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LEADERSHIP: A PERSONNEL ECONOMICS APPROACH

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ABSTRACT

A theory of leadership is proposed and tested. Leaders are characterized as those who have the ability to choose the right direction more frequently than their peers. The theory implies that leaders tend to be more able, place themselves in visible decision making situations more frequently, and are generalists. Also, the most able leaders should be found in the highest variance industries, where decision making has the greatest payoff. The theory is tested using data on Stanford business school alumni and is confirmed. Leaders are generalists rather than specialists, both innately and in their pattern of skill acquisition.

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The topic of "leadership" has received an increasing amount of attention in the business world, as reflected in the business press and in the curricula of top business schools. Most recognize that it is important to be able to discuss leadership in a coherent manner. There is a significant literature on this subject in organizational behavior. Three review articles that cover many of the papers (over 300 independent papers referenced) are Barrow (1977), Yukl (1989), and House and Aditya (1997).

The papers summarized generally fall into a few categories. First, there are those that describe the traits of leadership, listing the characteristics that lead to being in a leadership position. This paper will do that as well, but will focus on a trait not usually emphasized in the past, namely having a wide variety of skills in many different areas. Other papers concentrate on describing type of leadership, sometimes whether a leader focuses on motivational leadership or whether choice of task is the more central role. Frequently called the "behavioral" approach, these papers analyze the actual behavior that can make ascribed to leaders.[1] A third set of papers examines leadership effectiveness and discusses the variables that make a leader most effective. Fourth are normative leadership papers, which discuss what leaders should do to satisfy particular criteria (private, social, organizational). Fifth, some papers delineate the environmental situations in which leaders can be effective and those in which they cannot. Sixth

[1]In the economics literature, a well-known paper on style and leadership is Rotemberg and Saloner (1993), where leaders can choose to be autocratic leaders or those who empathize with their employees, depending on the rate of innovation.

Another example from outside the economics literature of how leadership style and approach can affect productivity is provided by O'Reilly and Chathman (1984).

are papers that try to determine the amount of power that a leader has. Finally, some papers classify leaders into those who influence major changes in attitudes and assumptions of the organization and into those who go beyond, being "charismatic," meaning that the leader possesses a gift (perhaps divinely inspired) that is unique and which gives the leader unquestioned authority.

The approaches described above cover virtually every aspect of leadership and are rich in description and breadth. Their shortfall, to the extent that there is one, is that the literature does not lend itself well to the type of scientific analysis and proof that could add additional insight into our understanding of the area. The best evidence of this deficiency is that business schools still struggle to offer a well-developed leadership curriculum, even though there is great demand for training leaders in our top schools. In what follows, an attempt is made to strip down the problem of leadership to its basics, to provide a model that produces testable implications, and to present some evidence from a data set of individuals, many of whom have become successful leaders.

The view presented is that leaders are individuals who confront new situations often and choose the right direction in a high proportion of cases. Leaders also have the ability to identify situations where their skills will be needed and to do this frequently in a public setting. As a result of their success in choosing direction, and because the success is observable to others, leaders acquire followers who turn to the leaders for guidance in new and ambiguous situations. Individuals follow those who make correct decisions for a variety of reasons, the most direct of which is that they will boost their own probabilities of being correct by mimicking the decisions

of the leaders. Thus, a leader is someone who has both vision and wisdom and who attracts a coterie of followers because of displayed superiority of decision making.[2]

Because leaders are confronted with a wide variety of choices and because these choices span many fields, leaders tend to be generalists rather than specialists. Further, the broader the organization that an individual leads, the more general are the skills. Academic department chairs are broader than many of their colleagues who are not well suited to be chairs, but they are less broad than the heads of large corporations. Analogously, political leaders tend to be the least specialized and broadest of all leaders because they confront the entire spectrum of possible decisions. This is sometimes characterized as shallowness - knowledge that is 1000 miles wide

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[2]Hermalin (1998) points out that choosing to follow is voluntary and that individuals may choose to follow because they believe that the leader has better information. The focus of his work is on strategic behavior of the leader, who may want to mislead followers. Leading by example or sacrifice is a way to make credible that the leader believes in what he is doing.

Kobayashi, H., & Suehiro, H. (2005) consider leadership in a two period context where one chooses to lead and the other to follow based on confidence about the state of a stochastic production environment.

More recent work by Huck and Rey-Biel (2006) extends Hermalin (1998) to a team setting with leading by example, but focus on the endogenous choice of leader. There analysis leads to the conclusion that the least productive team member should be assigned the role of leader. This hinges on the assumed relation of leadership ability to production ability and on the production function that determines how ability affects output through production versus through leadership.

Hermalin (2007) follows his earlier work, imbedding the analysis in a repeated game context where leaders gain credibility, keep and acquire followers by demonstrated success. The definition of leadership in that paper, namely having followers, is similar to that used here.

Recent papers Komai, M., Stegeman, M., & Hermalin, B. E. (2007) and Komai and Stegeman (2010) continue the theme of leadership as a way to motivate other under uncertainty. Especially the latter, emphasizes the motivational aspect of leadership, where followers would shirk absent correct motivation or incentives.

The direction of followed in the work that follows is different. Effort is ignored. To provide empirical implications the focus is on the characteristics of individuals that allows them to assume leadership roles and on their behavior, both with respect to their own actions and to the way markets treat them.

and ½ inch deep - but breadth is important when the situations that will be encountered are from a large set of potentially unpredictable areas.

An additional key ingredient is that leaders also possess the skills necessary to convince others that they have leadership ability. Consequently, communication skills are likely to be an important component in the leadership mix.

The empirical work below follows some recent analysis of entrepreneurship and uses the same data from graduates of the Stanford MBA program.[3] This is not inappropriate because entrepreneurs are a subset of leaders. Indeed, the distinction between entrepreneurs and leaders is somewhat blurred. Most successful entrepreneurs view themselves as leaders because they had the vision that enabled them to provide valuable output economy. Starting a successful business requires the ability to navigate through a vast array of potential hazards. Conversely, most leaders of large corporations think of themselves as entrepreneurial, whether they founded the company or not. The most successful of some CEOs include a few founders, but are comprised primarily of those who redesigned existing companies to produce higher profits and shareholder value.

Building on this view, the analysis produces three main results, the last two of which are testable with the data at hand and borne out.

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[3]See Lazear (2005). Baumol (1968) was one of the first modern-era papers to consider the role of the entrepreneur in economic growth and macroeconomic activity. Sometimes, the ability to influence others is destructive as Baumol (1990) points out in his influential essay. In addition to being creative and generating value, those who are effective in swaying others can capture rents, and entrepreneurship and more generally leadership, can be used primarily to capture rent, without little increase in value. In what follows, most of the discussion will focus on those aspects of entrepreneurship and leadership that are indeed productive.

1. Ability and visibility, manifested in number of contacts per period, are complements. The most able seek to be the most visible in decision making settings.

2. The most able leaders are in the highest variance industries.

3. Leaders are generalists.

Model

In an economy, individuals encounter decision making situations. Sometimes the decisions are private, but in many, perhaps most, cases in business, the decisions that are made become known and the outcomes are eventually observable to others. Think of there being q encounters per period where each encounter is defined as an opportunity to make a decision or answer a question. The probability of getting a correct answer to a question depends on ability, a, which can be endowed or acquired.[4] Leadership is demonstrated when individuals excel at making decisions and answering questions with more accuracy than the individuals with whom they interact.

The main variable of interest is q, which is interpreted as the number of leadership-displaying situations in which an individual places himself. It can also be thought of as the main effort variable because it is costly to seek out such situations and everything positive that comes from effort is incorporated in the results of q, the number of decisions. Because decisions are thought to be public, it is useful to think of q as the number of new contacts that the individual

[4]The acquisition of these skills is a standard human capital investment problem. Because investment introduces complication without providing insight, the version of the model absent explicit investment is presented.

makes. The variable q then relates to the potential number of followers that a leader acquires. It is not the same as the number of followers, because individuals are more likely to follow when the individual makes a correct decision.

The main assumption in the model is that more able individuals are more likely to produces successful decisions for a given cost. Thus, the probability of success in a decision making situations, q, is a function of ability given by $G(a)$ with G bounded between 0 and 1. The number of successful decisions is then $q\,G$.[5]

The problem for the aspiring leader is to choose how much effort to put into finding decision making situations. Each time an individual demonstrates success by making a correct decision that is public, he acquires followers. The direct value of making a correct decision, coupled with the value that he attaches to acquiring followers, has value k.[6] The maximization is then

$$(1) \qquad \textit{Maximize Net Value of Contacts} = \underset{q}{Max}\left[kG(a) - C(q)\right]$$

This is a trivial problem, the first-order condition to which is

[5] There is no requirement on the shape of G(a_i), but it is natural to think of it as a logistic or some other similarly shaped function.

[6] Incorporated into k is the probability that a correct decision results in followers, times the value that the leader places on having these followers.

(2) $$k\,G(a) - C'(q) = 0$$

An individual of any given ability simply sets the marginal cost of effort in making contacts to the expected return, which is the probability of success in a context times the value of a success in gathering followers.

The first implication is that the more able seek out more contacts. From (2),

$$\left.\frac{\partial q}{\partial a}\right|_{F.O.C.} = \frac{k\,g(a)}{C''} \qquad \textit{which is positive}$$

The most able seek visibility. They do this by putting themselves in an observable decision making situation.[7] Thus, the able also seek to become people-persons, by connecting with many others. Individuals who are particularly able at making publicly observable decisions find it more profitable to cultivate contacts. The intuition is that contacts are more valuable to people who want to show off their knowledge than to people whose knowledge base is small. Put directly, if you've got it, flaunt it. Or the converse, attributed to Mark Twain, is that it is better to remain silent and have others suspect stupidity then to open one's mouth and prove it.

It also follows directly that the most able acquire more followers since the number of followers is merely dependent on $q\,G(a)$ and both q and G are increasing in a. Thus, leaders are likely to come from the ranks of the most able. Note that ability is defined here as a scalar and the ability that is relevant is the ability to make wise decisions that are publicly observable.

The next implication is that the most able gravitate to situations where the variance between the value of good and bad decisions is high. In this simple model, there is only one parameter that measures the value of a good decision, namely k. In some firms, occupations or industries, it is conceivable that mistakes do not matter very much. In others, a good decision, which sets a firm on the right course, can be extremely valuable, whereas a bad decision can imply disaster. This can be put in terms of additive or multiplicative production. A shoe

[7]This result is a necessary consequence of the fact that the reward to additional contacts is linear (sufficient but not necessary) and that the probability of success is increasing in ability. It is conceivable that in some ranges the most able might not seek out as many contacts as those somewhat less able. For example, were the reward to contacts sufficiently concave once an individual had a sufficient number of followers, it might not pay to acquire additional contacts after the high level of followers had been acquired. This would be a more natural outcome in a multi-period structure, where prior activity would affect the stock of followers who are brought into subsequent periods.

salesman's technology is additive production, where a mistake has limited effect and a success has limited gain. A research scientists' technology is likely multiplicative because the fruits of a discovery can be shared among many potential users and uses. The most able leaders will seek out occupations, industries and firms where the impacts of correct decisions are greatest.[8]

Formally, holding q constant,

$$\frac{\partial^2 (leadership\ gain)}{\partial a\ \partial k} = q\, g(a)$$

which is positive. Allowing q to vary optimally with a and k can only increase the gain further.

The value of ability is higher in those environments where k is highest. A competitive labor market for leaders guarantees that they will sort to the firms where correct decisions have the most value, a result that is found in Rosen (1982). Because of the complementarity between k and a, the most able have a comparative advantage at high k firms, so these firms can always outbid lower k firms for talented leaders. The market guarantees that lower ability individuals naturally sort to lower k firms, where they are less likely to have adverse effects on profit and where the skills of the most able do not shine so brightly.

Finally, the most able leaders are generalists. In order to derive this result, it is necessary to introduce a second type of ability, call it b. For any given amount of ability, $x = a + b$, the question is whether leaders more likely to have similar amounts of a and b, or are they more

[8]See Andersson, et al. (2006), who find that stars are found in, and best paid in, high variance industries.

likely to be specialized in either *a* or *b*? It is shown here that if leaders are among the most able, as defined by having high levels of *x*, generalists, with balanced levels of *a* and *b*, are more likely to choose the right direction given an encounter with a random problem. As such, generalists command the highest wage among leaders, and leaders will naturally be generalists.

Suppose that problems come in two varieties. These can be thought of as right-brain problems, which are solved using ability *a*, and left brain problems, which are solved using ability *b*. The proportion of right-brain problems encountered as a leader is λ, and the proportion of left-brain problems encountered is therefore $1-\lambda$. As before, the probability of getting a problem correct depends on the amount of ability that an individual brings to the problem. As before, an individual who encounters a right-brain problem gets it correct $G(a)$ of the time and one who encounters a left-brain problem gets it correct $G(b)$ of the time.

The scaling is not arbitrary, but is chosen so that the value of solving each type of problem is the same[9] and $G(a) = G(b)$ for $a=b$. That is, the contribution to the probability (and value) of solving a right brain problem equals the contribution to the probability of solving a left-brain problem at any given level of ability. The normalization is on the scale of either of the two types of ability. Once that scaling is selected, then the scaling of the other must be such that $G(a) = G(b)$ whenever $a=b$, for all levels of *a*. That is, the probability of solving a *b*-type problem with value one is the same as that of solving an *a*-type problem with value one when

[9]This can always be done because problems can be broken up into units the size of which makes their solutions have value equal to *k*.

$a=b$.[10]

The expected value of a decision from having an ability vector [a, b] is then

(3) $$Value = [\lambda\, G(a) + (1-\lambda)\, G(b)]\, k$$

which can be written

(4) $$Value = [\lambda\, G(a) + (1-\lambda)\, G(x-a)]\, k \quad .$$

The question is whether level x of ability, concentrated on one type of problem or the other, yields higher value than splitting x in some way. If a split x is better, then individuals of a given ability who are endowed with diversified ability are more likely to get high wage offers for leader positions than those who are specialized in one or another ability. To determine this, differentiate (4) with respect to a:

(5) $$\frac{\partial Gain}{\partial a} = [\lambda g(a) - (1-\lambda) g(x-a)]k = 0$$

It is important to examine the second-order condition because the solution to (5) is sometimes a minimum rather than a maximum. The s.o.c. is

[10]Once the scaling is set so as to make the value of one unit of b equal to the value of one unit of a, the distributions in the population are determined. Although one unit of b is scaled so that it has the same value as one unit of a, this does not imply that it is as easy to find b as a or vice versa. It may be that one skill is much more scarce than another, that is, that most are endowed with low levels of one relative to the other. Additionally, if a and b were produced by investing in them, there is nothing to require that the cost of produce one unit of b is the same as the cost of producing one unit of a when a equals b.

(6) $$\frac{\partial^2 Gain}{\partial a^2} = [\lambda g'(a) + (1-\lambda)g'(x-a)]k$$

From (6), it is clear that if $G()$ is concave throughout, the second order condition is negative, so (5) yields a maximum, implying an interior solution and diversification. The intuition of the result is clearest when $\lambda = ½$. Then (5) implies $a= b$. Because G is concave, putting extra ability on a has diminishing returns. The steepest part of the G function is at $G(0)$ so it always pays to move ability x from a to b until $a=b$. Of course, $\lambda= ½$ is not necessary, but then the ratio of a to b reflects not only the concavity of the G function but also the relative likelihood of the two kinds of problems arising.

Conversely, if $G()$ is convex in the relevant range, the second order condition is positive, implying that (5) yields a minimum. Under these circumstances, it pays to specialize in one skill or the other and the choice of which simply depends on whether λ is greater than or less than ½. Because there are increasing returns, additional units of ability devoted to any one skill has more value in increasing the probability of getting a correct solution than the first units of that skill. As a result, specialization is natural.

At very high levels of ability, the function is certain to be concave. As $G(x)$ approaches one, the function must asymptote and so concavity is implied. Consequently, very high ability individuals with diversified abilities have higher values of gain in (4) than those with specialized ability. Given concavity of $G(x)$ at high levels of x, it follows that the sufficiently able leaders

are generalists whether the abilities *a* and *b* are acquired or endowed. Those individuals who, for a given level of *x*, have diversified abilities, will command higher demand prices than those with specialized ability. Were individuals to invest in *a* and *b*, then those who in equilibrium acquire high levels of *x* tend to invest in some of *a* and some of *b*. Again, this follows from the first order condition in (5) and concavity at high levels of *x* that imply the optimality of an interior solution.

It is less obvious that $G(x)$ is likely to be convex at low levels of *x*. As a result, the logic that implies generalization at very high levels of *x* does not also imply specialization at very low levels of *x*. Were $G(x)$ a logistic function, then low ability individuals would be specialists because of convexity of $G(x)$ in the $G(x)$ in the relevant range. The high ability individuals would be generalists.

Many of the smartest people are highly specialized. Is this a contradiction of the theory? Perhaps, but not necessarily. The highly specialized individuals may not, in fact, be the "smartest" people we know. Although they are extremely good in a narrow area, they may actually have lower levels of "ability" defined as the sum of *a* and *b* than others who appear less impressive. Because we observe them only in the context of problems that relate to one type of ability, they are very successful, having $G(a)$ that exceeds the $G(a)$ or $G(b)$ of other top individuals. But that is not the test. The test is whether

$$a_i + b_i > a_j + b_j$$

where *j* is the CEO and *i* is the top scientist who works for him. The fact that $G(a_i)$ exceed the maximum of $G(a_j)$ and $G(b_j)$ does not imply that *i* is "smarter" than *j*, but only that *j* is not as

good at any one type of problem as *i*. The CEO is the generalist who appears very smart in many different areas, but lacking genius in any one. The scientist may have a very high value of *a* but a low level of *b*, implying that she is not very good at making decisions outside her narrow area. It is not a stretch to suggest that the most able technical people are not the ones that we would rely on to make marketing decisions, hiring decisions, or decisions about the general product strategy of a firm. The same is true in other leadership constructs. Those people who are most adept at structuring the best economic policies, say as they affect a particular government loan program, are not the ones likely to be best at making decisions affecting national security.

It is a trivial reinterpretation to think of the amount of *a* (and therefore *b* for a given *x*) as being a choice variable for the individual. Nothing in the previous analysis changes; it is irrelevant whether the individual chooses *a* or whether nature chooses it.

That high ability people are more likely to be generalists is testable using a variety of data sets. The Stanford University data described below can be used, but these individuals are very high ability as a group so the within group variation may not be pronounced. Still, it is possible to examine the simple relation of diversification in knowledge to position held in the firm.

Leadership in New Technology

Although high level leaders, like CEOs and founders of the great businesses, have many general skills, that seems less likely to be true in newly evolving fields. In new fields, the unanswered questions are more likely to be concentrated in the newer areas. In older fields,

what is left unanswered may come from anywhere. In new technical fields, the primary questions relate to the technology itself, not to the general management. Thus, one could argue that λ is closer to one (or zero) in new fields. This is a force toward wanting specialization. The better leaders are those who have large values of the relevant skill.

Formally, if $G()$ is concave in the relevant range, then (5) implies an interior solution as given by (4) which is rewritten as

$$\frac{g(a)}{g(x-a)} - \frac{1-\lambda}{\lambda} = 0$$

As λ goes to one, $g(a)$ goes to zero, which implies that a is large. High levels of λ imply more specialization in a and low levels of λ imply more specialization in b.[11]

This can be examined empirically. In new fields, the prediction is that highest level managers are more likely to be specialists than in older, established industries.

[11]Non-negativity constraints on b might imply that a corner solution is reached before the f.o.c. is satisfied.

Evidence

There are a number of propositions that can be tested using a unique data set that was used in Lazear (2005). In the late 1990s, Stanford University surveyed its Graduate School of Business alumni (from all prior years). This resulted in a sample of about 5000 respondents. The primary focus of the survey was compiling a job history for each of the graduates and detailed histories are available. Information on job titles, industry, firm size, starting and ending salaries and work periods was collected with special emphasis on information about starting businesses.[12] In addition to the detailed job histories, the data were matched with the student transcripts so that it is possible to see which courses were taken by those who went on to be leaders and which by those who became specialists. Additionally, the grade obtained in each of the courses taken is reported in the data.

In some ways, the data are very rich, but there is one way in which they fall short. Because the students are Stanford MBAs, and because Stanford is among the most selective MBA programs in the world, testing the proposition that leaders have high levels of ability to acquire knowledge is difficult. All of the individuals in this sample have very high ability and the differences between them may not be important. Still, some other aspects of the data are appropriate for the task at hand, particularly determining whether leaders are generalists.

The unit of analysis in Table 2 is a job spell. Each individual generally reports a number of jobs and there is a separate observation for each job for each individual. There are about

[12]The response rate was 40%. Some individuals were very old, and others were no longer alive, which accounts for some of the non-responses.

25,000 valid job spells, but each observation is not independent because there are multiple observations per individual. There are about 5100 individuals in the sample.

A number of implications that come from the theoretical model. The most important prediction is that leaders are generalists. In the Stanford data, one way to measure general skills is by counting the number of roles they have had, prior to an employment event. An individual who has general skills in the sense that he can do many things is likely to have played more roles in his prior jobs than one who is highly technical and who has concentrated in one area. The variable "NPRIOR" measures the number of prior roles in which an individual has served in his prior jobs. For example, an individual who had two jobs prior to the current observation might have served as a marketer and salesperson on his first job, and as a comptroller on his second. This person would have a value of 0 for the first job (no prior roles), 2 for the second job, and 3 for the current observation (the third job). The average number of prior roles for all observations is 3.4, with a maximum of 30 and a minimum of 0. Table 1 provides variable definitions and summary statistics. Table 2 provides a basic look at the importance of the number of prior roles in determining a who becomes leader. The variable "CLEVEL" is a dummy equal to 1 if the position that the individual has is defined as a "C" level position (CEO, COO, CFO...), a managing director, or similar. The data are for individuals who have had at least 15 years of experience. Those who have had only one or two prior roles up to that point have only a 2% chance of being a leader on the next job. Those who have had at least five prior roles up to that point have a 18% chance of being a leader on their next job. It is clear from this simple analysis that prior roles is a major determinant of being a leader. This could either be because leaders are

innate generalists or because those who are grooming themselves or are being groomed to be leaders take on many roles to prepare them for the job. Either interpretation requires that the basic implication of the model, namely that having broad knowledge is important for leadership. (The distinction is discussed below in Table 3).[13]

Although the basic correlation is interesting, it does not hold other factors constant. Table 3 reports logits which hold constant prior experience and demographic characteristics. Most important is that NPRIOR has a large effect on the probability of obtaining a C-level position. The derivative of the probability of being in a C-level job with respect to NPRIOR is 0.004. A one standard deviation move in the number of prior roles (equal to 3.4 roles) increases the probability of obtaining a C-level position by 0.014, with is about one-fifth the probability of being in a C-level position in the sample.

Experience also counts. Not surprisingly, more experienced individuals are more likely to obtain C-level positions. The same is true of males and, given experience, of those with more recent MBAs. Given experience, more recent MBAs are likely older, since most experience is obtained after the MBA is received.

In column 2 of Table 3, the logit is repeated, but clustered by individual to correct for non-independence. The same basic results prevail. Column 3 examines whether having had a specialized curriculum at Stanford is more or less likely to be associated with leadership. The variable "SPECDIF" is the difference between the maximum number of courses taken in one

[13]Kuhn, P., & Weinberger, C. (2005) show that leadership is correlated over different events in life. Individuals who were leaders in school are also more likely to assume leadership positions later when they enter management. This has implications for earnings, some of which are similar to those presented below in Table 5.

field and the average number of courses taken across fields. This is a measure of lopsidedness in the study of curriculum. Higher values of "SPECDIF" reflect higher levels of specialization in course of study at Stanford. The important result is that the coefficient on SPECDIF is negative and significant. Individuals who take more general and varied curricula at Stanford are more likely to become leaders in their subsequent employment.[14] This is additional evidence that supports the view that leaders are generalists, particularly among the very able who comprise the bulk of the Stanford data set.

Are Leaders Born or Made?

Mentioned earlier is that there are two interpretations of the finding that NPRIOR is a strong predictor of the likelihood of being a leader. Both are consistent with the generalist view. One is that people are born generalists, can therefore perform in many roles, and NPRIOR picks up this effect. The other is that those who want to be leaders or who are being groomed for leadership take on many roles to acquire the experience necessary for leadership.

The two hypotheses can be tested. Column 5 of Table 3 reports a fixed effect linear probability model with CLEVEL as the dependent variable. The fixed effect regression allows separation into the variation explained by the between-person effect and the variation explained by the within-person effect. The within-person effect corresponds to the effect of intentionally taking on roles in order to position oneself for leadership. The between-person effect

[14]Because data on courses taken were only available for later cohorts, the samples in columns 1 and 2 differ significantly from that in column 3, so coefficients cannot be directly compared.

corresponds to the innate differences between people, with some being better able to be leaders than others. Both are important, but the amount of variation explained by the between person effect accounts for only 22% of the total variance in the unexplained component, with the within-person effect making up the rest. This means that changes that occur over the work life are directly linked to the probability of being a leader.

The NPRIOR effect on leadership is actually stronger when fixed effects are removed than when they are not. In column 4 of Table 3, a standard linear probability regression is reported for the purposes of comparison with column 5. The coefficient on NPRIOR in the fixed effect regression is many times larger than that in the regression without fixed effects. The same is true of the fixed logit reported in column 6. When a straight logit is run on the same sample with the same variables, the coefficient on NPRIOR is 0.013 rather than 0.168. This implies that prior roles and innate ability are substitutes rather than complements in affecting leadership likelihood. Those least likely to become leaders compensate by acquiring more roles than those most likely. As a consequence, the observed (non-fixed-effect) relation is flatter than the within-person effects. This is shown in the figure 1.

Person 1 has observations shown by circles. He is the more able, having had 4 of 5 leadership positions. Person 2 has observations shown by diamonds. She has 3 of 5 leadership positions, but had to take on more roles in order to obtain them. The regression line with fixed effects is the average of the two upward sloping dotted lines, which results in a strongly positive effect of NPRIOR on CLEVEL. The regression without fixed effects is the solid flatter line. It is flat because those least likely to be leaders have the highest levels of NPRIOR.

Are leaders born or made? Person effects are important, which suggests that there are innate differences in leadership ability that play a role in becoming a leader. But these differences can be offset by experience and taking on many roles, both of which boost the probability of getting a leader position. In explaining variance in leadership, the changes that occur over time seem more important than the innate differences across people.

Visibility

The model predicts that individuals who are well suited to be leaders will place themselves in positions where their decisions are visible to others in order to acquire followers. The data can be used to examine this. The respondents state their functions in each of their jobs. We also know whether the respondent ever becomes a leader during their lifetimes. Table 4 reports the bottom and top jobs for becoming a leader (CLEVEL=1 at some point during the respondent's career). Jobs held when the individual is actually in a C-level position are excluded from the analysis.

The jobs least likely to end up leading to a C-level position include artists, entertainers, athletes, corporate attorneys, engineers, product managers, human resources, and finance (lower level, e.g., analysts). Are these invisible positions? Surely artists, entertainers and athletes are visible, but not for their decision making. The others are internal positions with technical functions.

The jobs most likely to end up leading to a C-level position include sales, banking, education, marketing and communications, lobbyists and senior finance positions. These jobs

for the most part involve much contact with other people who see the individuals in decision settings. Although descriptive, qualitative, and far from proof, the evidence here seems consistent with the notion that those who go on to be leaders are make themselves visible through job choice.

Leadership, Income, and Study

The Stanford data include, for more recent cohorts, the actual courses taken by the respondent when he or she was at Stanford. It is possible to trace leadership to courses taken when at Stanford. Table 5 reports the results. In a horse race, where all course types enter (the variable is the number of courses taken in the specific field), there is too much collinearity to pick up a significant effect of any field. After experimentation, the two most important fields in affecting leadership probabilities were economics and finance, the former having a positive effect, the latter having a negative effect. Column 1 of Table 5 reports the results. Each additional economics class taken at Stanford is associated with a 1% increase in the probability that the respondent will end up in a C-level position. Since the probability of being in a C-level position is 7%, this is a large effect. The association of leadership with finance course is almost as large, but in the opposite direction. Those who take finance courses do not rise to C-level positions because they tend to be more specialized in their careers. Despite that, they do earn more. Column 2 shows that while the effect of economics course on (log of) income is zero, the effect of taking finance courses is significantly positive, in part likely reflecting choice of job

and field.

Columns 3 and 4 of Table 5 add a variable that measures GPA. Grades are not thought to be too important at Stanford, in part because grades are not reported to perspective employers. But grades clearly matter, perhaps as a proxy for unobserved person-specific traits. First, note that in column 4, grades are significantly related to subsequent income. A one standard deviation increase in grade point average is associated with about a 7% higher in income.

More interesting is that there is a large and negative association between C-Level and grade point average. This is likely to be another manifestation of the "leaders are generalists" result. Suppose that there are two types of skills - school smarts and street smarts and that both are necessary for leadership. If ability varied dramatically, but the ratio of school smarts to street smarts were constant, then one would expect a positive association between leadership and GPA. High GPA individuals would have more of both skills and since the model predicts that the more able are more likely to be leaders, GPA would pick this up and be positively related to C-Level. If instead all individuals were of exactly the same total ability (as defined earlier), then better school smarts, reflected in GPA, would necessarily be offset by poorer street smarts. The correlation between leadership and GPA would depend on the relative importance of the skills in leading. Were street smarts more important than school smarts, the correlation would be negative, as observed in Table 5. Since the Stanford MBA population is a very narrow slice of the overall ability distribution, it is possible that most of what is seen in good GPAs is offset by deficiencies in other skills.[15]

[15]Indeed, the admissions criteria may actually create that situation. Anyone admitted to Stanford without superior grades likely had some other superior trait that caused him or her to

Technical and Non-Technical Fields

It is also possible to separate individuals by industries. The argument in the theory section suggested that in high tech industries (such as biotech or information technology), leaders should be relatively more specialized. Unfortunately, there are only 19 cases of c-level jobs being held in the high tech industries (recall that most of the data predate 1996) so it is impossible to do a serious comparison of tech leaders with non-tech leaders.

Conclusion

A theory of leadership is presented. Leaders put themselves in publicly observed decision making situations frequently and have a higher probability of getting the right answer more often than the average individual. As a result, they accumulate followers.

Both ability, either innate or acquired, and contact with others are important for leadership. Furthermore, they are complementary. Those individuals who are smartest are more likely to invest in generating contacts where their knowledge can be displayed and put to use.

The most able leaders are attracted to industries that have the highest variance in outcomes because their value added is highest in those industries. Wages are both high and variable in industries where outcomes across firms are highly variable.

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stand out relative to other applicants.

Ability is negatively related to specialization. Potential leaders who are very able acquire more followers by branching out than by acquiring incremental skills in their best areas. But for low ability individuals, it may be better to specialize. Knowing a very small amount about everything is unlikely to have much payoff.

The view is tested using data from the alumni of the Stanford Graduate School of Business. The data show that leaders are generalists relative to their peers.

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Table 1
Data Description

Variable	Definition	Mean	Std Dev	Obs
NPRIOR	The number of prior roles in which an individual has served in his jobs before the job event in question.	3.39	3.40	25718
CLEVEL	Dummy variable equal to one is the position that the individual has is defined as a "C" level position (CEO, COO, CFO, etc.), a managing director, or similar.	0.07	0.25	24796
EXP	Variable measuring respondent experience. Calculated as the difference between the year of the row and MBAYEAR.	8.47	8.95	20869
MBAYEAR	The year of graduation from Stanford's MBA program.	76.54	15.15	5030
MALE	Male =1	0.84	0.37	5105
SPECDIF	The difference between the maximum number of courses taken in one field and the average number of courses taken across fields..	2.49	1.15	2030
ECONOMICS	The total number of economics courses taken.	3.00	1.22	2029
FINANCE	The total number of finance courses taken.	3.66	1.85	2030
GPA	Grade point average on 6 point scale	3.66	0.50	2030
LOG INCOME	Log of income in specific job.	4.10	0.97	24796

Table 2
Number of Prior Roles and Probability of Being a CLEVEL

NPRIOR	Probability of CLEVEL=1
One or two	.02
Five or more	.18

Table 3
Dependent Variable = CLEVEL

	1 Logit	2 Clustered Logit	3 Clustered Logit	4 Linear Probability Regression	5 Fixed Effect Linear Probability Regression	6 Fixed Effect Logit
NPRIOR	.064 (.008)	.064 (.011)	.143 (.035)	.002 (.002)	.017 (.004)	.168 (.024)
EXP	.054 (.004)	.054 (.004)	.069 (.027)	.011 (.001)	.011 (.001)	.043 (.008)
MBAYEAR	.016 (.003)	.016 (.003)	-.033 (.022)			
MALE	1.12 (0.13)	1.12 (0.15)	1.10 (0.26)			
SPECDIF			-.191 (.068)			
Constant	-5.54 (0.26)	-5.54 (0.32)	-1.07 (2.00)	.152 (.009)	.075 (.011)	
log likehood	-5051	-5051	-956			-1678
ratio within-to-total variance					.22	
Observations	19120	19120	4887	5473	5473 (930 persons)	5371 (896 persons)

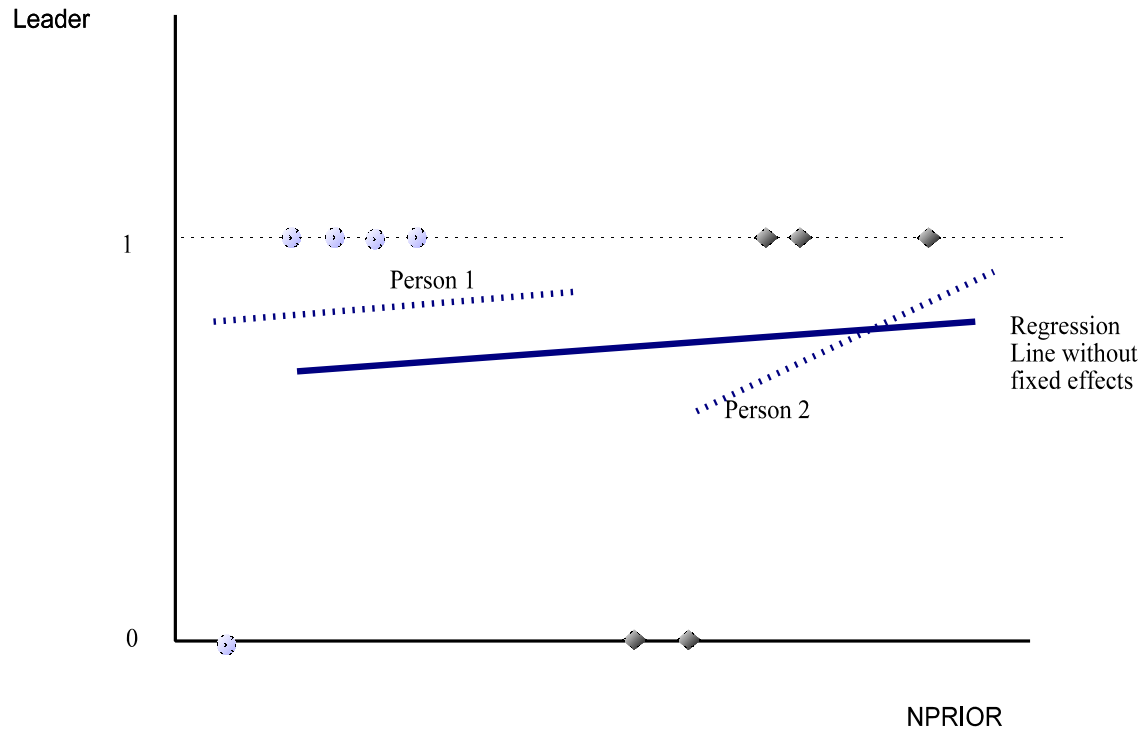
Table 4
Leader Ever Probability by Function, Top and Bottom

Function Name	Probability of Ever Being a Leader
Artist, Entertainer, Athlete	0
Corporate Attorney	0
Engineer	0
Product Manger	.02
Human Resources	.04
Finance (other than senior)	.05
...	...
Sales	.16
Banker	.17
Education	.20
Marketing/Communications	.22
Lobbyist	.22
Finance - Senior	.23

Table 5
Course Effects on Leadership and Income

	1 C-Level Clustered Logit	2 Log of Income Clustered Regression	3 C-Level Clustered Logit	4 Log of Income Clustered Regression
NPRIOR	.141 (.034)	-.025 (.012)	.137 (.034)	-024 (.012)
EXP	.070 (.027)	-.068 (.009)	.072 (.027)	.068 (.009)
MBAYEAR	-.030 (.024)	.020 (.005)	-.030 (.024)	.020 (.005)
MALE	1.18 (0.21)	.261 (.031)	1.21 (.208)	.245 (.031)
SPECDIF	-125 (.085)	.003 (.016)	-.112 (.084)	-.003 (.016)
ECONOMICS	.147 (.073)	-.005 (.016)	.156 (.073)	-.008 (.015)
FINANCE	-.103 (.058)	.097 (.011)	-.098 (.058)	.096 (.011)
GPA			-.300 (.141)	.141 (.035)
CONSTANT	-1.74 (2.34)	2.28 (0.48)	-.722 (2.387)	1.72 (0.50)
LOG LIKELIHOOD or R-square	-951	.12	-948	.13
OBSERVATIONS	4884	4241 (1738 groups)	4884	4241 (1738 groups)

Figure 1


Leader
1
0
Person 1
Person 2
Regression
Line without
fixed effects
NPRIOR