Success from Satisficing and Imitation: Entrepreneurs' Location Choice and Implications of Heuristics for Local Economic Development

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Abstract: *Decisions about location choice provide an opportunity to compare the predictions of optimization models, which require exhaustive search through very large choice sets, against the actual decision processes used by entrepreneurs choosing where to allocate investment capital. This paper presents new data on entrepreneurs' self-described decision processes when choosing where to locate, based on scripted interviews with 49 well-placed business owners and senior managers in charge of location choice. Consideration sets are surprisingly small, especially among those who are successful. According to entrepreneurs' own accounts, locations are frequently discovered by chance rather than systematic search. Few describe decision processes that bear any resemblance to equating marginal benefit with marginal cost as prescribed by standard optimization theory. Nearly all interviewees describe location choice decisions based on threshold conditions, providing direct evidence of satisficing rather than optimization. Imitation is beneficial for small investment projects. Decision process data collected here suggests a need to rethink standard policy tools used to stimulate local economic development.*

Keywords: Process Model, Bounded Rationality, Interview Data, Ethnic, Discrimination, Low-income, Neighborhood, Lexicographic, Non-compensatory, Business Owners

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Section 1: Introduction

Economic models of business decision making in both neoclassical and behavioral economics are typically based on the assumption of constrained optimization: a process that requires exhaustive search through all elements in the relevant choice set, assigning net benefit scores (i.e., benefits minus costs) to each element in this choice set, and finally choosing the element with the highest net benefit score. In contrast, this paper takes an empirical approach to describing the process by which business owners make high stakes decisions about where to locate their businesses, or branches of their businesses. Rather than assuming that location choice results from a process of optimization, this paper uses a scripted in-depth interview of 49 entrepreneurs (i.e., business owners or senior managers with personal capital at risk when making location choice decisions) in the Dallas-Forth-Worth greater metropolitan area.[2] The interview script probes the size of business owners' consideration sets, the criteria they use to stop searching, and the criteria used to select an element from their consideration or choice sets.

Economists often argue that the very essence of economics is precisely the axiomatic (i.e., without evidence to check its validity) assumption of optimization. Looking at the world under the presumption that all observed behavior derives from a process of constrained

[2] In contrast with surveys, interviews are a non-standard data source within economics (Yonay, 2000; Yonay and Breslau, 2006). Nevertheless, a number of important interview studies have appeared in the economics and business economics literature (Schwartz, 1987; Bewley, 1999; Schwartz, 2004; Wennberg and Nykvist, 2007). These papers use interview data as source material for developing new economic theories as well as for testing established theory.

optimization introduces strong restrictions about what can be inferred from empirical observations and influences prescriptive advice for public policy makers. In particular, if one observes a section of a city that, for years, does not attract business investment, the assumption of universal optimization implies that this must reflect a lack of profitability (i.e., better opportunities were to be found elsewhere). If no one is investing there, then the logic of optimization says that it must not be profitable to do so. This paper shows this logic to be invalid.

Even when so-called behavioral models are introduced, the methodology typically adds parameters (e.g., representing biases, decision costs, or random noise) to otherwise standard constrained optimization models, rather than testing or substantively modifying the axiomatic assumption of constrained optimization (i.e., that observed decisions arise as the result of exhaustively searching for the best feasible alternative). In addition to descriptive work based on the axiomatic assumption of as-if constrained optimization, prescriptive advice about how business decisions ought to be made frequently reflect the standard methodological tenets as the gold standard of rationality, from which adages such as "Consider all the alternatives," "Look before you leap," or "Be sure to consider all the trade-offs," follow. This paper demonstrates that, among successful entrepreneurs, more choice and more information do not guarantee superior performance.

The interview data presented in this paper indicate three main findings. First, the consideration sets for the high stakes decision of where to locate the business are extremely small—radically smaller than is predicted by the theory of constrained optimization.[3] Second,

[3] A possible objection to this claim is that entrepreneurs are in fact optimizing by trading off time and information costs against the benefits of further search. This is a potentially important explanation counter to the one presented

rather than beginning with large-sale search to constitute the consideration set with a range of alternatives, a surprisingly large number of locations are discovered by random chance while on unrelated business or leisure activities. Third, the criteria used by business owners to finalize decisions and choose a single element out of the many possibilities are nearly always stated as inequalities, which I interpret as evidence of satisficing heuristics.

Landlords who invest in mall properties talk about requiring an 80 percent occupancy rate within a year. Gas station and convenience store investors talk about requiring at least 10 percent annual return on capital within one or two years. Nearly all business owners state the decisive factor in their location choice as an inequality: "If I can get at least *x* return within *y* years, then I'll do it."

The standard economic model stated in terms of calculus requires that marginal benefit equal marginal cost (as a necessary but not sufficient condition) for any optimal choice. No one in our interview data mentioned such a condition or required any exact equating of two quantities. Rather threshold, or satisficing, decision procedures characterized their reasoning.

One could of course include search costs, time costs, information costs, etc., to add "realism" to the model. A handful of entrepreneurs interviewed described the reason for terminating search after considering just a handful of locations with phrases such as, "Looking at

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in this paper and is frequently raised in the neoclassical and behavioral economics literature. I deal with this in several places below and present evidence that speaks against this interpretation. Two simple observations from the interview data can be mentioned here. First, none of the entrepreneurs (who spoke with economic sophistication about some quantitative measures such as rates of annual return) mentioned quantifying the expected benefit of further search or produced any measures of the costs of time, information or deliberation. Second, none discussed exhaustively scanning the space of possible search lengths that is required to choose a stop-search condition under optimization.

any more properties wouldn't have been worth it." Yet none of the interviewees described a process of quantifying expected benefits of continued search or the costs of time, information and deliberation. A paradox of search models that introduce costs of search is that, by hanging onto the assumption of optimization, they require decision makers to consider every possible length of search and compute a stopping rule optimally after considering all the possible search lengths, which paradoxically does not save time or deliberation costs at all. Instead, every entrepreneur mentioned at least one threshold, or inequality condition, indicating to him or her that it was all right (i.e., good enough, but not necessarily optimal) to go ahead and make a final decision, even though the consideration set remained very small.

A typical story is this. One of Dallas' most prominent commercial high-rise and residential real estate developers described bumping into a large, undeveloped tract of land while driving to play golf in a northern suburb: "The idea struck me as I was driving by that area, that it could be developed into a property of note. I told my [spouse] to drive by to get a feel for the area. We liked it. It felt right. Then I ran the numbers and it looked like we could get at least 20 percent annual return on capital within two or three years. That was enough to make it worthwhile to go ahead."

Note what is ruled out by this description. There is no exhaustive search through thousands of potential locations and alternative uses of the investment capital to ensure the highest possible return. By the business owner's account, a threshold condition had to be met. And once it was met, that by itself terminated the search phase and finalized the decision to invest.

More stark contrasts emerge between the satisficing decision processes described in interviews with business owners and the standard model's assumption of constrained

optimization. These additional findings include two less-is-more effects. Business owners making location choice decisions typically focus on one, two or three pieces of information. Those who avoided too many types of information and used the information they did collect in order to satisfy a satisficing condition had a greater chance of meeting or exceeding the return they expected at the time of investment. In other words, less information and not attempting to optimize appear to raise the chances of success, at least for the business owners in this sample. Finally, an information-frugal event-tree model of performance (i.e., falling below, meeting, or exceeding expectations) achieves a surprisingly high rate of accuracy—more than 90 percent—in contrast with maximum-likelihood estimates based on more information, which never reach accuracy rates of higher than 60 percent.

There is a debate within behavioral economics concerning how to interpret such findings.[4] When the predictions of standard theory do not match what is observed in the real world, one interpretation is that the people are making mistakes. Some go as far as suggesting that the standard rational choice model enjoys such compelling normative authority that educators, business schools and legislatures should seek to "de-bias" people who fail to conform,

[4] A fuller account of the normative debate taking place within behavioral economics is in Berg (2003, 2010) and Berg and Gigerenzer (2010). In contrast to Jolls, Sunstein and Thaler's interpretation of violations of the standard theory as pathological, several papers document that markets with biased beliefs (Berg and Lien, 2005) or nonstandard behavioral procedures (Berg and Gigerenzer, 2007) can outperform economies populated by agents who conform to the standard normative theory. And at the individual level, Berg, Biele and Gigerenzer (2010) and Berg, Eckel and Johnson (2010) present evidence of improved performance among individuals who violate axioms of internal consistency upon which the optimization models are based. This raises the issue of what it means to make a good decision and whether standard rationality axioms provide a useful basis for prescribing how people ought to make decisions, which is discussed further below.

modifying behavior to be more in accordance with theories of optimal choice and axiomatic rationality (Jolls, Sunstein and Thaler, 1998).

A very different logical deduction, based on the same observed tension between the standard normative model and observed behavior, is to modify shortcomings in the theory and collecting new data to better explain the decision procedures in use and the environments in which they perform well. By describing the reward structure of environments and the decision processes that match well (or badly), empirically grounded rather than axiomatic normative assessments can be made based on the principle of ecological rationality (Gigerenzer and Selten, 2001; Smith, 2003; Berg and Gigerenzer, 2010).

Because the agents in this study who use allegedly anomalous decision procedures are very successful by the metric of accumulated wealth, this provides a special opportunity to strengthen the empirical record documenting the decision processes used by entrepreneurs. Whatever those processes turn out to be, it behooves students of business, psychology, and economics alike, to be open to learning how those with a robust record of operating a going concern in the real world cope with challenges and take new risks. Rather than documenting yet another deviation from axiomatic rationality and interpreting it as a human foible or systematic limitation in human capacity, this paper seeks to describe in detail what it is that successful business owners do when choosing where to locate their businesses. Whether giving prescriptive advice to loved ones or advising MBA students, I argue that we have a lot to learn from the self-described decision processes of entrepreneurs. When content-blind (i.e., context-free, universal, or domain-general) normative axioms are contradicted by the behavior we observe from successful business owners, surely doubt must be cast as much on the normative axioms as on the business owners.

This case study provides an example of empirical normative economics based on ecological rationality, documenting success (defined in context-specific terms) and describing the procedures used to achieve that success. Were we to insist that people in the real world follow prescriptions based on the standard model in this task domain (i.e., choosing a location for one's business), this advice would lead to unacceptably large time costs, missed profit opportunities and, because of these disadvantages, almost certain failure in business.[5] This evidence speaks affirmatively to the normative value of satisficing heuristics used by business owners.

The paper proceeds as follows. Section 2 reviews predictions and prescriptions based on the standard optimization model when applied to the task of location choice. Section 3 describes the interview data collected from 2007-2010 and presents findings about the very small consideration sets that sophisticated businesses use when choosing location. Section 4 filters these business owners' data about self-reported performance (i.e., whether they are meeting the expected rate of annual return on capital, falling below, or exceeding expectation) using compensatory linear-index models and a non-compensatory, information-frugal event tree. By using less information, the non-compensatory model predicts business performance to a much

[5] If a business choosing a new location took the standard model at face value, the first step would be to scan the budget set consisting of all affordable properties in the entire world. No matter how remote the location, the standard theory sensitizes us to pay attention to potential tradeoffs whereby low enough property prices or advantageous amenities could compensate for the remoteness of the location. In contrast to this compensatory model, heuristics can create tremendous value by quickly shrinking choice sets down to manageable size. See Yee, Dahan, Hauser, and Orlin (2007) for a similar argument regarding benefits to consumers of having non-compensatory rules or requirements that quickly shrink a large field of possibilities down to a manageable handful of choices to consider.

greater degree of accuracy. Section 5 interprets these findings in light of local economic development policies commonly put forward on the basis of the standard economic model. Shortcomings of tax incentives are discussed and alternatives are suggested that could effectively achieve business development goals by matching the decision making processes actually used by business owners with newly designed institutions. Section 6 concludes with a brief interpretation of these findings.

Section 2: Predictions of the Constrained Optimization Model

The decision under study in this paper is where to locate one's business. This task is well suited for studying decision making processes and the real-world application of simple heuristics, because the predictions of the standard model based on constrained optimization are unusually clear, and relatively easy to distinguish from simple heuristics applied to the same location choice problem. In virtually any principles of microeconomics textbook used in first-year economics courses, one quickly encounters a graphical representation of the so-called canonical choice problem: a consumer choosing two quantities (an x good and a y good) to maximize utility subject to a budget constraint. Students learn the consumer's choice set, or budget set, and identify it with the geometric object of a right triangle intended to represent an exhaustive list of the infinite possible combinations of two goods that are affordable at current prices.

The multi-dimensional extension of this in hedonic real estate models views each potential location as offering a vector of quantities of different amenities. For an entrepreneur considering locations, each address provides access to a quantity of space, a quality of space, access to labor, proximity to sources of other inputs in the production process, and of course

customers. Geometrically, the affordable set in the hedonic location choice model is a multi-dimensional pyramid. In the 2-dimensional canonical choice problem, the decision maker sees this menu of infinite possibilities instantaneously and with virtually no time or effort costs. This is precisely what the triangle representing the budget set accomplishes: it makes instantaneously visible the exhaustive list of all possible actions.

Given an investment budget, the choice set (budget set, affordable set, or feasible set) should include every property that can be afforded at given prices and the available quantity of investable funds. Even for a modest budget, the tenet of exhaustive search in the standard model implies that business owners, at least at the initial stage of considering locations, should have thousands, if not millions, of potential locations. Far-away locations, if there are compensating features such as large and productive spaces with very cheap rents or access to productive low-cost workers, cannot be discarded a priori because, by the benefit-cost criterion, there may be compensating trade-offs that would make place the optimal location for a business at some remote location.

A more descriptive model of choice could be constructed by drawing a tiny oval somewhere inside the budget set representing where the decision maker currently exists and his or her very limited view at any point in time of the choice set, whether based on memories of places encountered in the past or data bases of locations generated using Geographic Information Systems (GIS) technology. The rest of the budget set is, for most decision makers in the real world, invisible unless substantial time and cost is expended to add new elements to the list of locations that are being considered as possible locations. The standard consumer model insists that the entire budget set is instantaneously observed and that each element is scored in terms of net benefits so that the net-benefit maximizing location can be chosen.

But consider how large the choice set is even with very modest budgets. With only $100,000 to spend, an exhaustive list of affordable addresses in the world would be vast. Even in Dallas alone, considering the list of affordable addresses would consume so much time that prices and economic conditions would be substantially different before the search is complete. If business owners used the textbook model of choice to choose locations, time-consuming information collection and site visits would likely bring commerce to a standstill. Business owners engaging in wastefully exhaustive search would miss many profitable investment opportunities while occupied with the process of collecting information and making calculations. Nevertheless, with GIS technology, Census Data, and computer aided search to manage large data bases of potential locations, it is interesting to investigate whether location choice in practice looks more like a technologically-aided striving toward achieving the ideal of optimization in standard textbooks, or something else altogether.

Section 3: Interview Data

Data were collected using a convenience sample targeting well placed business owners or senior management in charge of location choice and with personal capital at risk in the location choice. All 49 respondents risked substantial personal capital in the investment projects they recounted in interviews.[6] Those interviewed included developers of prominent office high-rises,

[6] A total of 53 interviews were conducted, which included four other experts on location choice who did not risk personal capital in the location choices they described and were therefore excluded from the data analysis presented here. The four excluded interviews revealed a number of interesting insights from the vantage point of consultants with experience on a large number of location choice decisions. They included two bankers who make business loans for a major US bank in Dallas, one location choice consultant with a number of large clients, and a senior official in the City of Dallas' Office of Economic Development. Excluding these four left a sample of 49.

malls, grocery store chains, major chain convenience stores, independent convenience stores, gas stations, sporting goods stores, veterinaries, concert halls, bars that feature live music, and retailers selling furniture, paints, laundry services, and restaurant owners. Confidentiality was a concern for a number of those interviewed. Some sensitive numbers about the details of their investments were discussed and then grouped into discrete categories, summarized in Table 1.[7]

[Table 1 about here]

Table 1 provides descriptive statistics for business owners' location choices. Projects are considered *large* if total investment capital at the new location exceeded 1 million dollars and *small* otherwise. Among the 49 projects, 17 (a little over a third) were designated accordingly as large. Participants were asked what kinds of information they considered relevant when making location choice decisions. The number of types of different information mentioned in this open-ended description is coded as the variable # Types of Information, which ranges from 1 to 5. For example, a neoclassical expected utility maximizer with mean-variance preferences would be expected to discuss only return and volatility of returns, which would be coded as # Types of Information = 2. If, in addition, the entrepreneurs mentioned a desire to locate near other retailers, or in neighborhoods with particular demographic characteristics (for reasons other than their influence on return and risk), then the number of types of information would increase. This variable is dichotomized in the indicator variable Quantity of Information, which flags as *hi-info* those who mentioned 4 or more distinct types of information needed to make good location choice decisions, and *low-info* otherwise.

[7] An appendix reproduces the scripted interview questions that structured all interviews. Responses were open ended, but some of the interview items elicited yes/no responses that were coded for statistical analysis, which are summarized in Table 1.

The variable # Locations in the Consideration Set is one of the most interesting pieces of evidence collected in the interviews. Nine owners described a location choice process in which only one location was considered. The modal response was a consideration choice with three potential locations, which describes the choice sets of 20 of the entrepreneurs interviewed. A frequency distribution for this variable is presented and discussed in a subsequent section. The next row in Table 1 labeled Consideration Set (Large/Small) dichotomizes the size of the consideration set, such that consideration sets with strictly more than three elements are designated as *large*, and *small* otherwise. If the standard axiomatic choice model were a good description of how location choices are made, we would expect the consideration set to contain tens of thousands, if not millions, of potential locations.

The next three binary variables code entrepreneurs' self-described decision process relating to a specific location choice. These binary variables indicate whether interviewees ever described a process of maximization, a process of satisficing, a process of imitation, or any combination of those three. Deciding precisely how to code self-descriptions of decision process is not always clear cut, and a few internally inconsistent sets of responses were recorded to, as best as possible, record what entrepreneurs said in these interviews.

Maximization is particularly thorny, raising subtle distinctions because so many behaviors (all?) can be rationalized as if arising from maximization. Six respondents used the word "maximize" while describing what was in fact a process of satisficing. For example, one respondent said: "I try to maximize the return on capital so that it always stays above 10 percent." I interpret this statement to describe a process of adjusting decision variables in a way to satisfy the inequality that returns are at least 10 percent (in fact, that is exactly what this participant said), which is a satisficing procedure and not maximization. In its marginalist form,

maximization requires choosing decision variables so that the marginal benefit of the last unit just equals its marginal cost (before checking second order conditions and checking that local extrema are indeed global). An equivalent set-theoretic description would require exhaustive search through a well-defined choice set and choosing the best available option.

Surprisingly, the language of superlatives (i.e., finding the "best") was infrequent in owners' descriptions of how they make high stakes investment decisions concerning location choice. Only two participants made descriptions of their decision processes that could be described as constrained optimization. Every single business owner described an inequality or threshold condition that was coded as a satisficing process. In other words, two interviewees described both maximization and satisficing, which are internally inconsistent, although the coding is true to what was stated in these interviews.

A strong majority (41 out of 49) described wanting to locate in an area where other businesses were already active. I code this separately as an imitation component or consideration in the business owners' decision process. Four other characteristics of business owners and their investment projects were recorded, which have special relevance to local economic development policy. Dallas' South Dallas neighborhood is thought of by many Dallasites as a low-income, high-crime area that many business owners would never consider as a potential location. As one respondent put it, "The city could offer subsidies and incentives until my rents are entirely free, and I still would never consider locating my business in South Dallas." This respondent mentioned high crime, the stress that he believed the South Dallas environment

would have on his employees, and a general sense of anxiety concerning maintenance of public order.[8]

The variable labeled Transformation of South Dallas Possible measures each owner's subjective assessment about whether urban revitalization, gentrification, or sustained improvements in economic growth, are possible for South Dallas.[9] Only 11 of 49 respondents responded affirmatively.

The major policy tool that has been discussed in recent decades about simulating growth in neighborhoods that seem to have trouble attracting business investment is tax incentives. The interviews revealed great skepticism—among business owners—about this approach. Only 3 respondents stated that tax incentives "might" induce them to consider investing in South Dallas. As the earlier quotation suggests, most respondents would need something altogether different—a transformative signal about opportunities in South Dallas—to attract their investment capital.

Another important policy tool for local economic development is public transportation. Dallas has invested substantially in building new light rail lines from the northern suburbs to access South Dallas and other neighborhoods that, in recent decades, have not experienced large

[8] Whether this is founded in statistical realities is an important issue not addressed in this paper. There is evidence that much of the crime is concentrated within one or two addresses within a neighborhood, which raises questions about how fair it is to characterize an entire neighborhood with crime statistics generated by only a few residents. Evidence suggests that perceptions and fears are exaggerated relative to actual crime frequencies. (See the discussion and Dallas-specific citations on this point in Berg and Murdoch, 2008).

[9] Some residents and advocacy groups working to attract investment to South Dallas do not aim for gentrification and worry openly that, if and when a wave of investment comes to the neighborhood, rents will make the neighborhood largely unaffordable for long-time residents. The point of the interview item was to elicit beliefs about how likely it would be, and under what conditions, that substantial levels of commercial investment flow into to South Dallas.

in-flows of non-residents for daily commercial activity. Only two respondents said that the location of public transportation influenced, or would influence, their location choice decisions.

Finally, because of local economic development studies that have emphasized the role of artists in predicting new business starts, patent applications, and other measures of local economic development, all interviews contained discussion items about the arts (Florida, 2002; Frey, 2005). Nine of the respondents owned projects directly connected to Dallas' arts scene. Many others described positive spillovers from the Dallas arts scene to the world of commerce, and sentiments among the entrepreneurs were strongly in favor of arts and their role in local economic development.

The final three rows in Table 1 describe an ordered discrete outcome generated by participants' responses to this question: "In the most recent year of operation, would you say the rate of return on your investment is below, meeting, or above, the rate of return you expected at the time you made the decision to choose the current location?" I could have analyzed the actual rate of return. But because different projects have different risk levels, the most meaningful outcome for this analysis with a heterogeneous sample of different kinds of businesses is to ask whether actual return is below, above, or just meeting the expectation that owners had at the time the location decision was made. The interviewed group is, according to their self reports, remarkably successful at meeting or exceeding expectations. Only 16 percent had returns below expectations. 47 percent met expectations, and 37 percent exceeded expectations.

The next section uses linear regression and ordered probit statistical models to predict this three-valued dependent variable as a function of a "kitchen sink" model that includes nearly all the other variables in Table 1. These models are used to predict the business returns outcome (i.e., below, meets, or above expectations). And the predictive success of these standard linear-

index models are compared with the predictive accuracy of a non-compensatory event tree based on a theory of heuristics and their match to the business investment environment in Dallas.

Section 4: Statistical Models of Business Performance

The first step in this section is to estimate a linear regression model and ordered probit model and use these fitted models to predict performance outcomes as benchmarks of predictive accuracy. Let y_i represent whether the recent year's returns are below ($y_i = -1$), meet ($y_i = 0$) or exceed ($y_i = 1$) expectations at the time the location decision was finalized. The following linear regression model is fit by ordinary least squares:

$$y_i = \alpha + \beta_1 \text{QuantityOfInformation}_i + \beta_2 \text{SizeOfInvestment}_i + \beta_3 \text{Imitation}_i + \beta_4 \text{ConsiderationSet}_i + \beta_5 \text{Ncompetitors}_i + \beta_6 \text{ArtsIndustry}_i + \beta_7 \text{PublicTransportMatters}_i + \varepsilon_i,$$

where the regressors all correspond to variables described in Table 1, α is a constant, and ε_i is a mean-zero random error assumed to be uncorrelated with regressors. Fitted values of the linear regression model are denoted ystar_REG_i. Based on this, a binary measure of how often predicted values hit the actual outcome can be defined as follows:

$$\text{hit\_REG}_i = (y_i == 1 \ \& \ \text{ystar\_REG}_i > 0.5) \mid (y_i == -1 \ \& \ \text{ystar\_REG}_i < -0.5) \mid (y_i == 0 \ \& -0.5 < \text{ystar\_REG}_i < 0.5),$$

where each of the expressions on the right hand side in parentheses (as well as the entire right hand side) are logical truth tests that return 1 if true and 0 otherwise. The variable hit_REG_i indicates that the fitted value predicts the outcome that was actually observed. The linear regression model generates 28 hits and 21 misses (an accuracy rate of 57 percent). That is not so bad considering there are three outcomes and therefore that random chance has only a 33 percent chance of a hit.

Economists typically worry about the logical inconsistency of negative predicted probabilities using linear regression for discrete dependent variables. To alleviate those concerns, I also fitted an ordered probit model. The ordered probit model requires two extra parameters to cut the fitted linear index into regions where yi = -1, 0 and 1 are predicted. Given these estimated "cut" parameters, each observation gives rise to three fitted probabilities: one each for the respective events yi = -1, 0 and 1. I then define ystar_OPROBIT_i as the outcome that has the maximum fitted probability. From this, the ordered probit model's hit indicator can be computed:

$$\text{hit\_OPROBIT}_i = (y_i == \text{ystar\_OPROBIT}_i).$$

Whenever the actual outcome coincides with the predicted outcome, a hit is indicated. The model generates 27 hits and 22 misses, for an accuracy rate of 55 percent, slightly worse than OLS despite using two extra parameters.

Yee, Dahan, Hauser, and Orlin (2007) use non-compensatory trees to predict consumers' decisions when choosing cell phones. They show that it performs better than linear regression. Spanning a wide range of literatures from operations research to psychology, the advantages of using fewer predictors is well established, pointing to an interesting less-is-more effect in prediction relevant to the event tree model presented here that uses only four predictors (Hogarth and Karelia, 2005, 2006; Baucells, Carrasco and Hogarth, 2008; Goldstein and Gigerenzer, 2009). Gigerenzer, Todd and The ABC Research Group (1999) show less-is-more effects from specific decision heuristics in both real-world and simulated environments, and this is given additional theoretical justification in Berg and Hoffrage (2008) who show that ignoring information and conditioning on a small number of factors is consistent with payoff maximization.

[Figure 1 about here]

Inspired by this work on non-compensatory decision making, where one factor sometimes totally over-rules other factors, a non-compensatory investment return event tree was constructed, using a strict subset of the available information. This model is presented in Figure 1. According to Figure 1, a business owner who takes too much time collecting many different kinds of information will perform below average (the right terminal branch at the top of the event tree in Figure 1). The tree then bifurcates into small versus large investment projects. Small projects based on some degree of imitation perform above average. Small projects that do not imitate will meet expectations when they have small consideration sets, which likely means doing the "obvious thing" (e.g., following local zoning to locate in a central business area). Note that imitation can exploit the costly information collection used by other firms and makes it easier for customers to find retails (e.g., locating a gas station near other gas stations, or a restaurant near other restaurants). For large investment projects, however, imitation does not pay. Rather big projects benefit from boldly going somewhere no others had bet on before. Among those that did not imitate, the information-frugal model assumes that less deliberation is better. The entrepreneurs whose large-scale development projects are among the most successful real estate bets in Dallas said that the locations they chose were discovered by accident (e.g., a building first noticed while eating dinner in a new neighborhood with friends, or a promising undeveloped area on the entrepreneur's drive to a golf course on the outskirts of town). This model has no free parameters. It simply makes predictions based on the four principles: less is more when collecting information upon which to base a high stakes decision; large projects benefit from originality whereas small projects benefit from a heuristic of imitation, reflecting a principle of ecological rationality; choosing from small choice sets is quicker, leads to less

regret, and puts the proper focus on a more high-stakes question of what belongs inside the choice set in the first place (Gigerenzer, Todd and the ABC Research Group, 1999; Gigerenzer and Selten, 2001; Schwartz, 2004). The information-frugal model in Figure 1 correctly predicts 45 out of 49 observations (92 percent accuracy).

Section 5: Location Choice and Implications for Local Economic Development

There is an unmistakable normative interpretation built into the assumption that all observed behavior derives from optimization.[10] Since all opportunities for individual improvements in payoffs have, by assumption, been exhausted in a model with optimizing agents, there can be no role for entrepreneurs. And locations without business activity can only be interpreted as lacking business activity because they are unprofitable. The data in this paper suggest alternative explanations and raise the possibility of profitable investments in locations that lie unexploited over sustained periods.

If one encounters a neighborhood or a particular address with little nearby commercial activity, the assumption that we live in a profit-maximizing world points to the unavoidable

[10] Berg's (2003) "Normative Behavioral Economics" demonstrates how policy conclusions are tacitly built into purportedly descriptive models. This very methodological complaint was raised before the US Congress recently by Nobel Laureate Robert Solow. He complained that macroeconomic models (the Dynamic Stochastic General Equilibrium model in particular), which are used to make important macroeconomic predictions, rule out by assumption the most important features of the macroeconomy that economists should be working to improve. Models with equilibrium in labor markets rule out involuntary unemployment. And so-called representative agent models where the entire economy is modeled as if its decisions are guided by a single decision maker cannot explain or reproduce fraudulent behavior in the financial sector that played a role in bringing about the current economic crisis.

conclusion that the reason for the absence of other investors must be that it is unprofitable to locate there. This would undoubtedly be true if all investors systematically and exhaustively considered each element in their entire choice set and independently weighed costs and benefits associated with each of these elements. In such a scenario, the observation that no businesses are present at a particular address would indeed imply that thousands of investors had undertaken independent benefit-cost analyses and, each time, came to the conclusion that it was unprofitable. In this imaginary scenario, the law of large numbers suggests that these many independent negative assessments of value amount to virtually irrefutable evidence that the location is a bad one and cannot be invested in successfully.

The interview evidence in this paper, however, shows that most location choice decisions of business owners do not derive from exhaustive search and consideration of all potential locations. The modal size of business owners' consideration sets is 3, and many owners only consider one location. This already implies the possibility of finding unexploited opportunities for profitable investments in a city such as Dallas.

The second important finding revealed by the interview data is the high degree of dependence among business owners' (especially small business owners') location choice decisions. Some 84 percent of respondents described using an imitation heuristic—in other words, locating where other firms had already chosen to locate. For smaller investment projects, imitation is not foolish behavior. Rather, it economizes on the research and decision costs of others, and exploits the publically observable information in other firms' location choices.

There is a large literature on mechanisms that lead to spatial agglomerations. Imitation can be an economical way to find a location where consumers will find the business, usefully coordinating economic activity in a city's urban geography. However, it also represents a self-

reinforcing mechanism by which particular areas without many businesses might hold untapped investment opportunities for many years with no investors wanting to be the first one to take a chance on a location that so many others have overlooked. The two interpretations contain an important distinction: firms overlooking an untapped opportunity (perhaps because of imitation) is very different than evidence that many entrepreneurs have considered the location and decided against it. This suggests that bold steps to undertake new investments in locations long regarded as unlikely to produce profits could generate tremendous surprises, while providing jobs and business opportunities to poor neighborhoods that badly need it.

Weissbourd (1999) describes enormous untapped profit opportunities in micro lending and business development in low income areas. Firms as sophisticated as Starbucks and Home Depot have seen their own revenue forecast models for location choice, which depend heavily on neighborhood income, refuted by their profitable experiences in low-income areas (Weissbourd, 1999; Helling and Sawicki, 2003; Sabety and Carlson, 2003). Cydnie Horwat, Vice President of Starbucks Store Development, writes: "Our Urban Coffee Opportunities joint venture has essentially shown that Starbucks can penetrate demographically diverse neighborhoods in underserved communities, such as our store in Harlem, which is not something that we had previously looked at" (Francica, 2000).

Why would Starbucks have overlooked profitable opportunities in low-income neighborhoods for so long? And why did it require a new joint initiative with nonprofit groups working to expand opportunities for low-income residents to discover that the coffee giant could operate profitably in low-income neighborhoods?

One answer concerns a too-often-forgotten lesson from first-year statistics courses on linear regression: predictions that extrapolate outside the range of variation of the data collected

produce unreliable forecasts. For firms that have conditioned their location choices on neighborhood income in the past, their entire data base of store revenue and neighborhood information is censored to exclude low-income neighborhoods. It may very well be that among middle and upper class neighborhoods, higher income predicts larger store revenues. Extrapolating in the opposite direction, in the absence of data, is nothing more than speculation. The firm's revenue forecast models predicted very low revenue in poor neighborhoods despite having collected almost no data by experimenting with stores in those neighborhoods.

Several food and coffee sellers in Dallas have reported that their highest revenue stores are in low-income neighborhoods (see references in Berg and Murdoch, 2008). One reason is likely to be the lack of competition. Compared to affluent northern suburbs where one commonly finds, for example, two or three grocery stores at a single street intersection, a retailer who sets up shop in an area that most others have ignored may enjoy unusually high profits. This underscores the question raised earlier: Are neighborhoods that retailers avoid really less profitable, or do interdependencies among firms' location choices lead to inefficient lock-in at a status quo where few stores decide to locate there simply because few stores have decided to locate there in the past?

Small Consideration Sets and Tax Incentives for Investors

Table 2 presents the frequency distribution for the number of elements in the interviewees' consideration sets. One interviewee could not decide whether he had considered three or four locations before deciding, and his response is coded as 3.5. These data suggest that, for policy makers wanting to stimulate new investment in poor neighborhoods, one crucial component is to find a mechanism that puts the target location into investors' consideration sets.

Given the small sizes of the consideration sets in Table 2, simply making it into the consideration set may be the most substantial hurdle.

[Table 2 about here]

When policy makers use tax incentives to induce investment in a particular region of a city, the best that can be achieved with this policy tool is to tip an investor already considering that area in favor of going ahead with an investment. Tax incentives rest on an optimization model where it is assumed that all investors consider the location and simply need a small push to make net benefits large enough to trigger investment to the target location.

Only 3 of the 49 participants in this study said that tax incentives would induce them to consider investing in South Dallas. Some said that, even if they received a subsidy equal to their entire costs for a year, they would still not consider locating a store in what they perceived to be high-crime neighborhoods. Others gave specific conditions, usually very visible signals of well-functioning middle-class commercial districts (e.g., absence of trash, broken cars, loiterers, and the appearance of pharmacies, grocery stores and other stores where residents can shop for basics).

The large fraction of respondents that gave accounts of discovering locations by random chance suggests that when areas of a city become segregated or economically isolated, with few residents from other parts of the city coming into contact with the neighborhood, this by itself presents a substantial barrier to the natural flow of investment capital and the random face-to-face encounters that support it (See Berg, Hoffrage, and Abramczuk, 2010, for more on the surprising power of random face-to-face encounters to re-shape a city's spatial geography).

Imitation in Location Choice and Consequences for Local Economic Development

Pairwise correlation between imitation and recent business performance is 0.43 among the 32 smaller investment projects, and -0.69 among the 17 larger projects. This, together with the event tree model from Figure 1, suggest that imitation in location choice is a useful heuristic that finds a good-enough location (i.e., meeting or exceeding expectations) for a large majority of business owners undertaking small projects.

Large projects, in contrast, appear to suffer from imitation and benefit from bold originality, or a contrarian spirit of locating one's project in an area not previously considered by many others. These results suggest the need for further theoretical and empirical work on several related issues. First is the function of economizing on information that imitation affords. If A undertakes costly search and B imitates A, then B benefits from the information that is publicly revealed when A chooses his location. This pooling of the common information resource (i.e., the information that A collected and then revealed by its choice of location) through imitation will be analyzed in a future theoretical paper.

A related issue is the social-welfare consequences of imitation. On the one hand, sharing of information would tend to achieve spatial coordination without the waste of each individual undertaking completely independent information search. On the other hand, the potential for inefficient lock-in, whereby an untapped profit opportunity lies unexploited over a sustained period of time, is clearly a social cost. A theoretical model that could quantify both of these aggregate effects from individuals' use of imitation would be useful.

Arts and Local Economic Development

Standard cost-benefit calculus does a poor job of explaining the decision processes described by business owners about how they chose their locations. The role of arts venues

seems to play a large role in the thinking of entrepreneurs in a variety of industries (Florida, 2002). Interviews with leaders of arts venues, and with leaders of businesses that have no direct contact with the arts, reveals a rich portrait of attitudes about the arts among high-level decision makers in the Dallas, Texas, business community. Nearly all of the non-arts-industry entrepreneurs spoke about the importance of arts for the cultural life of the city and its spillovers to the city's world of commerce. This intersection of commerce and culture revealed itself time and again when interviewees were asked to envision transformation and describe the desired characteristics of local economic growth that they hoped to see. The ideas in Florida (2002) linking arts to economic growth seem to be well corroborated, albeit indirectly, in the various personal accounts that nevertheless were nearly consistent on the premise that arts and creative people play a special role in cultivating the business environment.

Section 6: Conclusion

This paper used scripted interviews of 49 well placed business owners and senior managers in charge of deciding where to locate new businesses. Location choice provides an opportunity to compare the predictions of optimization models that require exhaustive search with the actual decision processes used in practice when making high-stakes decisions about where to locate investment capital. Consideration sets, especially among the most successful businesses, are surprisingly small. Locations that do make it into consideration are often discovered by chance rather than systematic search. Rather than describing decision processes that equate marginal benefit with marginal cost, nearly all interviewees described threshold conditions that can be expressed as satisfying an inequality, which provide direct evidence of satisficing rather than optimization.

Imitation in location choice is beneficial for relatively small investment projects. The smallness of consideration sets and high frequency of imitative reasoning in entrepreneurs' location choices calls into question a key assumption about policies aimed at stimulating local economic development. Neighborhoods that do not attract investment capital are assumed to be unprofitable under the standard model. An alternative explanation based on these data is that when firms condition their location choices on the location choices of others, then an inefficient lock-in can prevent the discovery of untapped profit opportunities in stigmatized sectors of a city. On the other hand, rather than tax incentives at the margin, a bold push by one non-imitative investor in a long-ignored area could "seed the cloud" and induce a beneficial cascade of new investment and commercial activity based on the same imitative mechanism, which has theoretical justification as an information pooling and spatial coordination device.

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Table 1: Descriptive Statistics for Business Owners' Location Choice (N=47)

variables	min	mean	max	# No (0)	# Yes (1)
description of decision maker's location choice and investment at new location					
Size of Investment >$1mil (Large/Small)	0	0.347	1	32	17
# Types of Information	1	2.388	5	.	.
Quantity of Information (Large/Small)*	0	0.163	1	41	8
# Locations in the Consideration Set	1	3.010	10	.	.
Consideration Set (Large/Small)**	0	0.184	1	40	9
Describe Process of Maximization	0	0.041	1	47	2
Describe Process of Satisficing	0	1.000	1	0	49
Describe Process of Imitation	0	0.837	1	8	41
# Competitors***	0	3.531	5	.	.
Transformation of South Dallas Possible	0	0.224	1	38	11
Tax Incentives Matter	0	0.061	1	46	3
Public Transportation Influenced	0	0.041	1	47	2
Arts Industry	0	0.184	1	40	9
firm's performance in most recent year (ordered dependent variable)					
Return Below Expectation	0	0.163	1	41	8
Return Meets Expectation	0	0.469	1	26	23
Return Above Expectation	0	0.367	1	31	18

*Quantity of Information is defined as *large* if the business owner describes strictly more than three types of information used in location choice, and *small* otherwise.

**The consideration set is defined as *large* if strictly more than three potential locations were considered, and *small* otherwise.

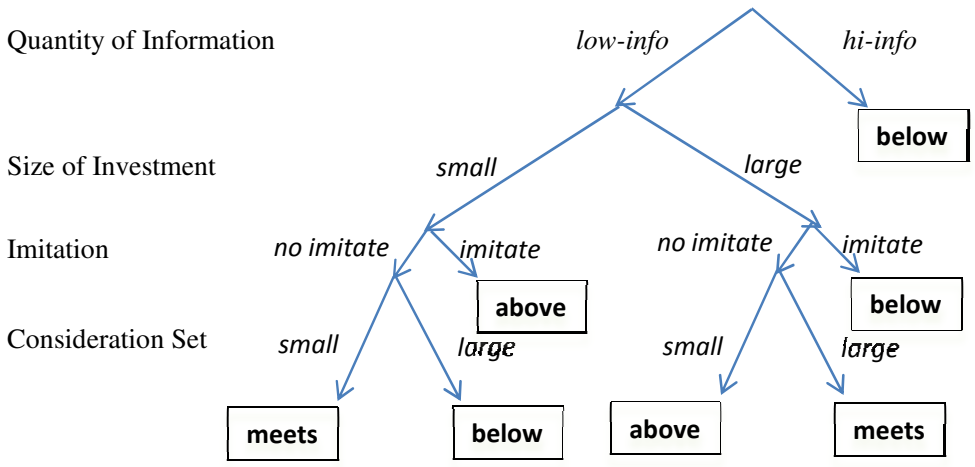
***The variable # Competitors counts the number of firms or organizations that the participant regarded as a competitor. If five or more competitors were mentioned, then the response was coded as 5.

Table 2: Frequency Distribution for the Number of Locations in Business Owners' Consideration Sets

# locations in consideration set	Frequency	Percent
1	9	18.4
2	11	22.5
3	20	40.8
3.5	1	2.0
4	1	2.0
5	1	2.0
6	3	6.1
8	2	4.1
10	1	2.0

Figure 1: Information-Frugal Investment Return Event Tree: Business Owners' Returns Meet, are Below, or Above Expected Return in the Most Recent Year

variables



This investment return event tree predicts whether businesses' return in the most recent year will meet, be below, or above the expected return at the time the location choice was made. This event tree predicts 45 out of 49 observations (92 percent) correctly. In contrast, a fitted ordered probit model using the four variables in this model plus three additional variables coded from the interviews predicts outcomes correctly only 55 percent of the time, and a fitted regression using the same expanded list of predictors hits the actual outcome (as reported by participants) 57 percent correctly.

Appendix: Script for In-Depth Interview of Business Owners Regarding Location Choice

Thanks in advance for agreeing to answer a few questions. I'm working on a research paper about neighborhood dynamics and business investment in the greater Dallas Fort Worth metropolitan area. I'd like to be able to quote your answers, along with those of other experts, in my final report. My use of your answers will be anonymous, of course, with no identifying details about you. My report will eventually be sent to an academic journal and possibly used by local policy makers working on economic development.

Q1: First, would you describe what you do at your job on a typical day?

Q2: I'd like you to think of a high-stakes decision you recently made as part of your job. Would you describe the decision, the information you needed to consider, and how you finally made the decision?

Q3: One thing I'm particularly interested in is how property investors, retailers and other businesses opening new branches (or first-time business ventures) decide on locations. Could you think of one particular case you've worked on, or know of, in your business, and describe what information was considered by you (and other investors) when making the decision of where to locate?

Q4: Regarding the location decision you just described, please describe the full range of possible locations that were considered? I'd like a description of the set of potential locations that received consideration.

Q5: Regarding the location decision you just described above, what reasons were used to eliminate possible locations from consideration?

Q6: What criteria were used to make the final decision?

Q7: Regarding that same decision described above, could you elaborate more on the facts that were considered, and on the basis of what factors, or criteria, were comparisons of different locations made?

Q8: Did DART[1] lines or public transportation enter into the decision process in any way?

Q9: Did you, or do you, consider your business to have competitors? If so, roughly how many competitors does your business have?

Q10: Did the locations of competitors enter into your location decision?

[1] DART (Dallas Area Rapid Transit) lines refer to new light rail public transportation in the greater Dallas area. For more information, see http://www.dart.org/.

Q11: When retailers decide where to locate their next branch or new business within the Dallas metropolitan area, how important is it what other companies are deciding about their locations? Do the other businesses nearby influence your decision much? Examples would be helpful.

Q12: Would you say that investment decisions in your work are based, in part, on observations about other firms' location decisions? Or do different firms usually do their own, independent analyses of locations?

Q13: Given the emergence of lively retail and residential property markets in previously poor and run-down areas of Dallas, would you expect a transformation like that ever to occur in South Dallas[2]? If no, why not? If so, when, and under what conditions?

Q14: Taking the perspective of a businessperson, what's the most important thing that government could do, or does, to encourage investment in a neighborhood like Fair Park in South Dallas?

Q15: In the most recent year of operation, would you say the rate of return on your investment is below, meeting, or above, the rate of return you expected at the time you made the decision to choose the current location?"

Thank you very much for taking valuable time to contribute your insights to this project under the auspices of University of Texas-Dallas and the Dallas Center for Urban Studies.

Q16: If you have any additional thoughts that you think those of us conducting analyses of economic development in Dallas should be aware of, I'd be delighted for you to describe them here.

Q17: Also, if there are any individuals who you think I should talk to about these issues, I'd appreciate any and all advice

[2] Local economic growth in South Dallas has been a concern of City of Dallas policy makers for at least several decades. The area is perhaps unfairly stigmatized. Many proposals for attracting business growth to South Dallas have been proposed and are the subject of ongoing debate.