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Entrepreneurship and Firm Boundaries: The Theory of *A* Firm

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ABSTRACT In this paper, we consider how a better understanding of entrepreneurial activities can help explain how firm and industry boundaries change over time and how a more comprehensive understanding of boundary setting can explain where entrepreneurial activities are directed. We start from the premise that while entrepreneurs believe themselves to have superior ideas in one or multiple parts of the value chain, they are characteristically short of cash, and of the ability to convince others to provide it. This premise motivates a simple model in which the entrepreneur has a value-adding set of ideas for 'upstream' and 'downstream' parts of a value chain, as well as for the ways to make these two parts of the value chain work better when joined under unitary control. Assuming that the entrepreneur's objective is to maximize her wealth, we observe that even in the presence of transactional risks or other factors that might make integration preferable to specialization, initial scope depends also on relatively unexplored factors such as (a) how severe the entrepreneur's cash constraint is, and (b) how much value the entrepreneur's ideas add at each part of the value chain. Entrepreneurs will focus on the areas that provide the maximum profit yield per available cash – a criterion which implies that scope choices depend on cash availability and the depth of the demand for the new idea along the value chain. We also note that entrepreneurs make money not only from the operating profits of their firms, but also from the appreciation of the assets the firm has accumulated. This consideration can change the optimal choice of the firms' boundaries, as entrepreneurs must be sensitive to choosing the segment that will enable them to benefit not only in terms of profit, but also in terms of asset appreciation. We propose that, in the entrepreneurial context especially, it is helpful to focus on the multiple considerations affecting the choice of boundaries for 'a' firm – the context faced by an individual entrepreneur – rather than on generic considerations affecting 'the' (representative) firm. Scope choices reflect the entrepreneur's own theory of 'how to make money'.

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INTRODUCTION

How do entrepreneurs choose the boundaries of their own ventures? And what can we learn with regards to the theory of the firm itself by considering the way in which entrepreneurs determine the scope of their ventures? This paper suggests that we can gain useful insights by answering both questions, which have generally been tackled separately in the literature. We argue here that a better understanding of the nature and function of entrepreneurship can augment our understanding of how firm boundaries are chosen, amending standard theoretical predictions on when we should expect integrated production to displace a vertically specialized structure. Likewise, a better appreciation of how firm boundaries are chosen can help us better understand the direction of entrepreneurial activities and the scope of entrepreneurial ventures. Our paper is an effort to provide such a synthetic account.

To provide the conceptual background, we briefly consider why entrepreneurial activities are critical in shaping firm and industry boundaries. They help change the transactional and institutional structures of a sector. Through the creation or strengthening of new markets along the value chain, entrepreneurs catapult integrated sectors into vertical dis-integration, or help build new, all-in-one integrated markets. Moving to the contribution of this paper, we consider how individual entrepreneurs decide the scope of their ventures, given the transactional and financial conditions they face, and provide a positive model of boundary choice facing the entrepreneur. We think of entrepreneurial action as intentional effort to seize a profit opportunity – or, more accurately, to seize an opportunity to create private wealth for the entrepreneur. We consider such effort to be entrepreneurial when it goes beyond the ordinary effort to seek out the most favourable deployment of the ordinary human (and perhaps financial) capital of the entrepreneurial individual. Thus, we reject the common propensity to identify 'entrepreneurship' with 'small business' or 'self-employment' in general. Entrepreneurial activity, whether carried out through a start-up or within a large corporation, must by our definition be extraordinary, idiosyncratic, unusual and/or peculiar. What the entrepreneur sees, few others can see, else the opportunity would not be there.

Theories of entrepreneurial behaviour must therefore be founded on the effort to capture what is common to the uncommon. We propose that the key commonality across entrepreneurial situations is the difficulty of convincing the rest of the world that the entrepreneurial vision is correct. Such difficulty has the direct (and common) implication that it may be difficult to persuade the rest of the world to help finance the entrepreneurial effort, except perhaps on onerous terms. On the basis of this principle, our paper explores the indirect implications for entrepreneurial decisions about firm scope.

We start with a brief discussion of how entrepreneurs transform the boundaries of their industries on the basis of their new ideas. We then delve more deeply into the narrower question, considering how entrepreneurs choose the boundaries of their own firms. To do so, we prepare a simple model as our baseline. We focus in particular on the nature of the cash constraint that the entrepreneur faces; on the types of returns that she expects from the venture; and on the tradeoffs involved in the choice between being vertically specialized as opposed to integrating along a value chain. Our analysis suggests that transactional conditions alone are not sufficient to generate predictions of the

venture's scope; and that other factors have to be taken into account. We show how these factors interact to drive scope, assuming that the objective is to make operating profits. We then expand our analysis by looking at how additional ways of making money (through increases in value of the assets used at each part of the value chain) affect the appropriate choice of vertical scope. Our results highlight the role of asset appreciation, which, we argue, should be better incorporated in our analysis of business motivations generally, including but not limited to the choice of firm boundaries. Finally, we discuss how our analysis serves to identify gaps or inconsistencies in existing theory in entrepreneurship, strategy and economics that can be constructively filled.

EXISTING THEORY ON FIRM BOUNDARIES, AND THE ROLE OF ENTREPRENEURS

The question of the boundaries of the firm, and in particular of vertical scope, was first raised by Coase (1937), who observed that in deciding how to set their firms' boundaries, entrepreneurs and managers weighed up the benefits of relying on internal production against the costs and risks of using the market. However, it was not until almost 40 years later that the pioneering work of Klein et al. (1978) and Williamson (1971, 1975) led to what we now know as transaction cost economics (TCE). TCE identified conditions under which the costs of using the market would be such that the firm would decide to internalize a transaction through producing in-house. The question of vertical scope was central to TCE (Williamson, 1985), and a firm's decision about its boundaries became synonymous with deciding whether to integrate a particular transaction within its own governance structure: to make rather than buy. Commitments to relation-specific assets, TCE pointed out, could lead a party to a market transaction to become vulnerable to opportunistic *post hoc* renegotiation pressures from the other side. To safeguard such assets, firms might have had no better choice than to integrate, especially if uncertainty exacerbated the risks involved in renegotiation. Therefore, to understand a firm's boundary decisions it is necessary to understand the determinants of asset specificity, as a large body of empirical and theoretical research has tended to confirm (David and Han, 2004; Shelanski and Klein, 1995).

Various researchers have critiqued, elaborated on and expanded beyond the TCE viewpoint. Kogut and Zander (1996), for instance, suggested that firms provided more than transactional havens; they provided loci of identification, and the organizational backdrop against which knowledge and experience could be shared and applied, a theme amplified by Ghoshal and Moran (1996). Conner and Prahalad (1996) built on earlier work and suggested that integrating not only saves on transaction costs (helps 'avoid the negatives'), but also helps create value through better information flow, coordination, and concerted problem solving (Arrow, 1974; Nickerson and Zenger, 2004; Pelikan, 1969).

Over the last decade attention has shifted towards examining how the capabilities and idiosyncratic aspects of firms might affect their boundaries. Drawing on Barney (1986), Penrose (1959) and Richardson (1972), and research in evolutionary economics (Nelson and Winter, 1982), researchers have recognized that firms are packages of competence, whose scope is path-dependent. It thus became accepted that the decision about whether

to integrate or not may be related to the firm's capabilities, and how best to profit from them (Chesbrough and Teece, 1996; Teece, 1986). Argyres (1996) found that the decision about whether to make or buy was based on both capabilities and transaction costs, a finding replicated in large-scale studies by Coombs and Ketchen (1999), Leiblein and Miller (2003), Schilling and Steensma (2001), and Jacobides and Hitt (2005). These studies suggest that in setting their boundaries, firms have to take account of their own particular conditions and circumstances (Madhok, 2002; Williamson, 1999). In this regard, the most seminal contribution undoubtedly came from Teece (1986), who considered how an innovator or entrepreneur should organize the scope of her venture on the basis of its transactional characteristics.

Furthermore, more recent research has also considered how the conditions faced in the environment change. As we have argued elsewhere (Jacobides and Winter, 2005), to understand a firm's vertical scope we have to understand not only the way they perform the 'make-or-buy' calculus on the margin, but also consider how firms shape the menu of transactional alternatives in an industry through conscious, often entrepreneurial efforts. Such efforts have been documented in the context of vertical dis-integration, e.g. in the mortgage banking sector in the USA (Jacobides, 2005), where a host of entrepreneurial firms championed or facilitated the emergence of new intermediate markets; and in the shift towards re-integrated, 'all-in-one' markets, such as the UK construction sector, where entrepreneurial firms championed the new 'design and build' methods as a means to capture new markets and soften competition (Cacciatori and Jacobides, 2005). More broadly, recent research by Santos and Eisenhardt (2005, 2006), Ozcan and Eisenhardt (2005) and Jacobides et al. (2006) has explored how emerging firms actively try to shape the boundaries of their sectors, so as to both leverage and capitalize on their capabilities, and even to change the industry's structure to strengthen their role within it.

The analysis of *industry* boundaries thus highlights a crucial element that was lacking in our understanding of scope, the role of entrepreneurship in the process of discovery or creation of new alternatives (cf. Alvarez and Barney, 2005). To understand how firm and industry boundaries alike change over time, we have to consider the conscious agency of entrepreneurs – an insight drawing on the seminal work of Knight (1921) and Schumpeter (1955). Yet while the research surveyed above points to the need to integrate entrepreneurship in our theories of firm and industry boundaries and makes significant headway in our understanding of how industry boundaries are formed and evolve, it still does not inform us much on how entrepreneurs set the scope of their own ventures. The remainder of this paper will be focused on this narrower question, and will seek to illuminate the economic logic of the boundary choices of entrepreneurs.

HOW IS SCOPE CHOSEN IN ENTREPRENEURIAL VENTURES? A POSITIVE FRAMEWORK

As mentioned in the previous section, existing research has generally focused on a small number of factors (in particular, transaction costs) with a view to confirming their statistical significance. The question of how these factors intertwine with other considerations affecting firms' scope has been relatively neglected. Both because the 'intertwining' brings combinatorics into play and because entrepreneurial situations are intrin-

sically diverse, such an analysis is inevitably highly contingent – and its purpose is to get the relevant contingencies in view. So rather than starting with a focal line of explanation, we give primacy to the setting – the entrepreneur and her decision, and adopt theoretical tools that seem to suit the problem. So let us move to our identification of the key (common) aspects in the setting.

The entrepreneur is, in general, rich in ideas and poor in cash (see Casson, 1982; Holtz-Eakin et al., 1994; Shane and Venkataraman, 2000).[1] Situations arising from this central premise fall on a continuum between two analytically significant poles. The variation arises from the question of how easily the economic merit of the entrepreneurial idea can be made convincing to others without going far down the road of actual, expensive implementation. At one extreme, the promise of the idea becomes fully apparent once it is fully disclosed. In that case, the key issues the entrepreneur faces involve managing the tradeoffs between the financing advantages that some disclosure could bring versus the expropriation hazards presented by such disclosure (which depend in part on the level of intellectual property protection available (see Arrow, 1962; Dushnitsky, 2007; Dushnitsky and Shaver, 2007; Teece, 1986). In this paper, we set aside the disclosure issue to focus on the part of the continuum where the dominant logic comes from the other extreme. There, the challenge that the entrepreneur faces is that she has some unique insights but, on the other hand, cannot easily make these insights persuasive to others, no matter how freely and vigorously she talks about them. Success in providing such argumentative 'proof' would necessarily rest on a high degree of alignment in the *ex ante* subjective probabilities held by the advocate and her audience – and such alignment would imply that this is not an entrepreneurial setting, by our definition.[2]

So, in addition to the confidence she has in what she believes to be superior ideas, another component of an entrepreneur's outlook is a relative cash shortage, at least as compared to her preferred plans. While potential funding may well exist (e.g. from venture capitalists, other specialized providers, etc), its terms of access and relative costs (in terms of the share of ownership that the entrepreneur might need to give up) qualify the attractiveness of resorting to this option. It is also worth stressing that while we treat cash as the principal constraint on choice of scope, there might be other relevant scarce resources to which a similar logic applies – capabilities, attention of the entrepreneur and other key personnel, etc. The role of these is likely to be quite variable from one case to another, while the cash constraint is a recurrent theme that may be expected to impact scope quite generally.

The entrepreneur's idea, then, may span several parts of an industry's value chain. The idea might be industry-transforming, as in the case of a newly dis-integrated service (e.g. a new outsourcing offering to existing firms, or a new role for a vertical specialist); or in the case of a newly re-integrated market, an idea for an 'all-in-one' service which did not exist before. But, for simplicity's sake, we leave instances of industry transformation outside the current analysis, and consider an entrepreneur contemplating entry to a two-segment industry. She could have a great idea for improving the operations, or creating a new service or product upstream, downstream, or both. The two-segment setting will allow us to examine the basic logic of boundary choice, which can be extended to any number of vertical segments.

To illustrate, consider the restaurant business – suppose the entrepreneur is contemplating entry to the high-end, trendy restaurant segment, in sophisticated urban settings. The entrepreneur could have a great idea with regards to the identification and running of the property – i.e. being able to identify a new trend, a new area and style that might transform, say, a previously run-down building into a swish, trendy locale. The entrepreneur's new insight idea could also apply to the restaurant 'concept', that is, both with the actual cooking, and with the running of the place – the style of the restaurant, the nature of the offering, etc. Obviously, co-specialization between cooking and property yields some additional benefits from integration. Identifying the locale and turning it into exactly what fits the restaurant 'style' and 'concept' would yield better results than just having a 'concept' and looking for a property to house it. Likewise, having the ability to identify and turn around a property might not work out that well if the style of the restaurant and the cooking were not well-aligned to the property and its location. In addition, transactional hazards may emerge should a restaurateur focus on only one of the two parts of a value chain (Williamson, 1985). The property owner at a (newly) swish locale, made prosperous not by its own merits but largely through the skills of the vertically focused restaurateur, would have the incentive to raise the rent of the property. Promises to abstain from this would be subject to opportunistic default, given the highly specific commitments of the restaurateur to the location. Thus, the vertically focused restaurateur would face the risk of a hold-up.

Given this setup, existing theory would largely focus on the nature of interdependencies between the two vertically linked stages. The questions would then become, what are the transaction costs that would emerge should our restaurateur decide to focus on only one of the two parts of the value chain? Will there be a risk of hold-up, especially if she focuses on the area she can improve the best? Can she devise effective arrangements with arm's length spot contracting? Or should she instead consider long-term contracting to try to ensure that her transaction partners are not the principal beneficiaries of her ideas? Is it that transactional conditions are so tough that nothing short of integration will protect her? (See Williamson (1985) and especially Teece (1986) for a thorough analysis of the pros and cons of different actions, and Alvarez and Barney (2004) for an application to entrepreneurship.) The analysis of such transactional conditions has done much to improve our understanding. It is however, more relevant to understanding the broad patterns in well established activities than it is to the specifics of entrepreneurial choice. That is, the question that is answered by the literature is typically: 'Do the transactional conditions and the nature of the entrepreneurial idea, make governance choice A (e.g. vertical specialization with arms-length contracting) superior to choice B (e.g. alliance) or C (e.g. full integration)?'; and 'What determines when A is better than B or C?'. Important as this question is, it is *not* the question that a resource- and finance-constrained entrepreneur asks. Rather, the entrepreneur asks: 'How can I make the most return on my limited resources (cash in particular) given the nature of my idea, as well as the transactional conditions that exist?'. This is a fundamentally different question, where transactional hazards are confronted as one part of the broader challenge of making money. We need an approach that considers the full gamut of considerations that influence scope – not one that aspires to prove or disprove the significance of a particular partial determinant of scope (see Jacobides and Hitt, 2005).

ENTREPRENEURS AND THEIR OBJECTIVES: FROM PROFIT TO WEALTH

Before describing our specific model of the scope choice, we present our view of the conceptual foundations of the broader subject. We propose that the most promising starting point for an analysis of entrepreneurial behaviour is to make a particular assumption about the entrepreneur's objectives and motivations – namely, to posit a desire to increase personal wealth. This proposal is hardly original or controversial at this point, since this same basic assumption has been adopted by countless scholars and commentators, both famous and obscure, over a period of centuries. Neither could one advance the discussion much by offering a critique of this familiar assumption on the ground that it is not 'the whole truth'. Of course it is not the whole truth, but that point too has been well made. We understand that the unyielding constraint at 24 hours per day necessarily imposes other motivations, that 'personal' should oftentimes be replaced by 'family', that the thrill of the chase may matter a lot, that a quest for fame or vindication of judgment, or solidarity with the venture team, may also play a role in the psychology of entrepreneurship. Regarding our example case, we acknowledge that many restaurateurs choose their ventures partly as a means of personal gratification or hobby. Yet we cannot build an effective positive theory of entrepreneurship if we do not consider something that is common to most, even if not all, ventures. If logic is to be an effective tool for clarifying matters, there has to be a clear and unequivocal starting point. From this instrumental viewpoint, there clearly is no sensible alternative to the idea that 'this is about getting rich'.

Yet the problem of 'getting rich', simple as it seems as a principle, is not examined as carefully as it might be in most (economic) analyses (see Lippman and Rumelt, 2003). In particular, a failing of 'textbook orthodoxy' in economics (Winter, 1988) has been the absence of any discussion of the role of *asset price changes* as a driver or consequence of economic and strategic activities – itself an unintended side-effect of the consistently forward-looking perspective of price theory (Arrow and Hahn, 1971).[3] And, despite the attention that resources and capabilities have attracted in the field of strategic management over the last decade or two, the important distinction between *having* strategically significant resources and *acquiring such resources on advantageous terms* has tended to resist full clarification (but see Barney, 1986, 1989, 1991; Denrell et al., 2003; Dierickx and Cool, 1989; Winter, 1995). Also, in the field of entrepreneurship, while 'profiting' from an innovative idea is clearly a central premise (Alvarez and Barney, 2004; Shane and Venkataraman, 2000), whether this happens from the accumulation of profits (and the inability of competitors to emulate, even if for a short time) or if it happens through asset appreciation has not been much considered.

There are some additional factors that tend to obfuscate the relative role of asset appreciation, systematically under-playing its potentially important role. Financial accounting principles in particular, make their own distinctive contribution to the potential for confusion, because asset values on balance sheets are typically reflective of historical acquisition costs (not current market prices or unreliable assessments of an unknown future). Changes in market prices of assets do not impact accounting versions of cost and income in any direct way – the rules of depreciation accounting, as well as the

specific temporal patterns of production and asset acquisition, intervene. This generally means that today's success in 'buying low' in the asset market will be transformed by accounting procedures into apparent operating cost savings in the future, as underpriced assets on the books are notionally allowed to flow through into productive use. Such savings become virtually indistinguishable, in accounting representation, from technical operating efficiencies; and as a result we tend to impute more success than we should on to operations, as opposed to asset appreciation.

This point has substantial implications, which go far beyond the need for terminological consistency or analytical clarity (cf. Lippman and Rumelt, 2003). As Hirshleifer (1971) noted in his seminal paper, the asset appreciation path to entrepreneurial wealth can remain open even when the direct financial success of the venture itself is compromised by imitation. Indeed, the bigger the swarm of imitators, the more likely that any underlying scarcity of the relevant specialized assets will be reflected in value appreciation. In terms of our example, even if an entrepreneur who has found a successful new formula for attracting high-end diners in newly trendy locales gets emulated, and if competition intensifies, her wealth may increase, as the intensification of competition will increase the price of the assets that the restaurateur has – such as prime location in the newly appreciated locales. If she has the cash available at an early stage, she might sensibly take an equity interest in a few nearby properties. Thus the same idiosyncratic information that drives the productive venture also has implications for the asset portfolio; the two paths compete for attention in the entrepreneur's single budget constraint, and also interact. Perhaps paradoxically, the entrepreneur may find herself *wishing* that her idea becomes more widely recognized, inasmuch as potential wealth from asset appreciation may more than compensate lost profit from intensified competition.[4]

In the analysis that follows, we first consider the scope choice under the condition where the entrepreneur anticipates no asset value changes, and then introduce that consideration into the picture, showing that the inclusion of asset appreciation can be a potent predictor of the direction of entrepreneurial scope.

Summing up, our approach suggests: (a) that the transactional elements, which have been studied extensively to date, are a part of the entrepreneur's calculus; (b) that other factors in addition to transactional considerations, go into that calculus; (c) that cash constraints are expected to affect the scope of the enterprise; (d) that the objective the entrepreneur has is to maximize returns; (e) that returns may not be limited to 'profits' as that term is understood in economics, hence understanding what different types of returns enter the equation is important; and (f) that some factors that have not been thoroughly explored to date, such as the nature of the benefits and capital intensity of the new idea or the extent of latent demand will also need to be included in the entrepreneur's calculation. With this background, we can provide a simple stylized model that brings these ideas to life and puts them in understandable order, while remaining tractable.

A STYLIZED MODEL OF SCOPE DETERMINATION FOR THE ENTREPRENEUR

Here we describe a simple model of the entrepreneur's choice of scope for her venture. It is framed as a linear programming (LP) problem – drawing on a body of technique

once in vogue but more recently neglected in economic theorizing (see the Appendix and references cited there for a review). The particular virtue of the LP framework in the present context is that it provides a way to organize a large number of quantitative considerations that all bear on a single decision, far more considerations than can feasibly be handled in a tractable analytical model of the more familiar kind. The drawback is that, beyond its organizing and logic-clarifying aspects, the model is essentially an engine for exploring numerical examples. It can therefore address the question of what *could* happen, but is not at all forthcoming with conclusions about what *must* happen. We argue that this open-endedness is actually a virtue in the context of entrepreneurship studies since, as we have emphasized, the individual cases are necessarily idiosyncratic and collectively form a highly diverse population. Valid propositions are therefore highly contingent, with a lot of specific 'ifs' preceding the 'then'.

The basic form of the calculation is this: the calculation covers a single period, which is assumed to be a year. The entrepreneur has various alternatives available to implement her idea, which differ in vertical scope. She has limited initial cash available to spend on the necessary capital equipment, which we simply call 'capacity'. We assume that it is only capacity that imposes a financing requirement, i.e. no financing is needed for working capital (as, for example, in the case that accounts receivable and accounts payable work on a similar cycle). Furthermore, we allow for the entrepreneur to invest any cash she does not use for her venture and earn a return from such a portfolio investment, so that cash allocation will need to take into account outside opportunities. Then, at the end of the period, the firm recovers the value of depreciated capacity, plus the net proceeds from its transactions in inputs and outputs, plus any potential interest earnings from lending (portfolio investment). Thus, if the rate obtainable from lending (investing) exceeded the rate of return on the entrepreneurial venture, the venture would not be undertaken. The formula for the value of depreciated capacity reflects the possibility of price appreciation. It is this last feature of the model that represents our point that (operating) profit is not the only path to the creation of new private wealth.

For simplicity, we assume that the entrepreneur assesses the future options with *subjective* certainty. This is by no means a denial of the role of uncertainty in the situation; it is on the contrary a resounding affirmation of it. We emphasize that we are modelling *ex ante* calculation, not the learning processes by which reality forces revision of expectations. Further, the point that the entrepreneur's views do not have the socially constructed 'objectivity' of widely shared opinion is at the heart of our story. Thus, our simplifying assumption is not only consistent with the presence of uncertainty, in the key operational sense of that term, but also with the literature that emphasizes the role in entrepreneurial behaviour of optimism, over-confidence and related decision biases (Camerer and Lovallo, 1999; Dosi and Lovallo, 1997; Meza and Southey, 1996).

Summing up, the criterion for the optimization is the entrepreneur's final cash – which corresponds one-to-one with net present value to the entrepreneur at the start of the period, since initial cash and the interest rate are fixed. This differs from the economic profit from operations in that it includes price appreciation or depreciation on the assets held during the period.

As noted above, the entrepreneur can choose alternative modes of implementation of her ideas and it is that choice we focus on. In modelling this, we assume first that there

are two vertical stages. The entrepreneur can choose from a range of participation modes spanned by four basic approaches, called *Hollow*, *New Int*, *New Fin* and *Full*. In the LP formulation, these are the activities, and linear combinations of them (with positive coefficients) are also available, subject to the limitations imposed by the constraint system; in other words, the entrepreneur can opt for 'tapered' or 'mixed form' solutions spreading her capacity between different choices (see Harrigan, 1985).

Specifically, '*Hollow*' (for Hollow corporation) involves no fixed capacities or assets on either part of the value chain, and hence no cash outlay; it involves buying the intermediate product and outsourcing the final stage, which we call 'assembly'. Thus *Hollow* represents the potential value added that obtains from the idea alone, without the added benefit of implementing each of them 'correctly' in each stage of the value chain, and with the added challenge of the potential transaction cost (TC) from a market transaction for both segments. '*New Int*' (for New Intermediate product method) involves manufacturing capacity and capabilities at the upstream stage only. It yields a unit of the intermediate product, and does not involve participation in the final product market at all. '*New Fin*' (New Final product method) is symmetric with *New Int*; it involves new manufacturing capacity at the downstream stage and requires a unit of intermediate product as input, which may come from either external or internal sources. In the latter case, there are no transaction costs. '*Full*' (Full integration) is the entrepreneur's new, fully integrated method. It does not involve participation in the intermediate product market or even separately identifiable intermediate product, but does incur additional variable costs of production corresponding to the need to produce the intermediate product. It also requires the combined capacity investments of *New Int* and *New Fin*. Figure 1 illustrates the different options.

For comparison purposes, in our tables we also show the numbers for an activity that is the sum of *New Int* and *New Fin*. This combination is, of course, available to the entrepreneur if its two constituent activities are available, and in that sense need not be introduced explicitly. We call it '*Pseudo*' (integration) because it involves balanced participation upstream and down – without, however, taking advantage of the systemic reorganizations possible to the entrepreneur, themselves represented by *Full*. Also included in the model for comparison purposes is the activity '*Old Base*'. This is the integrated production technique for the final product that is assumed to define the market standard that the entrepreneur aspires to beat.[5]

Table I displays the coefficients describing the four entrepreneurial and two comparison activities, with the sign convention that output carries the negative sign (like an easing of the constraints limiting input). It also shows the unit costs discussed above, and the capacity cost component of those costs.

The general idea of 'cash leverage' is intuitively understandable and apparently familiar in discussions of entrepreneurship; we here give it a (narrow) technical meaning. We define the 'cash leverage' of an activity as the ratio of its unit profitability to the capacity costs per unit that it entails. First the numerator: the unit profitability is the price of the activity's output minus the unit cost of production implied by that activity. While the unit cost calculation is mostly of the obvious kind (e.g. price of ground beef times 0.25 lb ground beef per hamburger), there is one subtlety. These are *economic* costs, and that means that the services of durable equipment include an

The entrepreneur has an idea, which she can implement by outsourcing the rest:

Hollow
(idea on the product or service, regardless of production)

But she also has some new ideas for producing both the intermediate and the final product:

New Int
(production of Intermediate good)

New Fin
(production of Final good)

And in addition, the entrepreneur also could reorganize production and do it all in a new way:

Full
(new, integrated package,
including reorganization of Intermediate & Final)

So the entrepreneur could choose 'full' (doing it all, fully reorganizing production), 'hollow' (outsourcing production in both up- and down-stream), or partly integrating, e.g. producing only the intermediate product (as shown below), or only the final product (alongside the idea):

New Int
(Production of Intermediate good)

Or she could be 'pseudo-integrated', by being in both stages of the value chain, but not opting for the fully integrated new technique; she would simply implement a piecemeal approach:

Pseudo
balanced but without reorganization at the interface

New Int	New Fin
(production of Intermediate good)	*(production of Final good)*

Figure 1. A stylized version of an entrepreneurial opportunity set

interest component, the legendary 'normal return' on capital. Now the denominator: by 'capacity costs per unit' we mean the initial cash outlays for a unit of capacity (in its natural physical units), divided by the number of annual capacity service units provided by a unit of capacity. So for example, the durable equipment used for *New Fin* costs \$20,000 and is good for 1000 units of capacity service per year, giving \$20 per service unit as the denominator.[6] Continuing with the example of *New Fin*, the unit profitability of *New Fin* is \$25.00 – \$18.40 = \$6.60 (Table I). So the cash leverage is 6.60/20 = 0.330, and its dimensions are 'per year'. The unit costs and cash leverage

Table I. Production activities of the scope LP model

	Old Base	*New Int*	*Hollow*	*New Fin*	*Full*	*Pseudo*
Final product	−1	0	−1	−1	−1	−1
Variable input	1.5	0.6	0.4	0.15	0.7	0.75
Intermediate prod		−1	1	1		
Final assembly svc*			1			
Old capacity svc	1					
New assembly cap svc				1	1	1
New interm cap svc		1			1	1
Memo: cost and profit						
Unit cost	$25.00	$10.20	$24.00	$18.40	$15.60	$16.10
Capacity svc cost/ unit	$10.00	$4.20	$0.00	$4.40	$8.60	$8.60
Cash leverage	0.00	0.077	Infinite	0.330	0.188	0.178

* Outsourced.

Table II. Scope LP: prices and related parameters

	Price		*Price*	*dep/yr*	*svc units/yr*
Final product	$25.00	Capacity:			
Variable input	$10.00	Old	$43,480	0.15	1000
Intermediate prod	$12.50	Final	$20,000	0.14	1000
Final assembly svc (os)	$7.50	Intermediate	$30,000	0.06	1000
Transaction cost/unit	$1.00				
Interest rate (lend)	8.00%				

values for the activities are at the foot of Table I. In Table II we show the various price parameters of the model, and the characterization of the three types of capacity. The transaction cost shown there relates to market transactions in the intermediate product, and the calculation assumes that the burden of this TC falls in equal proportion on the buying and selling sides.

In the LP array describing the model, the four entrepreneurial activities and two reference activities (*Old Base* and *Pseudo*) are accompanied by: (1) sale activities for both final and intermediate product, with the latter potentially affected by transaction costs; (2) purchase activities for the variable input (labour, etc), intermediate product, and the 'assembly' services required to transform intermediate product to final; (3) a purchase activity for each of the types of capacity (the old integrated type and the new upstream and downstream types), which create the availability of the corresponding capacity services and also 'produce' used capacity of the same type; (4) sale activities for each of the three (used) capacity types, which convert the physically depreciated capacity into cash; and (5) activities for lending cash and borrowing it (at a higher rate). This amounts to 19 activities in all.

There are 13 constraint equations, corresponding to final product, variable input, intermediate product, assembly services, services of the three types of capacity, the used versions of the three capacity types, plus the three important scale-determining constraints for initial cash, final product quantity demanded at the final product price, and intermediate quantity demanded at the intermediate product price.

What we will examine with the aid of the model is whether the entrepreneur will choose to go into the upstream segment, the downstream segment, or both – the latter being possible both on the zero cash basis of *Hollow* and the heavy cash basis of *Full*. In our example, the question is whether the entrepreneur will go into (1) restaurant location management, upkeep and decoration, or (2) concept design, food preparation and kitchen management; or both.

The first issue that matters is *the relative magnitude of the opportunity in the upstream, the downstream, and the integrated segment* – that is, what is the relative cost advantage (when compared to other established players) that the entrepreneur's unique ideas could have if implemented, at least according to the entrepreneur's expectations.[7] This can be decomposed into two components: first, the advantages created (a) upstream (only) and (b) downstream (only); and second, the extent to which there the advantages upstream and downstream are super-additive – that is, the extent of productive advantages conferred by systemic integration.

In our model, we distinguish between 'productive super-additivity' – that is, the extent to which an idea, once implemented in both segments jointly, can yield more benefits than if implemented in each segment separately – and transaction costs which result from the potential frictions and hold-up opportunities if an entrepreneur is in only one segment. While the 'productive advantages from integration' are characterized by the net improvement over the potential of new ideas upstream and downstream, when implemented separately, transaction costs act as a welfare loss, a friction that taxes the productive system. Both the benefits of super-additivity and the transaction costs in the intermediate product market point to the advantages of integration.

To clarify this distinction, consider the entrepreneur's options. The entrepreneur can participate in both segments as an integrated entity, expending whatever cash is needed to do so and fully implementing her new concept. Alternatively, she can invest only upstream (or only downstream), thus bearing the TC of the intermediate market as well as foregoing the benefits of productive co-specialization. She can also, however, choose to be 'pseudo-integrated', by investing in both the upstream and the downstream segments separately (say, because the 'real integration' could be more scale intensive or require greater learning investments). This would allow her to avoid the TC to the extent that upstream and downstream participations are balanced; yet she would forego the potential real synergies of productive integration, such as those driven by the need to have capabilities that span through a value chain and are not modular (Jacobides and Winter, 2005). With full integration (as opposed to pseudo-integration, which is advantageous only because it economizes TC), the exploitation of the potential synergy/super-additivity between the stage investments may mean that a discrete intermediate product stage does not even exist, i.e. there may be no punctuation of the novel internal value chain that corresponds to the market interface.

Per our example, the entrepreneur could have a set of new ideas with regard to the 'restaurant concept' (the nature of the offering, the organization of the kitchen, etc); the nature of the property (choice, style, design, location, configuration); or the way in which restaurant and location form an integral part. She can focus on either of the two alone, in the one case by renting the property and implementing her restaurant plan, and in the other by owning the property and leasing it, perhaps to another restaurateur. But doing so would lead her to forego the potential productive synergies; and, if she does not opt for 'pseudo-integration' she will also have to bear the TC, which is a cost to be added to production.[8]

In our illustrative calculations we posit that there are *both* productive synergies, i.e. benefits from full integration relative to pseudo integration; and that there are TC, so that specializing also entails additional costs from all the problems associated with market interface. Yet, the fact that there might exist reasons to integrate will not inescapably lead to interception, and nor should it. There are other considerations that might point the other way, and the trade-offs are a quantitative matter. So what are these other factors?

First, a key consideration is the *size of the market opportunity* in each segment (that is, how much more can the entrepreneur produce before the market becomes saturated and the potential returns decline). We might call this the 'effective niche size', and a number of considerations can affect it. In our example, the entrepreneur is contemplating activity in a specific geographical market with a maximum potential that is relatively determinate. If she is successful, she might ultimately be attracting customers from the remote suburbs, or even remote cities. But in the near term, she is in a neighbourhood with ascertainable demand characteristics, and these set some limits to plausible initial ambitions. We posit that there may be different niche sizes in the upstream and downstream segments, and we consider what happens to scope as we vary these niche sizes.

There is, of course, one other element that we will feature in our model calculations – the availability of cash to support the new venture. For simplicity's sake, we can consider this cash as being the entrepreneur's, although in practice it is more likely than not to also include investment by Friends, Family and Fools (FF&F) (or those whom the outside world considers fools). The discussion of how that initial pile of equity is formed, and in this pile, the relative contributions of the entrepreneur and her entourage or the terms of return that the entrepreneur has promised to FF&F, is left outside the scope of this analysis – save for the proviso that the terms given these other participants are not such as to qualify the entrepreneur's determination to maximize the overall return to the total of initial cash. In any case, as we note in the discussion, we consider it misleading to try to isolate separate roles for the ideas of the entrepreneur and her finances in the situation in hand. All that matters is that we have an entrepreneur, who (even after her deals with FF&F) has more ideas than cash, and cannot readily convince the outside world of the value of her idea. What we will do is vary the level of the initial cash, and see how changing the level of available cash affects the venture's scope. The general answer is easily summarized: at low levels of cash, alternatives with high cash leverage are preferred. At higher levels of cash, the entrepreneur accepts lower cash leverage in the interest of higher total profitability. We will subsequently postulate a more flexible structure, allowing the entrepreneur to dilute the ownership of her venture so as to obtain additional cash – for instance, from venture capitalists or other equity financiers. We will

consider whether this even makes sense for the entrepreneur, and how this might affect the results with regard to the boundaries of the entrepreneurial firm.

PARAMETRIZATION OF THE MODEL

Before presenting our illustrative calculations, it is important to qualify our remark above that the model is an 'engine for generating numerical examples'. It *is* that, but its logic-clarifying aspects are also significant. In particular, we note that the model does produce a number of propositions of the 'other things equal' type that are independent (or largely so) of the particular values of parameters. For example, it is unambiguous that a sufficiently high opportunity cost of capital (the lending rate) will make it optimal to forego the new opportunity. Given the characteristics of the productive opportunity, a sufficiently low prevailing price of the final product has the same effect. Perhaps more interestingly, sufficiently high transaction costs in the intermediate product market will rule out every participation mode except full integration or a balanced combination of *New Int* and *New Fin* (i.e. *Pseudo*).[9] We view such propositions as valuable mainly because they offer reassuring testimony that the model formulation gets simple things right. What is more interesting, and less simple, is the exploration of the trade-offs when a number of considerations bearing on the scope decision are relatively closely balanced, as we now discuss.

The parameter values underlying the calculations reported here were chosen with a number of qualitative considerations in view. First, obviously, we characterize the entrepreneurial venture as profitable. Further, in a special 'equilibrium' sense (unlimited finance available at the lending rate, and 0 TC as well as 0 asset appreciation), each of the four basic participation modes is independently profitable – in the sense that, in the absence of the others, it could generate an above-normal return on the entrepreneur's investment. Thus, if a particular mode does not appear in an optimal solution, it is because one or more of the others are more advantageous in the disequilibrium context, which is what we are interested in.

We choose the profitability values of each type of scope to be different when measured by profit per unit output (final or intermediate), with *Full* the highest, *New Fin* next, followed by *New Int* and *Hollow*. The cash leverage values are also different, with *Hollow* ranked first (with an infinite value), followed by *New Fin, Full*, and *New Int*. The transaction cost in the intermediate product market is not trivial – about 10 per cent of product value – but is not overwhelming. (We seek to illustrate the theoretical point that other things could outweigh the TC considerations, even if the force of TC is in the presumed direction.) Finally, the super-additivity advantages of *Full* are also not overwhelming, representing only about a 7 per cent saving in variable cost alone, relative to *Pseudo*. Such differentials are certainly big enough to be controlling in an equilibrium context; we show that in a disequilibrium context they are readily overbalanced.

The foregoing says implicitly that the entrepreneur has a number of different things to offer the world, but they are not all equally important. In particular, we assume it is in the downstream stage that the most distinctive contribution lies – our restaurateur has more special talent for cuisine than for property management. Although we cannot present quantitative bounds of validity for the lessons of our numerical examples, we

have sought to characterize in qualitative terms the sort of situation we have in view – and for which we expect the conclusions of our analysis to be quite robust.

MODEL RESULTS: TC, FINANCING, AND A VENTURE'S SCOPE

Table III summarizes our calculations that show how optimal scope depends upon initial cash. Not surprisingly, when cash is severely limited, the participation alternative that requires none (Hollow) is favoured. The small amount of available cash finances modest entry via the mode that offers the highest (finite) cash leverage (New Fin). Importantly, our assumptions imply that the entrepreneur could fill the demand niche without any cash at all, by using Hollow. Higher cash levels are therefore important to the venture only because they permit more efficient ways of serving that limited demand niche for the final product. As Table III shows, higher cash levels permit the choice of superior ways of meeting the demand, but as a better way phases in, an inferior way is phasing out. With available cash of a million dollars, full integration is the right answer. So far as the final product market is concerned, full integration is the least costly way to meet the demand of the niche, and it can be fully met. But this is not the end of the story, for we have specified an available niche in the intermediate product market that is much larger. At still higher levels of cash, it becomes optimal to meet some of the intermediate product demand, while continuing to meet the final product demand fully. This option remains available until the intermediate product niche is saturated, when $4 million of initial cash is available. Additional cash beyond that can only be lent out at the 8 per cent rate, as the final column of the table shows.

We note that as additional cash is made available to our entrepreneur, the Rate of Return (ROR) declines and the Marginal Rate of Return (MROR) also weakly diminishes, while the Net Present Value (NPV) as well as the total returns increase. These patterns reflect the fact that the entrepreneur applies her cash wherever it has the most leverage. With more cash available, she would apply it in the remaining alternatives with the most leverage.[10]

Table III. How optimal scope differs depending on initial cash (cash, payoff and NPV in thousands of dollars, activity levels in thousands of units)

Initial cash	20	200	400	700	1000	1300	1600	4200
Activity level: New Int	0	0	0	0	0	10	20	100
Activity level: Hollow	19	10	0	0	0	0	0	0
Activity level: New Fin	1	10	20	10	0	0	0	0
Activity level: Full	0	0	0	10	20	20	20	20
Payoff	37.2	282.0	554.0	911.0	1268.0	1610.0	1952.0	4904.0
NPV *	14.44	61.11	112.96	143.52	174.07	190.74	207.41	340.74
ROR**	86.0%	41.0%	38.5%	30.1%	26.8%	23.8%	22.0%	16.8%
MROR***	36.0%	36.0%	19.0%	19.0%	14.0%	14.0%	14.0%	8.0%
Free cash(inv @ 8%)	0	0	0	0	0	0	0	200

* Payoff/(1 + rout) – initial cash.
** (Payoff/initial) – 1.
*** Cash constraint dual value – 1.

To return to our variables of theoretical interest, *specialization may still emerge if it is more advantageous given the entrepreneur's cash constraints*. The reason is that the entrepreneur does not care exclusively about TC and the static efficiency of her structure. She cares about making money. And making as much money as possible given a set of constraints does not lead to choosing what is most 'economically efficient' in a static sense. Interestingly, even at extreme levels of productive advantage from integration, specialization might ensue if it provides clear benefits in terms of cash leverage. Likewise for 'frictional' or Williamsonian TC: all that is needed for specialization to emerge is for the value added of the idea of the entrepreneur in any one vertical segment (when compared to the status quo) to be proportionately larger than the cost imposed from the TC. If this condition is satisfied, even with substantial TC, the gains from trade are such that they can justify the transaction and ensuing vertical co-specialization (Jacobides, 2007; Jacobides and Hitt, 2005).

Introducing the option of financing at some (non-prohibitive) rate extends our results in an intuitive manner. We find that as cash becomes available, it will be used up to the point where the MROR is equal to the cost of the extra cash, and that borrowing increases the NPV while decreasing the marginal returns. It generally tends to help shift scope away from specialization, inasmuch as (a) with additional cash at hand, more opportunities are exploited; (b) the entrepreneur can have the luxury of using the most effective technology along the value chain – when permitted by cash in hand. Table IV illustrates the point, showing how the availability of borrowing at increasingly attractive rates not only changes the scale of production, but also creates a shift in terms of the firms' boundaries, pushing from hollow, to full integration, to both serving the fully integrated market and providing for the intermediate product, as well. So clearly, scope can and should be substantially affected by the availability of credit.

These results, taken together, suggest that the emphasis of the literature on transactional considerations may be misleading. TC and gains from productive integration are important elements of the calculus of the scope of a venture, and especially of an

Table IV. How optimal scope changes with borrowing opportunities (varying borrowing rates, base case at 20 K cash); cash, borrowing, payoff and NPV in thousands of dollars, activity levels in thousands of units

Interest rate (borrrowing)	40.0%	35.0%	20.0%	17.5%	15.0%	12.5%	10.0%
Amount borrowed	0	380	380	980	980	3980	3980
Activity level: New Int	0	0	0	0	0	100	100
Activity level: Hollow	19	0	0	0	0	0	0
Activity level: New Fin	1	20	20	0	0	0	0
Activity level: Full	0	0	0	20	20	20	20
Payoff	37.20	41.00	98.00	116.50	141.00	210.50	310.00
NPV *	14.44	17.96	70.74	87.87	110.56	174.91	267.04
ROR**	86.0%	105.0%	390.0%	482.5%	605.0%	952.5%	1450.0%
MROR***	36.0%	35.0%	20.0%	17.5%	15.0%	12.5%	10.0%

* Payoff/(1 + rout) – initial cash.
** (Payoff/initial) – 1.
*** Cash constraint dual value – 1.

entrepreneurial venture, but they only become binding (that is, they only matter) under particular circumstances. What also emerges is that cash leverage and the extent of the opportunity along different parts of the value chain play an important role. The answer to the question 'what is good about this entrepreneurial idea?' cannot be provided independent of the level of available financing or the difficulties of obtaining it.

While our model relates to a single period, and is thus suited to comparing alternative initial cash situations of the entrepreneur, it points to a plausible story about the evolution of a venture's scope over time. In the earlier days a venture would focus on the area that provides the highest cash yield. However, as profit would lead to the option of reinvestment and as success would increase the potential borrowing capability, or improve the credit terms (i.e. the cost of cash), the scope of the firm would likely expand. That is, the entrepreneurial venture might start off specialized, largely as a function of its tight cash or credit, and expand where it can only as available cash or capital becomes available.[11] The potential speed with which the firm shifts from one specialized part of the value chain to the next is itself a function of the extent of the existing, unfulfilled demand in the specialized segment: if the venture finds itself busy making money in the specialized setting, it will happily side-step the potential benefits from integration, until this pocket of demand is exhausted (or, otherwise put, until some competition kicks in), at which point the opportunities offered from a systemic reconfiguration become particularly attractive.

This pattern, which we alluded to in our earlier work (Jacobides and Winter, 2005), may also explain why several new sectors start as a patch-work of existing sectors, before going through a phase of integration. Take the US automobile industry, for example (Langlois and Robertson, 1995), which started as a specialized set of producers who would use intermediate inputs from carriage producers. Initially, the auto producers either did not have the finances to benefit from a systemic reorganization of the value chain (through reintegration), and/or were simply busy making money as assemblers. However, once cash became more widely available, the opportunities from a systemic reorganization (the potential super-additivity in integrated intra-firm production, and the TC that plagued any inter-firm co-specialization) became more salient, and integration ensued. In other words, the latent efficiency gains from integrating, which had been there all along, only became 'relevant' once the lower-hanging fruits of specialization had been picked; when spending money and time in rationalizing production became privately efficient for the entrepreneurs involved; and when sufficient funding became available to these entrepreneurs.

PROFIT VS. WEALTH: WHAT IS THE ENTREPRENEUR AFTER, AND WHY DOES THIS MATTER?

While the previous section summarized the results, it did so with one key assumption, shared with the vast majority of research on such matters. Namely, it assumed that the objective of the entrepreneur is to make money through profits. Yet, as we pointed out, in the real world (or in the world of theory, appropriately constructed) money is not only made from profit; it is also (and, often, largely) made from asset appreciation.

The potential for some types of assets to appreciate introduces yet another set of considerations into the analysis of scope: that is, much as we expect variation in terms of how much cash is needed to operate in each of the vertical segments, we also expect that each segment will differ with regards to the extent to which the assets in place will appreciate. Specifically, in Table V we show how our 'base' results (reported in Table III) change once we introduce different values of the 'asset appreciation' parameter, which we consider only for the intermediate product (e.g. the real estate/location of the restaurant, i.e. the upstream part of the business). We assume that the assets in the downstream segment will not appreciate, and see how changing the asset appreciation parameter from 0 per cent (our baseline) to 50 per cent changes the appropriate scope of the firm, which shifts from 'final only' to 'full integration' to 'pseudo integration' to 'intermediate only' as the appreciation rate in the intermediate stage increases. So through changing the asset appreciation factor in one stage of the value chain alone we observe that the appropriate scope of the firm changes accordingly, moving through the entire gamut of scope choices.

To illustrate our results, consider our restaurateur. In the previous setup, when we had set the asset appreciation parameter to zero (or, equivalently, we simply excluded it from the optimand), the cash-strapped entrepreneur chose to focus downstream, on the running of the restaurant, the provision of the cooking, etc, where solid margins could be made with only little cash outlay. If, however, asset appreciation were to come into this picture, our restaurateur may be induced to do the exact inverse, inasmuch as the assets needed for the restaurant design and the cooking will not appreciate as much (or will not be as easily sellable) as the assets associated with the restaurant and the real estate itself. This means that the entrepreneur, mindful for her own total returns, may not look at profit, focusing on the promise of asset appreciation instead. Similarly, she would also not be particularly bothered about inefficiencies of vertical specialization, and about either the foregone benefits of integration or the transactional risks from finding someone to 'run the place'. The issue is that going into the cooking side of the business as well, while

Table V. How optimal scope changes with asset appreciation (appreciation of intermediate capacity, base case at 700 K cash); cash, payoff and NPV in thousands of dollars, activity levels in thousands of units

Price appreciation, new int cap	0.0%	10.0%	20.0%	25.0%	30.0%	50.0%
Activity level: New Int	0	0	0	15	23.3	23.3
Activity level: Hollow	0	0	6	15	20	20
Activity level: New Fin	10	10	0	0	0	0
Activity level: Full	10	10	14	5	0	0
Payoff	911.00	939.20	969.50	993.50	1025.40	1157.00
NPV *	143.52	169.63	197.69	219.91	249.44	371.30
ROR**	30.1%	34.2%	38.5%	41.9%	46.5%	65.3%
MROR***	19.0%	28.4%	37.1%	38.5%	42.2%	61.0%

* Payoff/(1 + rout) – initial cash.
** (Payoff/initial) – 1.
*** Cash constraint dual value – 1.

potentially beneficial as an idea, would inevitably distract from the opportunity to buy some more assets that will appreciate, and as such, in terms of total returns, will not be a wise choice.

Introducing asset appreciation into our optimand, and acknowledging that the extent to which assets appreciate along the value chain differs, means we should consider a neglected set of factors: our restaurateur, then, should consider whether the assets accumulated in order to operate in one or another part of the value chain are more likely to gain and retain value; whether the expertise in cooking and the recipes will be easier to sell and profit on than the locations bought before the market niche was identified. This set of considerations may, in and of itself, be substantial enough to drive the choice of scope, and we show as much in our model.

The role of assets that will appreciate, and the extent to which they might drive entrepreneurial action (from individuals and corporations alike) becomes even more evident when we consider competitive dynamics. That is, if the entrepreneur's idea will become ultimately imitated or emulated, then we know that, prospectively, profits are likely to decline. However, if the entrepreneur has locked up key resources that are associated with the new offerings (e.g. the trendy locations, with charm and character, that cannot be reproduced), then the entrepreneur's success will be less self-defeating. As the market will grow, and as imitators will come in, the value of the assets is likely to remain at very high levels, and if the assets are unique enough, the entrepreneur will be able to leverage them, perhaps ultimately selling them.

EXTENDING THE MODEL: EQUITY FINANCE, COMPETITION, DYNAMICS AND SCOPE

Having explored the implications of a range of initial cash levels and a range of borrowing opportunities, we turn to a third mode of entrepreneurial finance. What would happen if equity finance became available from sources outside the FF&F category?

The first point we should make is that it is *not* in the entrepreneur's self-interest to let anybody else participate as an equity holder on a par with herself, provided that (a) the gross payoff is a concave function of investment, i.e. that there are no indivisibilities or areas of increasing returns leading to convex pay off sections; and (b) that the entrepreneur's cash would be valued exactly at par with any other cash to be used as equity. Under these two conditions, letting even benign investors or FF&F, say, match an entrepreneur's investment in exchange for a 50 per cent share is a bad idea. Of course, it could be a good idea if there were indivisibilities (such as initial setup or fixed costs) or increasing returns in the picture.

That being said, if the entrepreneur can get investors (relatives or not) to pay a price $p > 1$ for the same equity share for which the entrepreneur pays \$1, that *could* be advantageous if p is big enough. Indeed, having such a premium for the entrepreneur's money (or, alternatively put, set aside a part of the equity for the entrepreneur's 'idea') is the rule. Specifically, in our model calculus indicates that it is advantageous (at the margin) to dilute the entrepreneur's ownership of a venture, taking on investments if p (the ratio of the 'price' for equity for an outsider as compared to the 'price' of equity for the entrepreneur) is bigger than the ratio of the ROR to the MROR. From the entre-

preneur's viewpoint, and in the context of our model, the decision to dilute is broadly analogous to borrowing at a rate higher than the lending rate – you get more money in, but have to share some of the proceeds with the new investor. However, should new investors require a price of equity that is lower than ROR/MROR, then the entrepreneur will not accept any such investment.[12]

Should such a dilution be indeed profitable, the implications in terms of scope are analogous to the ones outlined earlier in the case of debt financing. In terms of our example, such financing will simply act as a relaxation of the cash constraint, potentially leading to changes in scope. As we can see from Table VI, the entrepreneur shifts from focusing on the cash-preserving final good, to mixed procurement and then to full integration; then, given additional equity finance, she maintains the level of integrated production and also gets involved in the stand-alone production of intermediate good with the additional finances. So scope does change with the availability of equity finance, and the appropriate scope is itself a function of the funding constraints the entrepreneur faces.

An interesting and perhaps surprising feature of Table VI is that the rates of return of the entrepreneur and the outside investors *both* rise as the size of the stock issue is increased, whereas the overall ROR decreases (as we would expect). This is counter-intuitive (and we resisted it ourselves at first), but it is correct – as in fact is readily demonstrated from the table. The correct intuition is to recognize that the overall ROR (which declines) is a *weighted* average of the rates for the entrepreneur and the outside investors. While an un-weighted average cannot decline when all the quantities averaged are increasing, this is perfectly possible with a weighted average – providing that the weight shifts from the higher of the two quantities to the lower. That is what is happening in Table VI, the larger stock issues means that the weight shifts away from the entrepreneur, as the last line of the table indicates. The MROR of the incremental investment is intermediate to the two return levels, and assigning the incremental payoff disproportionately to the outside investors raises the average for both. Of course, it is a relevant

Table VI. How share issue affects scope and entrepreneurial returns; shares issued at 1.33 . . . per $1 share, base case at 400 K cash

Shares (K)	0	300	450	600	750
Total cash	400	800	1000	1200	1400
Activity level: New Int	0	0	0	6.7	13.3
Activity level: Hollow	0	0	0	0	0
Activity level: New Fin	20	7	0	0	0
Activity level: Full	0	13	20	20	20
Total payoff	554	1030	1268	1496	1724
Total ROR	38.50%	28.75%	26.80%	24.67%	23.14%
Ent payoff	554.0	588.6	596.7	598.4	599.7
Inv payoff	0	441.4	671.3	897.6	1124.3
Ent NPV	113.0	145.0	152.5	154.1	155.2
Ent ROR	38.50%	47.14%	49.18%	49.60%	49.93%
Inv ROR	NA	10.36%	11.88%	12.20%	12.43%
Note: Ent share in payoff	1.00	0.57	0.47	0.40	0.35

background fact that these incremental investments, made possible by the stock issue, do have a return above the opportunity cost of capital, and in that sense are efficient investments.

Another element we treated somewhat summarily for the sake of simplicity was the time dimension – and competition. While our model has one period, the single period analysis could easily be converted to a multi-period one. In such a modified version, transaction costs in the market for capacity would make it unlikely that there would be a 'cash out' at the end of every period, and would allow for the continuity of the financial position as well. Also, we have greatly simplified the role of competition by assuming a limited market opportunity, at a given price, in each of the vertical segments. That is, we assumed that there is only a given part of the market that the venture can capture on the basis of the new idea. So, the question becomes, how would things change if we allowed for a setting whereby (a) there is more than one period, and (b) competitors could come in and thus reduce profitability? The main thing that would change would be the magnitude of the opportunity in each part of the value chain, as well as the 'extra margin', both of which can change as a function of competition. Still, the basic logic of scope determination would not be affected.

Introducing competition – and, in particular, imitators – would reduce the extent to which firms can extend their profitable operations in the future; but would, by the same token, increase the potential value of the assets in successful ventures, to the extent that there is some scarcity. This would tilt the balance even more towards specialization in the segment where assets appreciate more (proportionately).

WHAT DID WE LEARN ABOUT BOUNDARIES OF ENTREPRENEURIAL VENTURES FROM THIS MODEL?

This model has provided a simple analysis of how entrepreneurs set the boundaries of their ventures. While it incorporates the insights gained from TCE, and would respond to extreme transaction cost values in the way that theory predicts, it provides a more balanced view of the different factors that combine to shape an entrepreneurial venture's scope. In particular, we show how financing constraints and the extent and depth of different opportunities along the value chain can also shape the firm's scope, so that transactional considerations may or may not affect the chosen scope. Our analysis shows that even if both TC and productive synergies along the value chain exist, integration is not necessarily optimal for the entrepreneur.

We observe that entrepreneurs will focus on the segments with the highest cash leverage, and then as the financing constraint is relaxed will consider shifting onto more segments or adopting integrated solutions. We also identify market niche size as an important factor, in addition to the terms of access to capital and credit markets, and show how they combine to shape scope. This indicates that the transactional approach (Teece, 1986; Williamson, 1985) does not provide adequate guidance, since it does not fully consider the key question the entrepreneur is interested in: How can I make more money?

The second major contribution of this model is to illustrate the importance of an adequate characterization of what 'making money' comes down to, and point out that in addition to flow profitability (which is what most of the analyses in economics, strategy

and accounting focus on), wealth creation through asset appreciation plays a role; and its role can be even more important than that of profits, so that entrepreneurial activities are driven by the desire to accumulate assets that will appreciate. Crucial to our analysis was the oft-forgotten point that the same beliefs and information that frame the entrepreneurial opportunity are likely to frame, at the same time, the vision of future asset values. While it is conceivable that the contemplated entrepreneurial action actually has no implications for asset values, it will often be the case that the types of assets that are most specific to the venture will appreciate under the same conditions of the economic environment that are conducive to the success of the venture itself – which then means that it may be in the interest of an entrepreneur to forego immediate profits and even invite some competition in order to maximize her own wealth.

This analysis allows us to combine the insight of (Hirshleifer, 1971) with more recent analyses of the nature and potential value of different types of resources (Walter and Barney, 1990). The subtle difference with the resource-based view (RBV), though, is that we do not only focus on resources as a basis of future profitability; rather, we accept that their value appreciation is an important strategic issue as well (Winter, 1995). The juxtaposition of asset appreciation and profitability is, of course, a broader issue, important not only for helping us understand the direction of entrepreneurial activity and how scope evolves, but also for assessing and prescribing in the context of established firms. The substantial confusion with regards to different definitions of profit, and the potential inconsistencies or challenges in the accounting standards that affect reported profits and asset values, make a better understanding of the different means of profiting even more important. We think that a careful consideration of the role of the optimand, and of how different economic participants may profit will move us toward a view of strategic success that goes beyond profits and their sustainability and treats alternative paths to wealth in a balanced way.

To return to the narrower issue of scope, our approach, while accepting that each venture is unique, tried to consider what is common in the uniqueness of entrepreneurial efforts. And it also articulated a framework that explained how different factors relate – as opposed to simply positing that everything connects to everything else, tangled in a complex web of relations. It provides a positive account of how scope is determined and how it evolves. Yet it does so without 'parsing out' entrepreneurship from its context.

Our analysis shows that, for the purpose of understanding entrepreneurial behaviour, it is particularly necessary to reject the role separation analysis that notionally distinguishes the entrepreneurial role (innovator, uncertainty bearer) from the other economic roles of that individual.[13] Three key things are indivisible and inseparable from the identity of the individual (or corporate group engaged in entrepreneurship): (1) beliefs and information, which underlie the perception of the entrepreneurial opportunity among other things; (2) the time constraint, which shapes the application of the individual's or group's skills and energy to the entrepreneurial task; and (3) the personal budget constraint, which both limits the financial contribution of the entrepreneur to the enterprise and (in the hoped-for future) records the success in accumulating wealth. The influence of these considerations cuts across the identified roles; so our theory about how entrepreneurial ventures set their boundaries should be attuned to the specificities that *each entrepreneur or entrepreneurial unit* faces.

CODA: FROM THE THEORY OF *THE* FIRM TO THE THEORY OF *A* FIRM

This paper makes two overarching claims. First, we have argued that a better understanding of entrepreneurship can help us appreciate how and why firm and industry boundaries change. And second, that a thorough understanding of how firm boundaries are chosen (especially in the context of entrepreneurial ventures) can help us better comprehend the direction of entrepreneurial activity. Both of these claims essentially revolve around a key difference in approach between existing theory, and what we propose: A shift *away* from trying to consider the 'pure' theory of 'the' firm, and towards trying to understand the factors that go into the 'theory of *a* firm' – i.e., the theory and belief that an entrepreneur might have vis-à-vis their own venture and the way in which the venture can create and capture value.

Rather than being primarily driven by the power of particular theoretical approaches to highlight 'significantly' some parts of reality, we should consider the problems and challenges faced by entrepreneurs, and see what we can learn by providing a structured representation of their problem setting (cf. Sarasvathy, 2004). As our model shows, the near-exclusive focus on some factors (e.g. transactional issues), may lead us astray by shifting our attention away from some critical issues. We have identified other issues that affect a firm's scope, such as the depth of demand in any vertical segment, and the extent of the entrepreneur's cash constraints both to explain how scope is chosen and also to explain why it may be that firms change their position along the value chain over time, or why new industries going through integration after a brief period in which firms specialize only in their 'novel' component (Langlois and Robertson, 1995).

We consider that this paper contributes to the ongoing work on the intersection of entrepreneurship and the theory of the firm (Alvarez and Barney, 2004, 2005) and provides some predictions and prescriptions of how entrepreneurs should shape their boundaries, complementing and sometimes amending established views (e.g. Teece, 1986). Yet our model does more than just explain how scope evolves and why – highlighting factors that have not yet received due attention. It also considers the impact of focusing on different optimands, and underlines the role of resources and their ownership, bridging entrepreneurship research to the RBV. We do not follow the usual structure in the RBV, though, considering how future profitability should be based on particular types of resources; rather, we argue that we need to incorporate the role of asset value changes as *an objective and motivator of economic activity*. Much activity, all too readily dismissed as 'rent-seeking' revolves around the quest for asset appreciation. Our paper underscores the need to take this more seriously, not only to explain the scope of entrepreneurial activities but also to explain actions of new and established firms alike.

While our analysis is far from complete, we do believe that it is a step in the right direction, and hope that it will engender follow-on work. A rich agenda lies ahead for theorists, analysts, strategists, accountants and policy-makers interested in how value-added and wealth generation should be measured and assessed, and how this motivates entrepreneurial behaviour as well as economic behaviour more generally.

NOTES

[1] We focus in this paper on the case of the entrepreneur as an individual. Much of our analysis does apply to corporate entrepreneurship as well, but the corporate context gives rise to new firms that begin life with a substantially different set of advantages, especially resource availabilities, than is characteristic of personal entrepreneurship.

[2] It is this implication for venture finance that is the crucial operational implication of the presence of the sort of 'uncertainty' that underlies the opportunity for entrepreneurial profit. It is, as Knight noted, 'true uncertainty which by preventing the theoretically perfect outworking of the tendencies of competition gives the characteristic of 'enterprise' to economic organization as a whole and accounts for the peculiar income of the entrepreneur' (1921, p. 232). However, we do allow at the end of our analysis for the possibility that some degree of external financing might be available.

[3] The objective of that theory is to explain why things carry the prices they do, and the resource allocations that are antecedent to or entailed by those prices. Toward these ends, neoclassical economic theory adopts a powerful simplifying assumption involving a strictly forward-looking view of cost as opportunity cost (in some sense). This means that realized changes in asset values are always 'bygones' and have, *per se*, no consequence for future prices – beyond perhaps some wealth or income effects on consumption patterns, which are typically ignored. Foreseeable future changes, on the other hand, are linked to current prices by no-arbitrage conditions that themselves directly declare the absence of opportunities for abnormal profits. In an important sense, therefore, asset price changes play no role in the theory. And because they are not in the theory, they are also not on 'the books' in the economist's version of 'the firm' (to the minimal extent that anything resembling books is actually visible in that picture).

[4] There are further implications that caution against the baleful influence of the price theory textbook. Whereas entrepreneurs are commonly conceived as pursuing 'profit', the profit that the textbook has in view is the excess of operating revenues over costs, with costs at opportunity cost values. An entrepreneur who actually set out to maximize this sort of profit might make the same contribution to society as one who took a broader view of the problem, perhaps even a larger contribution – but the one who takes the broader view is likely to wind up wealthier. As previously noted, the distinction between these two paths will be partially obscured by the fact that the second entrepreneur's speculative success is transformed in accounting appearance into operating efficiency.

[5] Representing *Old Base* explicitly – with its own technical coefficients and type of specialized equipment – has the advantage of providing a parameterized competitive standard: it responds to changes in input prices as well as interest and depreciation rates. The market price assumed for the final product should correspond to the production cost of final product using *Old Base* – reflecting a competitive equilibrium with 'normal returns', i.e., zero economic profit. If a new method offered by the entrepreneur is not competitive with *Old Base*, it does not represent an attractive opportunity at all.

[6] This cost in terms of initial outlay is *not* the capacity service cost, which is an hourly rate computed as a year's interest and depreciation on the value of the machine, divided by the normal number of hours of service per year.

[7] Of course, the advantage might be and often is expressed in terms of superior quality as opposed to cost; however, if we assume that we adjust prices for qualities, we can simply translate a quality advantage into an equivalent cost advantage in a quality-adjusted basis.

[8] This is in keeping with the analysis of Williamson (1985), where total costs are the sum of production and transaction costs. We thus add TC as a parameter, and we will consider their impact on scope. For a more elaborate analytical treatment of varying TC conditions on scope, see Jacobides (2006).

[9] This is on the assumption that there are no TC involved in accessing final assembly services – or if there are, they are among the things held constant as TC in the intermediate product market are notionally increased.

[10] Of course, this property is only weakly true in the real world, largely because of indivisibilities. That is, if there are lumpy investments that are needed in each segment, then the ROR may increase, before it starts decreasing again.

[11] We acknowledge, of course that a host of other factors are relevant to the evolutionary patterns of changing positions along the value chain (e.g. Helfat and Raubitschek, 2000), but still insist that the cash availability explanation deserves particular attention in the context of entrepreneurship.

[12] Our analysis also does not explicitly consider issues of risk aversion, or the problems of adverse selection and moral hazard that usually plague entrepreneurial finance. We chose to set such issues apart largely

because they do not interfere with the major point in our model/paper, and would unduly complicate the exposition and logic. There are, however, potential complementarities between our analysis and some recent work in entrepreneurial finance.

[13] In taking this stance, we are going counter to a long tradition in economics. From Say through Mill and on to Schumpeter and modern agency theory, the quest for clarity in economic theory and entrepreneurial studies has involved, as one manifestation, an effort to parse the multiple roles (and returns) of the sole proprietor (see Schumpeter 1954, especially pp. 554–7) – and then to analyse them as separately determined.

APPENDIX: LINEAR PROGRAMMING ANALYSIS OF THE FIRM

Linear programming is the optimization of a linear function subject to linear equality and inequality constraints. Considered as a subject in the setting of economic theory, it is the computational optimization branch of the broader body of theoretical technique known as linear models of production. It has an alternative existence as a branch of the much larger body of techniques for computational optimization, a subject of continuing interest in theoretical and applied operations research. The two branches were closely intertwined in the historical origins of the subject (Koopmans, 1951, 1977), but tended to diverge in more recent years as economists have largely lost interest in the analysis of production. Arguably, that interest is undergoing a revival, at least in the economic analysis of problems in strategic management (Langlois and Foss, 1999). Also, as noted below, advances in computer hardware and software have made the technique vastly more powerful and easy to use. Thus, a reconsideration of its uses may be timely.

In matrix notation, one mathematical form for a linear programming problem is the following:

$$\text{Max } c \cdot x$$

subject to

$$\begin{aligned} Ax &\leq b \\ x &\geq 0 \end{aligned}.$$

Here, A is an M×N matrix, c is an N-vector, b is an M-vector, and x is the N-vector that is subject to choice. In a typical application to production, the columns of A are the inputs required (+) and outputs produced (–) per unit of the activity for each of N production activities, b is a vector of M initial resource availabilities, the elements of vector c are profit or other 'payoff' amounts per unit of the activity, and x is the vector of activity levels. The first M inequalities say that the amount used of any resources cannot exceed the amount produced plus the amount initially available, the N non-negativity constraints say that activities cannot be run backwards. This formulation is, however, canonical in the sense that algebraic tricks can convert any LP problem (Max or Min, equalities or inequalities, non-negative or unrestricted variables) into this mathematical format. And the interpretation of the mathematics as relating to production is, of course,

optional. For example, in our application in this paper, activities represent not only production but also buying and selling, borrowing and lending, etc.

Substantial practical and theoretical interest in linear programming really dates from the invention of the first effective computational technique for solving such problems. This was the simplex algorithm, invented by mathematician George B. Dantzig (1914–2005) in 1947. Subsequently, other quite different algorithms have been invented, which are more effective with larger and less well-behaved problems.

Linear programming was recognized to be not merely a practical tool and a way of representing production problems, but also a source of insight into the fundamental economics of resource allocation and valuation. Particular interest was found in the 'duality' aspect of linear programming problems – the fact that problem of profit maximization characterized above is intimately associated with the related problem of assigning sensible valuations to the resources represented by the vector *b*. This line of development was epitomized by the book *Linear Programming and Economic Analysis* (Dorfman et al., 1958). A related expository article by Dorfman (1953) was long a staple of graduate economics reading lists.

Today, very large problems are routinely solved for purposes of operations management. For work on a smaller scale, there are spreadsheet programs. The 'What's *Best*!®' software from Lindo Systems, Inc. functions as an add-in to an Excel spreadsheet – and is said to be capable of handling 100,000 variables. It also solves integer and nonlinear optimization problems. As used in the current paper, the features of the program that matter are high flexibility, transparency and ease of use – and the scale is such that the downloadable trial version (from www.lindo.com) is more than adequate.

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