitude of negative human recognition and treats her in a humiliating manner, the change in the total level of recognition the woman receives may be relatively small. But if the health care worker provides her a large magnitude of positive recognition – asking about and addressing her concerns, providing counseling – this may have a greater effect on the total level of recognition the woman receives.

Proposition 1: *The expression,* $r_{i_r} = \frac{1}{\sqrt{n}} \sum_{h=1}^{n} \rho_{hi} r_{hi}$ *, satisfies Properties 1 – 4.*

The expression is the weighted sum of human recognition received through interactions with others. The term r_{hi} is the recognition that individual *h* provides to individual *i*. During the period of analysis, *i* interacts with *n* individuals who provide varying levels of human recognition to her. An individual likely interacts with more than *n* individuals during the period, but only interactions involving receipt of human recognition are included. The *r* terms can be positive or negative, signifying positive or negative human recognition. ρ_{hi} is a parameter that represents a provider-specific weight that captures differences in the impact a given level of provided recognition has on individual *i*'s received recognition.[6] The proof of Proposition 1 is given in the Appendix (A1).

2.2. Total Human Recognition

The r_{i_r} term represents the quantity of human recognition an individual receives in a given period of analysis, i.e., the flow of recognition. Related to but distinct from this is an individual's total

5 The condition $|q_{n+1}| > |Q|$ is necessary because an input of small quantities of recognition may not have a significant effect on total recognition received if it has a much lower magnitude than the quantity of recognition otherwise received. For example, if Q=20, an additional input of $q_{n+1} = 30$ would likely have a greater effect than $q_{n+1} = 5$, even though the magnitude $| q_{n+1} - Q|$ is greater for $q_{n+1} = 5$ than it is for $q_{n+1} = 30$.

6 In addition to capturing differences between providers (e.g. between a spouse and neighbor), ρ_{hi} also captures differences among receiving individuals in how they convert provision of a given level of provided recognition into received recognition. Individuals vary in their inherent resilience and how they absorb recognition provided by others, e.g., some may brush off negative recognition while others take it to heart.

level of human recognition, R_i, which refers to the overall level of recognition an individual has at a given point of time, i.e., the stock of recognition. R_i is determined by a function,

$$R_i = f(r_{i_r}, \bar{r}_i) = f(r_{i_r} + \bar{r}_i).$$

The function f(..) describes how received recognition accumulates and is stored as total recognition. r_{i_r} is the quantity of human recognition received in the period of analysis. $\bar{r}_i$ is the base level of recognition individual *i* has at the beginning of the period, which is the discounted present value of recognition received in the past because the impact past receipt of recognition has on current recognition levels may diminish over time.

Based on observed characteristics of human recognition, the function f(r), for $r = r_{i_r} + \bar{r}_i$ should satisfy the following properties:

Property 5 – NON-DECREASING IN THE ARGUMENT: *$f'(r) \geq 0$ for all r.*

The function does not decrease in its argument because, consistent with intuition, higher (lower) levels of received or base recognition lead to higher (lower) levels of total recognition.

Property 6 - DIMINISHING MARGINAL EFFECTS FOR HIGHER ABSOLUTE VALUE OF THE ARGUMENT: *$f''(r) < 0$ for $r > 0$, and $f''(r) > 0$ for $r < 0$. An inflection point exists at $r = 0$.*

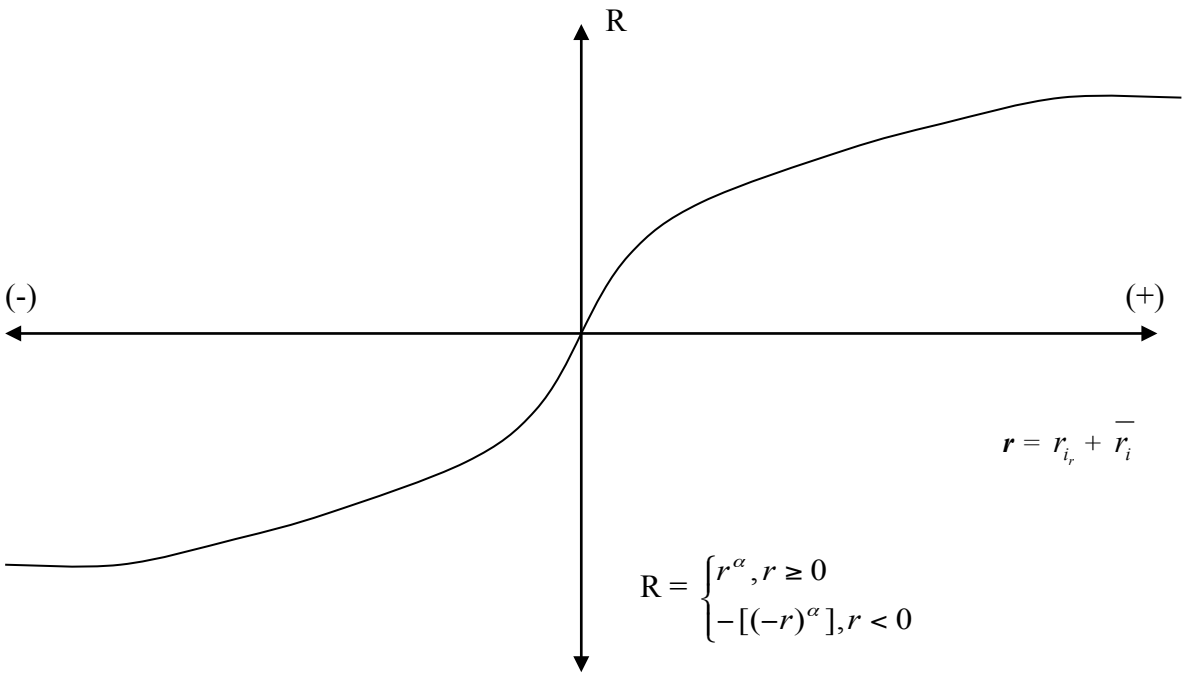
The second order conditions mean that as the magnitude of r increases, the marginal effect that additional received recognition has on total levels of recognition diminishes. High magnitudes of human recognition insulate individuals from the effect of additional recognition inputs.

Proposition 2: *The following functional form satisfies Properties 1 and 2 above:*

$$R = f(r) = \begin{cases} r^{\alpha}, r \geq 0 \\ -[(-r)^{\alpha}], r < 0 \end{cases} \quad \text{where } 0 < \alpha < 1$$

The proof of Proposition 2 is given in the Appendix (A2). Figure 2 graphs this function.

Figure 2: Relationship between an Individual's Received and Base Levels (r) and Total Level (R) of Human Recognition



A feature of this function that is relevant to economic development is that for individuals with high levels of negative recognition (deep in the 4th quadrant), the marginal effect of an input of negative recognition is less than the marginal effect of an equivalent input of positive recognition. An example of this is the asymmetry described earlier between the effects a health worker's positive and negative recognition have on an otherwise poorly treated woman. This asymmetry stems from Property 6. Because f'(r) decreases as the magnitude of r increases, for an individual receiving net negative recognition (quadrant 4), the marginal effect of an additional input of negative recognition is less than the marginal effect of the same quantity of positive recognition; and vice versa for an individual receiving net positive recognition (quadrant 1). This feature of the function amplifies the effect of Property 4 that the impact of a new input of recognition is greater the larger the difference is between the new input and the existing recognition level.[7]

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7 A numerical example helps to illustrate. Suppose an individual receives -5 units of human recognition from 8 individuals all of whom have weights of $\rho = 1$. Applying the expression for received recognition, the individual's level of received recognition is $r_{i_r} = -14.1$. Assuming a base level of recognition of zero and $\alpha = 0.5$, her total level of recognition is $R_i = -3.76$. If someone then provides her with -8 units of human recognition, her new $r_{i_r} = -16$ and his new $R_i = -4$. If instead of -8 someone provides +8 units of human recognition, the individual's new $r_{i_r} = -10.67$ and his new $R_i = -3.27$. The positive recognition input leads to a change in total recognition level (+0.49) that is more than twice the magnitude of the change in total recognition (-0.24) from the negative recognition input.

2.3. Provision of Human Recognition

Benefits and Costs

In the model individuals choose how much recognition to provide to others by balancing the marginal benefits and marginal costs of recognition provision. Several exogenous determinants of human recognition provision also exist, such as personality, culture, religious beliefs, and even adaptive preferences. In some settings these exogenous determinants can significantly influence human recognition provision decisions and can be influenced by interventions such as counseling, education, and introduction of role models. The model focuses on individual recognition provision choices that are based on benefits and costs, an approach that enables human recognition transactions to be analyzed and predicted. Because the model's benefits and costs encompass both material and psychic costs, exogenous determinants can be largely incorporated into the benefit-cost model. For example, respecting others because of religious beliefs can be interpreted as conferring psychic benefits to an individual.

Before presenting the formal benefit-cost model, it is worth noting two features of the model. Benefit-cost frameworks often imply a calculation of material, quantifiable benefits and costs. This model, however, includes the psychic benefits and costs of providing human recognition as well as the material benefits and costs. According to the model, individuals do not only consider material benefits and costs in determining their human recognition provision behavior but also psychological and emotional outcomes, such as guilt and satisfaction.

Related to this, the other feature worth noting is that while the functions in the model represent the various benefits and costs that influence human recognition behavior, individuals do not necessarily calculate benefits and costs explicitly to determine the human recognition they provide to others. Instead, there is often an implicit or even unconscious valuing and weighting of factors. For example, one may consider the psychic benefits of providing positive human recognition to a marginalized member of another group to be greater than the material cost of the financial support that the provision of positive human recognition leads one to offer. On the other hand, in a situation where providing a large magnitude of human recognition to the other individual requires sacrificing one's safety (e.g., by protecting the individual from attack during a genocide), one may value the material cost more than the psychic benefit. In these situations, the individual providing human recognition does not make an explicit calculation, but the relative values and weights of each benefit and cost are determinants of his human recognition provision. The model formalizes

this process by describing the categories of these factors (material benefits, material costs, psychic benefits, and psychic costs) and the roles they play in human recognition provision.

The quantity of human recognition that individual *i* provides to others is represented by r_{ij}, for j = 1….m, where *i* provides recognition to *m* individuals.[8] For each individual *j*, *i* chooses the level of human recognition, r_{ij}, by maximizing benefits minus costs.

The benefits to individual *i* of providing human recognition, r_{ij}, to *j* are given by:

$$B(r_{ij}) = \mu(r_{ij}) + \Psi(R_i, r_{ij}).$$

The $\mu(r_{ij})$ function represents the material benefits to person *i* of providing human recognition r_{ij} to person *j*. μ' will be negative in cases where provision of negative recognition materially benefits the provider, e.g., inhumane workplace conditions that generate greater profits. μ' will be positive in cases where provision of positive recognition materially benefits the individual providing it, e.g., a teacher who increases enrollment, attendance, or evaluation rankings – and consequently his salary – by providing students with greater human recognition.

Provision of human recognition can generate material benefits through two mechanisms: hedonic markets or factors outside of the market. In a hedonic market, provision of recognition serves as a compensating differential to which prices (including wages), supply, and demand adjust. For example, at a given wage and non-labor income, workers in some settings may choose to provide a greater supply of labor if higher levels of human recognition are provided at the workplace. In other settings inhumane working conditions can be used to change terms of production or exchange outside of market mechanisms. In such cases, provision of negative human recognition reduces the cost of production without offering compensation. Extracting material benefits outside of market mechanisms may require significant differences in power between the provider and receiver of recognition. If employees have sufficient power or alternative employment options, they can demand higher wages or supply less labor to compensate for the poor conditions, which leads to the hedonic markets case.

The $\Psi(R_i, r_{ij})$ function represents the psychic benefits to person *i* of providing human recognition r_{ij} to person *j*. The quotation by Justice Marshall at the beginning of the paper eloquently describes the positive psychic utility gained from providing positive human recognition to others. R_i is in the argument because one's own level of recognition can affect the psychic benefits gained from

8 Note that *m* does not necessarily equal *n* because the people from whom one receives recognition are not necessarily the same as those to whom one provides recognition.

providing human recognition to others. The properties of the function Ψ determine the nature of this effect; in particular, the sign and magnitude of the cross-partial $\frac{\partial^2 \Psi}{\partial r_{ij} R_i}$ determine the direction and extent, respectively, of the relationship between one's own recognition level and the recognition one provides to others.

The costs to individual *i* of providing human recognition, r_{ij}, to person *j* are given by:

$$C(r_{ij}) = \alpha r_{ij}^2 + \beta r_{ij},\ \alpha, \beta > 0.$$

There are some positive costs, αr_{ij}^2, associated with providing either positive or negative human recognition to others; these costs may involve time, effort, or other inputs. The polynomial term means marginal costs are increasing; this reflects situations in which providing small amounts of recognition (e.g. how one is addressed) incurs very little cost but providing larger quantities (e.g., employee benefits, or counseling and follow-up of patients) requires significantly larger investments of inputs. There are also some costs, βr_{ij}, that are positive for provision of positive human recognition and negative (i.e., savings) for provision of negative human recognition. In some situations providing negative recognition reduces short-term costs because treating people well requires greater investment of time or other inputs than treating them poorly.

An individual determines how much recognition to provide others by balancing the marginal benefits and costs to maximize her own net payoff. As mentioned above, this balancing is often an implicit or unconscious process. The following simple linear functional forms,

$$\mu(r_{ij}) = \mu r_{ij} \text{ and } \Psi(r_i, r_{ij}) = r_{ij}\psi(R_i),$$

yield a payoff function,

$$\pi_i(r_{ij}) = \mu r_{ij} + r_{ij}\psi(R_i) - \alpha r_{ij}^2 - \beta r_{ij.}$$

The individual solves[9]

$$\max_{\{r_{ij}\}} \pi_i(r_{ij}) = \mu r_{ij} + r_{ij}\psi(R_i) - \alpha r_{ij}^2 - \beta r_{ij.}$$

At the optimum, the marginal payoff from provision of human recognition equals zero, and

$$r_{ij}^* = (\mu + \psi(R_i) - \beta)/2\alpha.$$

Complementarity and multiple equilibria

9 Only r_{ij} is a choice variable, not R_i, since the individual has control over the level of recognition provided to others, not one's own level of recognition.

The model restricts ψ' to be positive, so the marginal payoff of providing positive human recognition increases in one's own level of recognition:

$$\frac{\partial^2 \pi_i(r_{ij})}{\partial r_{ij} R_i} = \frac{\partial^2 \Psi}{\partial r_{ij} R_i} = \psi'(R_i) > 0.$$

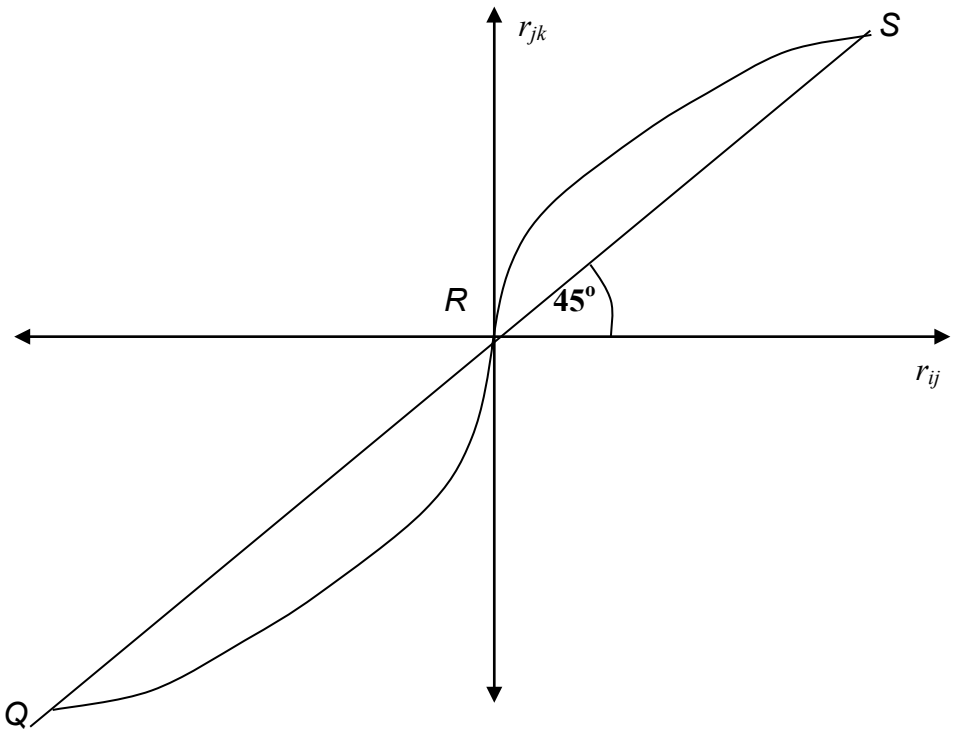
Having higher levels of positive recognition leads one to provide more positive recognition and less negative recognition, and vice versa for higher levels of negative recognition. This restriction is consistent with documentation about how the treatment people receive affects their treatment of others. For example, there is evidence that individuals abused as children are more likely to abuse their own children (Oliver 1993). In their study of procedural utility, Frey and Stutzer (2005) cite evidence that domestic violence offenders who are treated respectfully by arresting officers are less likely to become repeat offenders (Lind and Tyler 1988). Note that even with this restriction to the ψ function, an individual with positive levels of recognition may still choose to provide negative recognition to others if the material benefits and costs dominate the psychic benefits.

An individual's own level of recognition, R_i, depends on the human recognition others provide to her, r_{hi}, because $R_i = f(r_{i_r}, \bar{r}_i) = f(r_{i_r} + \bar{r}_i)$, where $r_{i_r} = \frac{1}{\sqrt{n}} \sum_{h=1}^{n} \rho_{hi} r_{hi}$. Combined with the increasing marginal payoff ψ', this suggests complementarity exists in provision of human recognition:

$$\frac{\partial \pi_j{}^2(r_{jk})}{\partial r_{jk} r_{ij}} > 0.$$

Individual *i*'s decision about how much human recognition to provide to *j*, r_{ij}, affects *j*'s level of recognition, R_j, which in turn positively affects the level of recognition *j* chooses to provide to others, r_{jk}, r_{jl}, etc.

Figure 3: Reaction Curve for Human Recognition Provision



For continuous actions such as human recognition provision, with identical agents,[10] multiple equilibria will occur if the reaction curve between r_{ij} and r_{jk} cuts the 45° line at an interior point with a slope greater than one (Hoff 2001). The parameters μ, α, β and the function $\psi(R_i)$ vary across individuals and interactions, and multiple equilibria can exist for a given set of individuals and interactions. Figure 3 depicts a case of multiple equilibria for provision of human recognition. Three equilibria exist: *Q* is a stable equilibrium in which members of a group of interacting individuals mostly provide negative recognition to each other, *S* is a stable equilibrium in which people mostly provide positive recognition to each other, and *R* is an unstable equilibrium in which people provide neutral recognition to each other.[11]

Complementarity in the model is based on psychic components of utility. However, material factors can reinforce this complementarity: once low (high) recognition provision becomes the

10 The identical agents assumption means differences among individuals' reactions to others' recognition provision are not explicitly considered. This assumption can also be interpreted to mean individuals *i* and *j* are representative agents for the population.

11 Diminishing marginal reaction to the magnitude of recognition received is a necessary condition for the type of multiple equilibria depicted in Figure 3. This means changes in others' behavior have less of an effect on one's own recognition provision behavior the larger the magnitude of recognition that one is already providing. Recognition provision decisions are likely to be more affected by others' behavior at moderate or neutral levels of recognition than at extreme values, when one's behavior may be more entrenched. Diminishing marginal reaction would occur when the function $\psi(R_i)$ is of a similar form to the f(r) function for total recognition.

norm it may be materially costly to provide high (low) levels of recognition to others. Returning to the labor example, if all employers apply inhumane employee conditions in factories, an employer who tries to provide better conditions and benefits may increase costs and lose his competitive edge. Conversely, when high recognition provision is the norm, an employer may lose employees if he provides negative recognition to employees through poorer conditions.

Existence of multiple equilibria can contribute to understanding the persistence of observed inefficiencies in behavior. Based on a study of domestic violence and intra-household resource allocation in south Indian households, Rao concludes:

> Clearly everyone in a violent household would be better off with the same allocation and without the violence. Why then does violence exist? No theoretical model of intra-household behavior, that I am aware of, allows for inefficient equilibria.
>
> - (Rao 1998)

Multiple equilibria in human recognition may explain this situation. The households Rao studied are stuck at equilibrium Q in a low recognition trap. It would be more beneficial for them to be at S with positive recognition and no violence, but they are stuck at Q. Individual attempts to provide positive recognition to others do not sustain as individuals react to others' negative recognition provision by returning to negative recognition practices, sliding back down to Q.

In cases where equilibria *Q*, *R*, and *S* are Pareto ranked, a coordination failure exists, which could involve a household in which disrespect and abuse are the norm, or a community in which people provide low levels of human recognition to each other in schools, health care facilities, and places of employment. In such cases, external interventions can help move the population from the low equilibrium to the high equilibrium. Interventions may include establishing and enforcing specific laws that address labor conditions, domestic violence, or minimum standards of privacy at health care facilities. Alternatively, programs that provide substantial positive recognition to a significant proportion of the population could raise recognition levels high enough that people respond by providing positive recognition to others, moving the population past point *R* and into quadrant 1.

This analysis of an individual's choice of human recognition provision ignores the "feedback" effect that providing recognition to others has on one's own receipt of recognition. That is, r_{ij} affects R_j, R_j affects r_{ji}, which in turn affects R_i. There are two reasons for ignoring this feedback effect in the expression for the optimal level of recognition provision. First, it is assumed that an individual interacts with large enough populations *m* and *n* that the effect of such feedback on any given human recognition provision decision is relatively small. Second, in many contexts

individuals have the widest latitude about providing human recognition to those less powerful than themselves, so recognition provision moves down power hierarchies. An example of this is the domestic violence offenders cited earlier: provision of positive human recognition by law enforcement officers to offenders reduces offenders' provision of negative human recognition – manifested in violence – to those with less power than them, household members vulnerable to their violence. This dynamic suggests that the people whose recognition levels an individual most influences may not strongly influence the individual's own recognition level. That said, there are contexts where the feedback effect may be significant, such as between spouses or among small groups of coworkers.

If complementarity moves down the power structure, then improving the human recognition that more powerful entities provide to the less powerful can contribute to raising overall human recognition levels. In poverty and development contexts, one rationale for empowering those with relatively less power is to enable them to better "hold their own" in dealing with those who exercise power over them, leading to more equitable and possibly more efficient outcomes. For example, Ghosh et al. find that increasing the bargaining power of credit-constrained borrowers reduces credit rationing, increases entrepreneurial efforts, and increases efficiency (Ghosh et al. 2000). In the case of human recognition, the "downward" direction of human recognition provision points to the importance of changing individuals' views and behavior toward those less powerful than them. This suggests that while targeting interventions to individuals at the bottom of social and power hierarchies is valuable for many reasons, working with populations in the middle and top of hierarchies may be an important means of improving human recognition transactions.

2.4. Contribution of Human Recognition to Utility

Human recognition's contribution to utility is modeled using a simple utility function,

$$U_i = U(h_i, c_i, R_i, R_{i_p}),$$

where h_i is individual *i*'s health status, c_i is her consumption level, R_i is her level of human recognition, and R_{i_p} is the total human recognition she provides to others, $R_{i_p} = \sum_{j=1}^{m} r_{ij}$.

For simplicity and because this part of the model does not have individual-specific interactions, the i subscripts are dropped: $U = U(h, c, R, R_p)$.

Health status and consumption are determined by the functions

$$h = h(H, R) \text{ and } c = c(C, R, R_p),$$

where H and C are factors and inputs other than human recognition that determine health status and consumption respectively. R is included in the health and consumption functions to capture the effects human recognition receipt can have on one's health and consumption. In addition to the health effects of violence or abuse that negative human recognition contributes to, there may be direct health effects of the human recognition itself. For example, based on neuroimaging, Eisenberger et al. (2003) found that the pain caused by social exclusion is similar to physical pain. Note that there may be interactions between H and R because one's level of human recognition can affect health-related behaviors or access to health services, and conversely some of these factors can affect recognition levels. Similarly, there may be interactions among C, R, and R_p. The R_p term is included in the argument of the consumption function because the level of human recognition provided to others can affect one's own consumption level.[12] The R_p term is not included in the health function because the direct impact recognition provision has on one's own health is expected to be minimal, though in some cases it could affect mental health.

R_p's effect on the providing individual's utility is derived directly from the payoff function. The individual payoff function, $\pi_i(r_{ij}) = \mu r_{ij} + r_{ij}\psi(R_i) - \alpha r_{ij}^2 - \beta r_{ij}$, can be converted to a payoff function for total recognition provided:

$$\pi(R_p) = \mu R_p + R_p\psi(R) - \alpha R_p^2 - \beta R_p.$$

For simplicity, the parameters μ, ψ, α, and β in this function are taken to be the same for all *m* individuals or, alternatively, can be interpreted as the average of parameters across *m* individuals.

The payoff function, $\pi(R_p) = \mu R_p + R_p\psi(R) - \alpha R_p^2 - \beta R_p$, is a subutility function. Although one's own recognition level R is a variable in the subutility function, it is not a choice variable in an individual's utility maximization and can be treated as exogenous. Therefore, two-stage maximization can be used whereby an individual chooses how much recognition to provide others and then chooses his other choice variables related to consumption and health (Varian 1992). Optimizing this subutility function yields

$$R_p^* = (\mu + \psi(R) - \beta)/2\alpha.$$

A simple linear function, $u(R) = \phi R$, is used for the direct psychic effect one's human recognition level has on one's utility, with $\phi > 0$. A simple linear function, $\psi(R) = \psi R$, is used for the marginal

12 For example, Bloch and Rao find that systematic domestic violence in southern India – a manifestation of a husband's negative human recognition of his wife – is used to extract dowry payments from the wife's family, which increases the husband's consumption (Bloch and Rao 2002).

psychic benefit of human recognition provision, with $\psi > 0$. The subutility of human recognition provision becomes $\pi(R_p) = \mu R_p + R_p\psi R - \alpha R_p^2 - \beta R_p$. Using a simple additive function, incorporating u_h and u_c as subutility functions for health and consumption, and incorporating the R_p* expression for the optimal level of human recognition provision, the utility function becomes:

$$U = u_h[h(H, R)] + u_c[c(C, R, \{\mu + \psi R - \beta\}/2\alpha)] + \phi R + \mu\{\mu + \psi R - \beta\}/2\alpha + \psi R\{\mu + \psi R - \beta\}/2\alpha - \alpha(\{\mu + \psi R - \beta\}/2\alpha)^2 - \beta\{\mu + \psi R - \beta\}/2\alpha.$$

Differentiating this expression with respect to R yields the total marginal utility of one's own level of human recognition:

$$\frac{\partial U}{\partial R} = \frac{\partial U}{\partial h}\frac{\partial h}{\partial R} + \frac{\partial U}{\partial c}\frac{\partial c}{\partial R} + \phi + \frac{\psi}{2\alpha}(\mu - \beta + \psi R).$$

The Appendix (A3) derives this expression.

This expression indicates that an individual's level of human recognition affects wellbeing in three ways: a) through its effect on health and consumption, $\frac{\partial h}{\partial R}$ and $\frac{\partial c}{\partial R}$, which in turn affect utility, $\frac{\partial U}{\partial h}$ and $\frac{\partial U}{\partial c}$ (*material effects*); b) through its direct effect on wellbeing, ϕ (*psychic effects*); and c) through its effect on the recognition one provides to others, which affects one's own wellbeing, $\frac{\psi}{2\alpha}(\mu - \beta + \psi R)$ (*psychic and material effects*).

Specifying the model further using simple, explicit functional forms for the u_h and u_c functions yields:

$$U = \eta h + \kappa c + \phi R + \pi(R_p), \text{ where } \eta, \kappa > 0.$$

The following explicit functional forms are used for the *h* and *c* functions:

$$h = h(H, R) = H + \frac{HR}{\lambda} + \sigma R, \text{ where } H \geq 0, \sigma > 0 \text{ and } \lambda > R'.$$

$$c = c(H, R, R_p) = C + \frac{CR}{\gamma} + \delta R + \theta R_p - \tau R_p, \text{ where } C \geq 0, \gamma > R', \delta > 0, \theta \geq 0, \tau \geq 0.$$

The σR and δR terms represent the direct effects one's recognition level has on health and consumption respectively. The θR_p and τR_p terms represent the positive and negative effects,

respectively, that provision of human recognition has on one's own consumption.[13] R' is the upper bound of the scale used to measure R and the inverse of the lower bound, which requires the function f(r) shown in Figure 2 to be asymptotic. The $\frac{HR}{\lambda}$ and $\frac{CR}{\gamma}$ terms represent the effects that one's human recognition level has on the "productivity" of other factors in producing health and consumption respectively. For example, if one component of H is proximity to health care facilities, an individual with a higher level of human recognition may obtain greater health benefits from living a given distance from health facilities than an individual with a lower level of recognition does. Greater recognition from family members may enable an individual to visit the facility more freely, and greater recognition from health care providers at the facility may encourage more frequent attendance and better adherence to treatment and recommended practices. The restriction that λ and γ are greater than the maximum magnitude of R means that the effect these interactions have on health and consumption will always be smaller than the direct effect of non-recognition factors, H and C; the interactive terms enhance or diminish the impacts H and C have on health and consumption, rather than supersede them.

Incorporating these explicit functions, the utility function becomes:

$$U = \eta(H + \frac{HR}{\lambda} + \sigma R) + \kappa(C + \frac{CR}{\gamma} + \delta R + \frac{(\theta - \tau)(\mu + \psi R - \beta)}{2\alpha}) + \phi R +$$

$$\mu\{\mu + \psi R - \beta\}/2\alpha + \psi R\ \{\mu + \psi R - \beta\}/2\alpha - \alpha(\{\mu + \psi R - \beta\}/2\alpha)^2 - \beta\{\mu + \psi R - \beta\}/2\alpha.$$

The marginal utility of one's level of human recognition is given by:

$$\frac{\partial U}{\partial R} = \eta(\frac{H}{\lambda} + \sigma) + \kappa(\frac{C}{\gamma} + \delta + \frac{\psi(\theta - \tau)}{2\alpha}) + \phi + \frac{\psi}{2\alpha}(\mu - \beta + \psi R).$$

Three key predictions emerge from the model that can be empirically tested:

1) Human recognition is positively associated with health and consumption.

$$\frac{\partial h}{\partial R} = \frac{H}{\lambda} + \sigma \geq 0.$$

[13] θ and τ are related to μ, α, and β, the parameters for the material benefits and costs of human recognition provision, but are not the same parameters because recognition provision can generate other material benefits and costs in addition to those related to consumption, e.g., political power within the community.

$$\frac{\partial c}{\partial R} = \frac{C}{\gamma} + \delta + \frac{\psi(\theta - \tau)}{2\alpha} > 0.$$ [14]

2) Human recognition's direct psychic effect on utility is positive. $\phi > 0$.

3) Human recognition's total effect on utility is positive.

$$\frac{\partial U}{\partial R} = \eta(\frac{H}{\lambda} + \sigma) + \kappa(\frac{C}{\gamma} + \delta + \frac{\psi(\theta - \tau)}{2\alpha}) + \phi + \frac{\psi}{2\alpha}(\mu - \beta + \psi R) > 0.$$

The model predicts that increases in one's level of human recognition improve utility through both direct (psychic) and indirect (material) channels and improve health and consumption outcomes. If predictions 1) and 2) hold, then prediction 3) also holds unless the last term in the marginal utility expression, $\frac{\psi}{2\alpha}(\mu - \beta + \psi R)$, is negative and of greater magnitude than the other terms combined. See the Appendix (A4) for a discussion of this unlikely possibility.

2.5. Programs

As discussed above, development programs influence human recognition transactions, which in turn can affect the target population's utility through direct psychic effects, material outcomes that are part of the program's objectives, and other material outcomes. The model describes how consideration of human recognition in the design of a health program affects resource allocation and outcomes. Similar models could be applied to programs in other sectors.

A program maximizes a utilitarian welfare function for a targeted population:

$$\max_{H,R} W = \sum_{i}^{q} w_i \text{ , } w_i = U_i(h(H_0, H, R_0, R), r(R_0, R))$$

$$= \eta[H_0 + H + \frac{(H_0 + H)(R_0 + R)}{\lambda} + \sigma(R_0 + R)] + \phi(R_0 + R)$$

---

[14] According to the model, it is theoretically possible, but unlikely, that $\frac{\partial c}{\partial R} < 0$. This would require that $\tau > \frac{2\alpha}{\psi}(\frac{C}{\gamma} + \delta) + \theta$, which means recognition provision's negative marginal effect on one's own consumption, τ, is significantly greater than its positive marginal effect, θ, and that the difference in these effects weighted by the marginal benefit-cost ratio, $\frac{\psi}{2\alpha}$, is of greater magnitude than the sum of the marginal effects one's level of recognition has on one's consumption, δ, and on the productivity of other consumption factors, $\frac{C}{\gamma}$. This is unlikely but with suitable data can be empirically tested.

$$\text{subject to } Hp_H + Rp_R \leq M,$$

where there are *q* members of the targeted population; w_i is the welfare of individual *i*; H_0 and R_0 are pre-existing health-related and recognition-related factors, respectively, that are not the result of program interventions; H and R are program interventions aimed at improving health and recognition respectively; p_H and p_R are the costs of health and recognition interventions respectively; and M is resources available to the program. Parameters μ, λ, σ, and ϕ are as described earlier.

The model assumes a homogenous target population, and H_0, H, R_0, and R represent levels for the entire population.[15] In this part of the model, H_0, H, R_0, and R are restricted to be non-negative because the model examines program inputs designed to improve health and human recognition, so zero represents the lowest level of health or recognition. Other components can be added to the objective function or constraints, such as implementing organizations' institutional priorities or donor requirements, but the program's primary objective is improving participants' utility and the primary constraint is a resource constraint. The model includes the use of distinct resources (Rp_R) to improve beneficiaries' human recognition levels. This may involve specific interventions such as psychosocial counseling or actions to reduce domestic violence, or may involve refinement of existing health interventions such as refining the content and methods of staff training, establishing norms for the minimum amount of time service providers spend with clients or installing infrastructure such as patient seating.[16]

Case 1: Direct and instrumental effects of human recognition considered (*optimal program*)

The optimal program accounts for recognition's direct effects on utility and its instrumental effects through health outcomes. It faces the constrained optimization problem given above. The program solves the following Lagrangian:

$$\max_{H,R} \mathcal{L} = \eta[H_0 + H + \frac{(H_0 + H)(R_0 + R)}{\lambda} + \sigma(R_0 + R)] + \phi(R_0 + R) + \Lambda(M - Hp_H - Rp_R).$$

The solution, derived in the Appendix (A5), yields the following optimal levels of investment in health and recognition:

15 Alternatively, these variables could be averages for a heterogeneous population.

16 Even apparently costless efforts to improve human recognition, such as improving service providers' interpersonal behaviors, may require resources for training and structured supervision to facilitate and institutionalize these changes.

$$\text{H}^* = \frac{1}{2}\left[\frac{M + (\lambda + R_0)p_R}{p_H} - H_0 - \lambda(\sigma + \frac{\phi}{\eta})\right]$$

$$\text{R}^* = \frac{1}{2}\left[\frac{M}{p_R} - R_0 - \lambda + \frac{p_H}{p_R}[H_0 + \lambda(\sigma + \frac{\phi}{\eta})]\right]$$

Comparative statics show that health and recognition interventions are both ordinary goods for the program; a price increase leads the program to "purchase" less of that good:

$$\frac{\partial H}{\partial p_H} = -\frac{M + (\lambda + R_0)p_R}{2p_H^2} < 0, \quad \frac{\partial R}{\partial p_R} = -\frac{M + p_H[H_0 + \lambda(\sigma + \frac{\phi}{\eta})]}{2p_R^2} < 0.$$

Health and recognition interventions act as substitutes; a price increase in one leads the program to "purchase" more of the other:

$$\frac{\partial H}{\partial p_R} = \frac{\lambda + R_0}{p_H} > 0, \frac{\partial R}{\partial p_H} = \frac{H_0 + \lambda(\sigma + \frac{\phi}{\eta})}{2p_R} > 0.$$

Comparative statics also indicate that better initial health conditions lead to relatively lower investments in the direct health aspects of interventions and relatively higher investments in recognition; and better initial recognition conditions lead to relatively lower investments in recognition aspects of interventions and relatively higher investments in health.

$$\frac{\partial H}{\partial H_0} = -\frac{1}{2} < 0, \frac{\partial R}{\partial H_0} = \frac{p_H}{2p_R} > 0 \text{ and } \frac{\partial R}{\partial R_0} = -\frac{1}{2} < 0, \frac{\partial H}{\partial R_0} = \frac{p_R}{2p_H} > 0.$$

This is because the marginal utility of health inputs and the marginal utility of recognition are both constant,

$$\frac{\partial^2 U}{\partial(H_0 + H)^2} = 0, \frac{\partial^2 U}{\partial(R_0 + R)^2} = 0,$$

but the cross marginal utilities are increasing,

$$\frac{\partial^2 U}{\partial(H_0 + H)(R_0 + R)} = \frac{1}{\lambda} > 0.$$

While H and R are substitutes in the standard economic sense, they are also complementary products that enhance each other's contribution to utility. Because of the positive interaction between recognition and health inputs in the health component of the utility function, higher initial levels of health (recognition) increase the marginal utility from improvements in recognition (health). These results imply that programs should aim to complement their primary investments in

direct health inputs with investments in human recognition, taking into account the pre-program status.[17]

For the welfare and utility functions given, these outcomes represent the optimal situation in which program design accounts for human recognition both as a direct component of utility and as a contributing factor to health outcomes, leading to the maximum welfare of participants. I now look at outcomes for programs that either do not consider human recognition or only partially account for it in program design.

Case 2: Human recognition not considered

A program that does not consider human recognition at all in program design solves a variation of the above optimization problem in which no R terms are included.

$$\max_{H} \mathcal{L} = \eta(H_0 + H) + \Lambda(M - Hp_H)$$

The solution is $H^{**} = \frac{M}{p_H}$. Since recognition is not considered in the design, there are no investments made directly in recognition, and $R^{**} = 0$. Note this does not mean the program will not have an effect on human recognition levels, but any such effects will be "unintended consequences" such as Sen (1999) describes. In some cases programs that focus exclusively on health objectives and do not consider human recognition may reduce recognition levels among participants because what is perceived as the most efficient methods for providing health services may entail provision of negative recognition, e.g., extremely brief doctor visits or coercive contraception.

Given the welfare function in this model, this outcome is a suboptimal resource allocation, and participants have lower welfare than in the optimal case. The program is over-investing in the direct health aspects of interventions ($H^{**} > H^*$) and under-investing in the aspects of interventions aimed at improving human recognition ($R^{**} < R^*$, except for the case when $R^* = 0$).

Case 3: Human recognition considered but no resources allocated

A variation similar to Case 2 is a program that does recognize and consider human recognition's role, but chooses *a priori* not to devote any resources specifically to addressing recognition. Such a

17 This does not imply that programs should invest equally in the two areas; investment in direct health inputs will generally be much higher given the likely greater impacts on programs' health objectives.

program solves an optimization problem in which there is no R term in the expenditure constraint and there is an additional constraint that R = 0.

$$\max_{H} \mathcal{L} = \eta[H_0 + H + \frac{(H_0 + H)(R_0 + R)}{\lambda} + \sigma(R_0 + R)] + \phi(R_0 + R) + \Lambda(M\text{-}Hp_H) + \Gamma(R\text{-}0)$$

The solution is the same as above: $H^{**} = \frac{M}{p_H}$ and $R^{**} = 0$, with the same implications for the welfare of participants.

Case 4: Only instrumental effects of human recognition considered

Realizing that respectful approaches lead to greater attendance and better adherence to treatments and recommended behaviors, some health programs account for human recognition's instrumental effects but not its direct effect on utility. Such a program solves an optimization problem in which $\phi = 0$.

$$\max_{H,R} \mathcal{L} = \eta[H_0 + H + \frac{(H_0 + H)(R_0 + R)}{\lambda} + \sigma(R_0 + R)] + \Lambda(M - Hp_H - Rp_R)$$

The solution yields the following levels of investment in health and recognition:

$$H^{***} = \frac{1}{2}\left[\frac{M + (\lambda + R_0)P_R}{P_H} - H_0 - \lambda\sigma\right]$$

$$R^{***} = \frac{1}{2}\left[\frac{M}{P_R} - R_0 - \lambda + \frac{P_H}{P_R}(H_0 + \lambda\sigma)\right]$$

The comparative statics have the same signs as in the optimal case, but this is a suboptimal allocation of resources. With recognition's direct effect on utility not considered in program design, the $\frac{\phi}{\eta}$ terms are no longer in the solutions, so $H^{***} > H^*$ and $R^{***} < R^*$. Overinvestment in direct health aspects of interventions and underinvestment in recognition aspects lead to lower welfare than the optimal case.

Case 5: Only direct effects of human recognition considered

The last variation involves a program that accounts for human recognition's direct psychic effect on utility, but does not account for its instrumental effect through health outcomes. Such a program is attuned to psychological and emotional aspects of wellbeing but does not consider the link between these factors and the program's health outcomes. The program's optimization problem has no R terms in the expression for participants' health.

$$\max_{H,R} \mathcal{L} = \eta(H_0 + H) + \phi(R_0 + R) + \Lambda(M - Hp_H - Rp_R)$$

The solution depends on the ratio of the parameters and the ratio of the prices.

If $\frac{\eta}{\varphi} > \frac{p_H}{p_R}$, then H**** = M and R**** = 0.

If $\frac{\eta}{\varphi} < \frac{p_H}{p_R}$, then H**** = 0 and R**** = M.

If $\frac{\eta}{\varphi} = \frac{p_H}{p_R}$, then there are an infinite number of solutions.

With a linear utility function and linear cost structure, if the benefit-cost ratio of health $(\frac{\eta}{p_H})$ is greater than the benefit-cost ratio of recognition $(\frac{\phi}{p_R})$, then all program investment will go to health; and if the benefit-cost ratio for recognition is greater, then all investment will go to recognition. If the two ratios are equal, then any allocation that meets the budget constraint provides the same utility. Neither of the definite solutions is optimal: one entails over-investing in health and under-investing in recognition, and the other entails over-investing in recognition and under-investing in health.

Development practitioners often report that *how* a program is implemented is as great a factor in its success as the technical content of interventions. This is one reason for the recent focus on quality improvement processes in health programs (Tawfik et al. 2012). This model predicts that part of that *how* is whether and how program design accounts for human recognition. Optimal improvements in program participant welfare occur when both the direct and instrumental effects of human recognition are considered in program design and resource allocation.

3. Concluding Remarks

This paper introduced and modeled human recognition, a dimension of development that has not been directly studied before. One of the challenges of incorporating intangible components of economic development into research and practice is the difficulty of modeling the roles such components play in development processes and outcomes. The model presented here offers an approach to understanding and predicting the determinants, contribution to utility, and programmatic role of one such intangible component. In addition to laying the foundation for further work on human recognition, the approach may also be useful for modeling other non-material components of development.

The model predicts that increases in one's level of human recognition increase utility through both direct, psychic effects and indirect, material effects such as improved health and consumption outcomes. It also predicts that incorporating human recognition considerations into program design can improve outcomes. Empirical measurement of human recognition will enable these and other predictions to be tested. Empirical study of human recognition can use data on specific manifestations of recognition transactions, such as domestic violence, and can use self-reported levels of human recognition that individuals receive.

A number of the model's predictions have implications for programs and policies. The model of human recognition provision suggests that, in some circumstances, multiple equilibria can exist, which may help explain certain observed household or community situations such as cycles of abuse. Given the hypothesized relationship between recognition and material outcomes, low-level equilibria can become low recognition poverty traps. Policy and program interventions addressing human recognition can help groups escape such traps and move to high-level equilibria.

A notable feature of the model is the "insulation effect" exerted by an individual's existing level of human recognition. The function that maps received recognition to an individual's total level of recognition increases in its argument but has marginal effects that decline for higher absolute values of the argument. This means that a given input of human recognition has less of an effect on individuals who already have large magnitudes of positive or negative recognition than it does on those with small magnitudes. This insulation effect also applies to the provision of human recognition, in which a given input of recognition received from others has less effect on one's own recognition provision behavior when one already receives large magnitudes of positive or negative recognition. Furthermore, among individuals receiving large magnitudes of negative recognition, inputs of positive human recognition have a greater effect than the same magnitude of

negative recognition does. This suggests that development programs working with marginalized populations and individuals can have a significant positive impact on human recognition and related outcomes.

One conclusion relevant to programs that emerges from the model is that an exclusively instrumental approach to human recognition issues is incomplete. The model predicts that when programs only account for recognition's role in achieving better health, education, or income outcomes and do not consider its direct role in wellbeing, the resulting program design and resource allocations are suboptimal. This implies the need to broaden the view of human recognition and related intangible components of development from being only a means of achieving better material outcomes to also being an objective of the same order – though not necessarily of the same priority – as material objectives. Such a broadening of perspective suggests that development at its optimum becomes a process of simultaneously improving material and intangible outcomes.

References

Alkire, S. (2007). The missing dimensions of poverty data: Introduction to the special issue. *Oxford Development Studies*, 35(4), 347–359.

Bloch, F., & Viyayendra, R. (2002). Terror as a bargaining instrument: A case study of dowry violence in rural India. *American Economic Review,* 92(4), 1029–1043.

Castleman, T. (2011a). Measurement of human recognition: A methodology with empirical applications in India and Kenya. (*Working Paper* 2011–10). The George Washington University: Institute for International Economic Policy.

Castleman, T. (2011b). Human recognition among HIV-infected adults: Empirical evidence from a randomized controlled trial in Kenya. (*Working Paper* 2011–11). The George Washington University: Institute for International Economic Policy.

Dunkle, K.L., Jewkes, R.K., Brown, H.C., Gray, G.E., McIntyre, J.A., & Harlow, S.D. (2004). Gender-based violence, relationship power, and risk of HIV infection in women attending antenatal clinics in South Africa, *The Lancet* 363, 1415–1421.

Eisenberger, N.I., Lieberman, M.D., Williams, K.D. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science*, 302, 290-292.

Foster, J., & Handy, C. (2008). External Capabilities. (*OPHI Working Paper* 8). Oxford University: Oxford Poverty and Human Development Initiative.

Frey B., & Stutzer, A. (2005). Beyond outcomes: Measuring procedural utility. *Oxford Economic Papers,* 57, 90–111.

Ghosh, P., Mookherjee, D., & Ray, D. (2000). Credit rationing in developing countries: an overview of the theory. In D. Mookherjee & D. Ray (Eds.), *A reader in development economics* (383–401). London: Blackwell,

Gourevich, P. (1998). *We wish to inform you that tomorrow we will be killed with our families*: *stories from Rwanda*. New York: Picador.

Gushee, D.P. (1993). Many paths to righteousness: an assessment of research on why righteous gentiles helped Jews. *Holocaust & Genocide Studies,* 7, 372–401.

Hoff, K. (2001). Beyond Rosenstein-Rodan: The modern theory of coordination problems in development. In B. Pleskovic & N. Stern (Eds.), *Annual World Bank conference on development economics 2000* (pp. 145–176). Washington DC: The World Bank.

Jewkes, R.K., Dunkle, K., Nduna, M., & Shai, N. (2010). Intimate partner violence, relationship power inequity, and incidence of HIV infection in young women in South Africa: A cohort study. *The Lancet* 376, 41–48.

Kabeer, N. (2001). Reflections on the measurement of women's empowerment. In A. Sisask (Ed.), Discussing women's empowerment – theory and practice. *Sida Studies* No. 3 (pp. 17–54). Stockholm: Novum Grafiska.

Lind, E.A., and Tyler, T.R. (1988). *The social psychology of procedural justice*. New York: Plenum Press.

Mullainathan, S. (2005). Development economics through the lens of psychology. In F. Bourguignon & B. Pleskovic (Eds.), *Annual World Bank conference on development economics Lessons of experience* (pp. 45–70). Washington DC: World Bank.

Narayan, D. (2005). Conceptual framework and methodological challenges. In D. Narayan (Ed.), *Measuring empowerment: Cross-disciplinary perspectives* (pp. 3–38). Washington DC: The World Bank.

Narayan, D., & Pritchett, L. (1999). Cents and sociability: household income and social capital in rural Tanzania. *Economic Development and Social Change*, 47(4), 871–897.

Narayan, D. (Ed.). (2002). *Empowerment and poverty reduction: A sourcebook*. Washington DC: The World Bank.

Narayan, D. (Ed.). (2005). *Measuring empowerment: Cross-disciplinary perspectives.* Washington DC: The World Bank.

Offer, A. (1997). Between the gift and the market: The economy of regard. *The Economic History Review,* 50(3), 450–476.

Oliner, S.P., & Oliner, P.M. (1988). *The Altruistic Personality*. New York: Free Press.

Oliver, J.E. (1993). Intergenerational transmission of child abuse: rates, research, and clinical implications. *American Journal of Psychiatry*, 150, 1315–1324.

Patel, V. & Kleinman, A. (2003). Poverty and common mental disorders in developing countries. *Bulletin of the World Health Organization*, 81(8), 609–615.

Rao, V. (1998). Domestic violence and intra-household resource allocation in rural India: an exercise in participatory econometrics. In M. Krishnaraj, R. Sudarshan, & A. Sharif (Eds.), *Gender, Population, and Development* (Chapter 5). Oxford: Oxford University Press.

Reyles, D.Z. (2007). The ability to go without shame: A proposal for internationally comparable indicators of shame and humiliation. *Oxford Development Studies,* 35(4), 405–430.

Rusesabagina, P., & Zoellner, T. (2006). *An ordinary man: An autobiography*. New York: Viking Penguin Press.

Sen, A. (1999). *Commodities and capabilities*. New Delhi: Oxford University Press. (Originally published 1985).

Sen, A. (1999). *Development as freedom*. New York: Anchor Books.

Sen, A. (2006). *Identity and violence: The illusion of destiny*. New York: W.W. Norton and Company.

Sen, A. (1992). *Inequality re-examined*. Cambridge, MA: Harvard University Press.

Sen, A. (1983). Poor, relatively speaking. *Economic Papers*, 35(2), 153–69.

Smith, A. (2000). *The theory of moral sentiments*. New York: Prometheus Books.

Tawfik Y., Bornstein, T., Marquez, L., Hermida, J., Boucar, M., & Donohue, K. (2012). *Improving maternal, newborn, child health, and family planning programs through the application of collaborative improvement in developing countries: A practical orientation guide.* Bethesda: University Research Co.

Varian, H. (1992). *Microeconomic Analysis*, 3rd edition. New York: W.W. Norton & Company.

Appendix

A1: Proof of Proposition 1 – Function for Received Recognition

1. MONOTONICITY: We need to show that for the case described in Property 1, an increase in q_j leads to an increase in r_{i_r}, or $\frac{\partial r_{i_r}}{\partial q_j} > 0$.

   Let $Q_0 = \sum_{h=1}^{n} \rho_h r_{hi} - \rho_j r_{ji}$. That is, Q_0 represents all recognition inputs that *i* receives except for *j*'s input.

   $$r_{i_r} = \frac{Q_0 + q_j}{\sqrt{n}}.$$

   In differentiating this expression, the Q_0 term can be treated as a constant because it does not change with q_j.

   $$\frac{\partial r_{i_r}}{\partial q_j} = \frac{1}{\sqrt{n}} > 0. \text{ QED.}$$

1A. We need to show that $\frac{\partial | r_{i_r} |}{\partial n} > 0$ for the case described in Property 1A.

$q_h = \rho_h r_{hi}$ and $q_1 = q_2 \ldots = q_n$.

So $r_{i_r} = \frac{1}{\sqrt{n}} nq$.

$$\frac{\partial r_{i_r}}{\partial n} = \frac{\partial(\frac{1}{\sqrt{n}} nq)}{\partial n} = \frac{q}{2\sqrt{n}}.$$

When $q > 0$, $r_{i_r} > 0$. When $q < 0$, $r_{i_r} < 0$. For $q > 0$, $\frac{\partial r_{i_r}}{\partial n} = \frac{q}{2\sqrt{n}} > 0$.

For $q < 0$, $\frac{\partial r_{i_r}}{\partial n} = \frac{q}{2\sqrt{n}} < 0$. In both cases $\frac{\partial | r_{i_r} |}{\partial n} > 0$. QED.

2. DIMINSHING RETURNS TO ADDITIONAL PROVIDERS: We need to show that for the case described in Property 2, $\frac{\partial | \Delta r_{i_r} |}{\partial n} < 0$.

$$\Delta r_{i_r} = \frac{1}{\sqrt{n+1}}(n+1)q - \frac{1}{\sqrt{n}}(n)q$$

$$\frac{\partial \Delta r_{i_r}}{\partial n} = q(\frac{1}{2\sqrt{n+1}} - \frac{1}{2\sqrt{n}}) = \frac{q}{2}(\frac{1}{\sqrt{n+1}} - \frac{1}{\sqrt{n}}).$$

When q > 0, $\Delta r_{i_r} > 0$. When q < 0, $\Delta r_{i_r} < 0$.

$\frac{1}{\sqrt{n+1}} < \frac{1}{\sqrt{n}}$ because n is always positive.

So for q > 0, $\frac{\partial \Delta r_{i_r}}{\partial n} = \frac{q}{2}(\frac{1}{\sqrt{n+1}} - \frac{1}{\sqrt{n}}) < 0$.

And for q < 0, $\frac{\partial \Delta r_{i_r}}{\partial n} = \frac{q}{2}(\frac{1}{\sqrt{n+1}} - \frac{1}{\sqrt{n}}) > 0$.

In both cases $\frac{\partial \mid \Delta r_{i_r} \mid}{\partial n} < 0$. QED.

2A. We need to show that $\frac{\partial \mid r_{i_r} \mid}{\partial n} < 0$ for the case described in Property 2A.

$Q = \sum_{h=1}^{n} \rho_h r_{hi}$.

$r_{i_r} = \frac{1}{\sqrt{n}} Q$. $\frac{\partial r_{i_r}}{\partial n} = \frac{\partial(\frac{1}{\sqrt{n}} Q)}{\partial n} = -\frac{Q}{2} n^{-3/2}$.

When Q > 0, $r_{i_r} > 0$. When Q < 0, $r_{i_r} < 0$. For Q > 0, $\frac{\partial r_{i_r}}{\partial n} = -\frac{Q}{2} n^{-3/2} < 0$.

For Q < 0, $\frac{\partial r_{i_r}}{\partial n} = -\frac{Q}{2} n^{-3/2} > 0$. In both cases $\frac{\partial \mid r_{i_r} \mid}{\partial n} < 0$. QED.

3. EQUIVALENCE OF PROVIDERS NOT REQUIRED: The parameter ρ_{hi} is a provider-specific weight that accounts for differences among providers in the impact a given level of provided recognition has on an individual's received recognition. Since these parameters differ for different providing individuals *h*, provision of the same quantity of recognition by different individuals can have different effects on the total level of received recognition.

4. INCREASING EFFECTS OF DIFFERENCES IN RECEIVED RECOGNITION:

We need to show that for case described in Property 4, $\frac{\partial \mid \Delta r_{i_r} \mid}{\partial \mid q_{n+1} - Q \mid} > 0.$

Let d = q_{n+1} - Q. Given the condition that $|q_{n+1}| > |Q|$, there are two possible cases:

$q_{n+1} > Q \Rightarrow q_{n+1} > 0, d > 0, \Delta r_{i_r} > 0.$

$q_{n+1} < Q \Rightarrow q_{n+1} < 0, d < 0, \Delta r_{i_r} < 0.$

That is, when $q_{n+1} > Q$, the addition of q_{n+1} increases total received recognition so $\Delta r_{i_r} > 0$, and when $q_{n+1} < Q$, the addition of q_{n+1} decreases total received recognition so $\Delta r_{i_r} < 0$. In both cases, d and Δr_{i_r} are the same signs. So an increase in the magnitude of d leads to an increase in the magnitude of r_{i_r} as Property 4 states, if and only if an increase in d leads to an increase in r_{i_r}.

If $|q_{n+1}| > |Q|$, then $\frac{\partial \mid \Delta r_{i_r} \mid}{\partial \mid d \mid} > 0 \Leftrightarrow \frac{\partial \Delta r_{i_r}}{\partial d} > 0.$

$$\Delta r_{i_r} = \frac{Q + q_{n+1}}{\sqrt{n+1}} - \frac{Q}{\sqrt{n}}.$$

$d = q_{n+1} - Q.$

By the chain rule, $\frac{\partial \Delta r_{i_r}}{\partial d} = \frac{\partial \Delta r_{i_r}}{\partial Q}\frac{\partial Q}{\partial d} + \frac{\partial \Delta r_{i_r}}{\partial q_{n+1}}\frac{\partial q_{n+1}}{\partial d} + \frac{\partial \Delta r_{i_r}}{\partial n}\frac{\partial n}{\partial d}.$

$$\frac{\partial \Delta r_{i_r}}{\partial Q}\frac{\partial Q}{\partial d} = (\frac{1}{\sqrt{n+1}} - \frac{1}{\sqrt{n}})(-1) > 0$$

$$\frac{\partial \Delta r_{i_r}}{\partial q_{n+1}}\frac{\partial q_{n+1}}{\partial d} = \frac{1}{\sqrt{n+1}} > 0$$

$$\frac{\partial \Delta r_{i_r}}{\partial n}\frac{\partial n}{\partial d} = 0$$

$$\therefore \frac{\partial \Delta r_{i_r}}{\partial d} > 0 \Rightarrow \frac{\partial \mid \Delta r_{i_r} \mid}{\partial \mid d \mid} > 0. \text{ QED.}$$

A2: Proof of Proposition 2 – Function for Total Recognition

5. NON-DECREASING IN THE ARGUMENT:

$$f'(r) = \begin{cases} \alpha r^{\alpha-1} \geq 0, r \geq 0 \\ \alpha(-r)^{\alpha-1} > 0, r < 0 \end{cases}$$ QED.

6. DECREASING MARGINAL EFFECTS FOR HIGHER ABSOLUTE VALUE OF THE ARGUMENT:

$$f''(r) = \begin{cases} \alpha(\alpha-1)r^{\alpha-2} < 0, r > 0 \\ -\alpha(\alpha-1)(-r)^{\alpha-2} > 0, r < 0 \end{cases}$$

For r > 0, as r increases (and |r| increases), f''(r) decreases. For r < 0, as r decreases (and |r| increases), f''(r) decreases, meeting the condition of decreasing marginal effects for higher absolute value of r. QED.

A3: Derivation of Marginal Utility of Recognition Level

The general utility function is:

$$U = u_h[h(H, R)] + u_c[c(C, R, R_p)] + \phi R + \pi(R_p)$$

Substituting for $R_p^* = \{\mu + \psi R - \beta\}/2\alpha$, and $\pi(R_p) = \mu R_p + R_p \psi R_i - \alpha R_p^2 - \beta R_p$, the utility function becomes:

$$U = u_h[h(H, R)] + u_c[c(C, R, \{\mu + \psi R - \beta\}/2\alpha)] + \phi R + \mu\{\mu + \psi R - \beta\}/2\alpha +$$

$$\psi R\{\mu + \psi R - \beta\}/2\alpha - \alpha(\{\mu + \psi R - \beta\}/2\alpha)^2 - \beta\{\mu + \psi R - \beta\}/2\alpha$$

To derive the expression for marginal utility of one's own level of human recognition, the above expression for utility is differentiated with respect to R.

Differentiating the first three terms, $u_h[h(H, R)] + u_c[c(C, R, \{\mu + \psi R - \beta\}/2\alpha)] + \phi R$, yields:

$$\frac{\partial U}{\partial h}\frac{\partial h}{\partial R} + \frac{\partial U}{\partial c}\frac{\partial c}{\partial R} + \phi$$

Obtaining the final term of the marginal utility requires differentiating the expression for $\pi(R_p)$, $\mu\{\mu + \psi R - \beta\}/2\alpha + \psi R\{\mu + \psi R - \beta\}/2\alpha - \alpha(\{\mu + \psi R - \beta\}/2\alpha)^2 - \beta\{\mu + \psi R - \beta\}/2\alpha$, with respect to R.

$$\frac{\partial \pi(R_p)}{\partial R} = \mu\psi/2\alpha + \mu\psi/2\alpha - \beta\psi/2\alpha + 2\psi^2 R/2\alpha - \psi(\mu + \psi R - \beta)/2\alpha - \beta\psi/2\alpha$$

$$= \mu\psi/2\alpha - \beta\psi/2\alpha + \psi^2 R/2\alpha$$

$$= \frac{\psi}{2\alpha}(\mu - \beta + \psi R)$$

So the expression for total marginal utility of one's own recognition level is

$$\frac{\partial U}{\partial R} = \frac{\partial U}{\partial h}\frac{\partial h}{\partial R} + \frac{\partial U}{\partial c}\frac{\partial c}{\partial R} + \phi + \frac{\psi}{2\alpha}(\mu - \beta + \psi R).$$

A4: Prediction of Human Recognition's Impact on Utility

1) Human recognition is positively associated with health and consumption.

$$\frac{\partial h}{\partial R} = \eta(\frac{H}{\lambda} + \sigma) \geq 0.$$

$$\frac{\partial c}{\partial R} = \kappa(\frac{C}{\gamma} + \delta + \frac{\psi(\theta - \tau)}{2\alpha}) > 0.$$

2) Human recognition's direct psychic effect on utility is positive. $\phi > 0$.

3) Human recognition's total effect on utility is positive.

$$\frac{\partial U}{\partial R} = \eta(\frac{H}{\lambda} + \sigma) + \kappa(\frac{C}{\gamma} + \delta + \frac{\psi(\theta - \tau)}{2\alpha}) + \phi + \frac{\psi}{2\alpha}(\mu - \beta + \psi R) > 0.$$

If predictions 1) and 2) above hold, then prediction 3) will hold unless the last term in the marginal utility expression, $\frac{\psi}{2\alpha}(\mu - \beta + \psi R)$, is negative and of greater magnitude than the other terms combined. This last term represents the effect on an individual's utility of the change in his provision of recognition to others that is caused by a change in his own level of recognition. Using notation, this effect can be expressed as:

$$\Delta R \longrightarrow \Delta R_p \longrightarrow \Delta U$$

This term will be negative if and only if R_p is negative. This can be seen by observing that the sign of this term, $\frac{\psi}{2\alpha}(\mu - \beta + \psi R)$, is the same as the sign of the optimal level of recognition provided to others, $R_p^* = \{\mu + \psi R - \beta\}/2\alpha$.[18]

When this term is negative, there are two cases to consider. The first case is an individual who is providing negative recognition, R_p, and whose own recognition level, R, *increases*. Because

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18 The result can also be seen on an individual basis from the first order condition derived earlier, $\frac{\partial \pi_i(r_{ij})}{\partial r_{ij}} = \mu + \psi R_i - 2\alpha r_{ij} - \beta = 0$. Given this condition, if $\mu - \beta + \psi R_i < 0$, then $r_{ij} < 0$. And in order for the sign of the last term in the marginal utility expression, $\frac{\psi}{2\alpha}(\mu - \beta + \psi R)$, to be negative, $\mu - \beta + \psi R_i$ must be negative.

of complementarity, the increase in R leads the individual to decrease the magnitude of negative recognition he is providing others. This may decrease the (psychic and/or material) utility the person obtains from providing negative recognition to others. So the rise in the individual's recognition level decreases the utility obtained from provision of recognition and hence the final term in the marginal utility expression is negative.

However, in terms of the individual's total utility, in most such cases the magnitude of the increase in utility from the increased recognition level (due to improved health, increased consumption, and psychic benefits) will be larger than the magnitude of the decrease in utility due to the change in recognition provision. That is, even if $\frac{\psi}{2\alpha}(\mu - \beta + \psi R) < 0$, it is very likely that $\frac{\partial U}{\partial h}\frac{\partial h}{\partial R} + \frac{\partial U}{\partial c}\frac{\partial c}{\partial R} + \phi > |\frac{\psi}{2\alpha}(\mu - \beta + \psi R)|$.

Furthermore, in terms of total social welfare, while providing less negative recognition may reduce the individual provider's utility, it will increase the utility of the individuals who receive the lower quantities of negative recognition. So while there may be a private loss of utility to the provider due to the reduced magnitude of negative recognition provision, there is likely a net social gain. This has implications for interventions aimed at increasing positive recognition provision and decreasing negative recognition provision.

The second case involves an individual who is providing negative recognition to others, R_p, and whose own recognition level, R, *decreases*. The decrease in R leads the individual to provide a higher magnitude of negative recognition to others, which may increase the (psychic and/or material) utility the individual obtains from providing recognition to others. So the decrease in the individual's recognition level increases the utility obtained from provision of negative recognition and hence the final term in the marginal utility expression is negative.

Again, in terms of the individual's total utility, it is unlikely that the magnitude of this increase in utility from providing more negative recognition will be greater than the magnitude of the decrease in utility caused by the decline in the individual's own level of recognition. That is, it is likely that

$$|\frac{\partial U}{\partial h}\frac{\partial h}{\partial R} + \frac{\partial U}{\partial c}\frac{\partial c}{\partial R} + \phi| > \frac{\psi}{2\alpha}(\mu - \beta + \psi R).$$

And again, in terms of social welfare, while the increase in utility caused by greater negative provision of recognition would be a private gain, it would likely represent a social loss given the decreased utility of those on the receiving end of the negative recognition.

With suitable data, it can be tested empirically whether prediction 3) holds when predictions 1) and 2) both hold.

A5: Derivation of Optimal Program Health and Recognition Investments

$$\max_{H,R} \mathcal{L} = \eta[H_0 + H + \frac{(H_0 + H)(R_0 + R)}{\lambda} + \sigma(R_0 + R)] + \phi(R_0 + R) + \Lambda(M - Hp_H - Rp_R)$$

The three first order conditions are:

$$(1)\ \frac{\partial \mathcal{L}}{\partial H} = \eta + \frac{\eta(R_0 + R)}{\lambda} - \Lambda p_H = 0$$

$$(2)\ \frac{\partial \mathcal{L}}{\partial R} = \frac{\eta(H_0 + H)}{\lambda} + \eta\sigma + \phi - \Lambda p_R = 0$$

$$(3)\ \frac{\partial \mathcal{L}}{\partial \Lambda} = M - Hp_H - Rp_R = 0 \longrightarrow \qquad (4)\ H = \frac{M - Rp_R}{p_H}$$

$$(1)\ \&\ (2) \longrightarrow \frac{\lambda\eta + \eta(R + R_0)}{\lambda p_H} = \frac{\eta(H + H_0) + \eta\sigma\lambda + \phi\lambda}{\lambda p_R}$$

$$(5)\ R = \frac{p_H}{p_R}\left[H + H_0 + \sigma\lambda + \frac{\phi\lambda}{\eta}\right] - \lambda - R_0$$

$$(4)\ \&\ (5) \longrightarrow H = \frac{M}{p_H} + \frac{(\lambda + R_0)P_R}{p_H} - (H + H_0 + \sigma\lambda + \frac{\phi\lambda}{\eta})$$

$$(6)\ \mathbf{H^*} = \frac{1}{2}\left[\frac{M + (\lambda + R_0)P_R}{P_H} - H_0 - \lambda(\sigma + \frac{\phi}{\eta})\right]$$

$$(3) \longrightarrow \qquad (7)\ R = \frac{M - Hp_H}{p_R}$$

$$(6)\ \&\ (7) \longrightarrow R = \frac{M}{P_R} - \frac{M}{2P_R} - \frac{1}{2}(R_0 + \lambda) + \frac{P_H H_0}{2P_R} + \frac{P_H}{2P_R}\lambda(\sigma + \frac{\phi}{\eta})$$

$$(8)\ \mathbf{R^*} = \frac{1}{2}\left[\frac{M}{P_R} - R_0 - \lambda + \frac{P_H}{P_R}[H_0 + \lambda(\sigma + \frac{\phi}{\eta})]\right]$$