



Toward a theory of sustainable entrepreneurship: Reducing environmental degradation through entrepreneurial action

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Received 1 March 2005; received in revised form 1 August 2005; accepted 1 September 2005

Abstract

This article explains how entrepreneurship can help resolve the environmental problems of global socio-economic systems. Environmental economics concludes that environmental degradation results from the failure of markets, whereas the entrepreneurship literature argues that opportunities are inherent in market failure. A synthesis of these literatures suggests that environmentally relevant market failures represent opportunities for achieving profitability while simultaneously reducing environmentally degrading economic behaviors. It also implies conceptualizations of sustainable and environmental entrepreneurship which detail how entrepreneurs seize the opportunities that are inherent in environmentally relevant market failures. Finally, the article examines the ability of the proposed theoretical framework to transcend its environmental context and provide insight into expanding the domain of the study of entrepreneurship.

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Keywords: Entrepreneurship; Opportunity; Market failure; Environment; Sustainability

For far-sighted companies, the environment may turn out to be the biggest opportunity for enterprise and invention the industrial world has ever seen.

The Economist.

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1. Executive summary

Despite extensive economic growth and increases in the quality of life over the last century, concern remains that the era of industrialization has had substantial negative effects on the natural environment and that these effects diminish the vitality and sustainability of our economic systems (Boulding, 1966; Ehrlich, 1968; Schmidheiny, 1992; United Nations, 1987; World Resources Institute, 2004). In addition to the localized problems of air pollution, surface–water degradation, and toxic wastes in groundwater, recent scientific discoveries have revealed global scale effects such as ozone depletion, climate change, and the worldwide destruction of ocean fisheries (World Resources Institute, 2004; United Nations, 1999, 2004). The long-term economic impacts of these effects may be quite substantial as a large portion of the world's economic output is dependent upon the viability of natural systems (Costanza et al., 1997).

The role of entrepreneurship in resolving such environmental challenges is emerging as a subject of some debate. Traditional theory from environmental and welfare economics largely concludes that the market failures inherent in the economic system prevent entrepreneurial action from resolving environmental problems and indeed often motivate environmentally degrading entrepreneurial behaviors (Pigou, 1932; Tietenberg, 2000; Cropper and Oates, 1992; Bator, 1958). In contrast, some authors promote entrepreneurship as a means of resolving market failure problems (Coase, 1974; Buchanan and Faith, 1981; North and Thomas, 1970; Demsetz, 1970) and, more specifically, environmental issues (e.g., Anderson and Leal, 1997, 2001).

Synthesizing theory from the entrepreneurship, environmental and welfare economics literatures, we develop a conception of environmental entrepreneurship as a subset of the broader concept of sustainable entrepreneurship and outline the means by which entrepreneurial action can resolve environmental challenges by overcoming barriers to the efficient functioning of markets for environmental resources. We argue that the growing desire of many individuals in the marketplace for the cessation of environmentally degrading activities, combined with a willingness to pay for reduction of these activities, represents opportunity for entrepreneurial action that can lead to the enhancement of ecological sustainability. This conception of sustainable entrepreneurship differs substantially from explorations of social entrepreneurship (Dees, 2001; Mort et al., 2003) which tend to address mission-driven, rather than profit-driven entrepreneurial endeavors. Regardless of its mission, the sustainable entrepreneurship we discuss is defined by its alleviation of environmentally relevant market failures through the exploitation of potentially profitable opportunities. Therefore, we seek to address the environmentally relevant subclass of sustainable entrepreneurship which is typically understood as meeting “the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 1987). Consequently, our intention is to begin the process of understanding the concept and domain of sustainable entrepreneurship through more specific theoretical development of the concept of environmental entrepreneurship, offering conceptual precision in developing a theoretical explanation for why environmental problems arise and persist and how sustainable entrepreneurship can reduce or eliminate them.

Review of the literature on the five categories of market failure that we address in our analysis (public goods, externalities, monopoly power, inappropriate government intervention, and imperfect information) suggests that the key to achieving sustainable and environmental entrepreneurship lies in overcoming barriers to the efficient functioning of markets for environmental resources. Because of the unique characteristics of many environmental resources, they do not tend to be easily amenable to market allocation. Environmental entrepreneurs create and improve markets for such resources through entrepreneurial action that results in the development of property rights and economic institutions, the reduction of transaction costs, the dissemination of information, and the motivation of government action. Through the resulting development of markets, entrepreneurs can profit from the economic value created while reducing environmental degradation and enhancing ecological sustainability.

We suggest that the magnitude of potential opportunities for sustainable entrepreneurship corresponds to the level of degradation of economically valuable environmental resources. Both increasing evidence of substantive environmental degradation and recent market developments in renewable energy, fuel cells, green building, natural foods, carbon emissions, and other sectors suggest an increasing importance of opportunities for environmental entrepreneurship. In addition, although it was not the initial intent of our manuscript, our synthesis of the market failure and entrepreneurship literatures suggests a substantial expansion of the scope of the entrepreneurship domain. Because our market failure perspective reveals a greater variety of barriers to the efficient function of markets than that addressed in the Austrian view, it implies additional types of entrepreneurs including the Coasian, institutional, market appropriating, political, and informational entrepreneurs.

2. Introduction

Traditional theory from environmental and welfare economics largely concludes that market failures within the economic system not only prevent entrepreneurial action from resolving environmental problems but actually motivate environmentally degrading entrepreneurial behaviors (Dorfman, 1993; Pigou, 1932; Tietenberg, 2000; Bator, 1958). More specifically, this literature states that, because of the unique characteristics of many environmental resources, certain obstructions to their efficient allocation in the market system exist, and, as a result, entrepreneurial action will not protect and preserve valuable environmental resources (Dorfman, 1993). From a practical perspective, this argument has led to policy that focuses on regulatory intervention as the primary solution to environmentally relevant market failures and has created a general lack of knowledge about the means by which entrepreneurs can help solve environmental challenges (Pigou, 1932; Dorfman, 1993). Unfortunately, the entrepreneurship literature has been of little help in addressing this issue. Despite the fact that the entrepreneurship literature directly addresses the market-equilibrating exploitation of market gaps, imperfections, and failures (Leibenstein, 1968, Kirzner, 1973, 1985; Shane and Venkataraman, 2000; Dean and McMullen, 2002; Eckhardt and Shane, 2003), it has yet to address how entrepreneurs can overcome environmentally relevant market failures and how the exploitation of these opportunities might decrease environmental degradation.

The purpose of this article is to demonstrate how entrepreneurship can help resolve environmental problems through the exploitation of opportunities inherent in environmentally relevant market failures and thereby help move global economic systems toward sustainability. Synthesizing theory from environmental and welfare economics with that of the entrepreneurship literature, we propose that the growing desire of market actors for the cessation of environmentally degrading activities represents opportunity for entrepreneurial action and that exploitation of these opportunities by entrepreneurs can lead to the enhancement of ecological sustainability. Whereas the welfare and environmental economics literature brings an understanding of the nature of market failures and the obstructions that produce them, the entrepreneurship literature suggests why these obstructions represent opportunities and how entrepreneurs overcome them. Thus, we seek to delineate the concept of environmental entrepreneurship and the more general term, sustainable entrepreneurship, and demonstrate the means by which entrepreneurial actors can achieve economic returns by exploiting environmentally relevant market failures. To the extent that entrepreneurs find innovative means of overcoming the barriers to the efficient functioning of markets, they can surmount the market failures that are responsible for environmental problems and help to alleviate these important economic challenges.

Such a synthesis of the entrepreneurship and environmental economics literatures makes a number of important contributions to the field of entrepreneurship. First, it reveals the presence of entrepreneurial opportunities in environmentally relevant market failures and correlates those opportunities to the magnitude of environmental problems or, at least, the economic value lost due to environmental degradation. Second, it provides specific knowledge about the means by which entrepreneurs overcome environmentally relevant market failure problems and are thereby able to exploit the economic opportunities they represent. Third, understanding the role that environmentally relevant market failures play in creating opportunities brings us closer to a theory of sustainable entrepreneurship which addresses more broadly the role entrepreneurs can play in creating a more socially and environmentally sustainable economy. Fourth, it suggests a less deterministic and more proactive role of entrepreneurs in developing the economic institutions that are necessary to overcome market failures. In this regard, our theoretical analysis suggests both that entrepreneurial action helps to motivate the development of economic institutions necessary for markets to function and that restrictive government intervention may be inferior to symbiotic actions that establish property rights regimes or otherwise enable markets for environmental resources.

Perhaps most importantly, the application of the environmental economics literature to entrepreneurship broadens our perception of the domain of the entrepreneurship field. Because the Austrian perspective focuses exclusively on widespread ignorance as the market barrier which engenders opportunity, the Austrian view limits conceptions of entrepreneurship to those individuals and organizations that capture opportunities through superior alertness. Our market failure perspective expands the Austrian view by delineating additional market barriers which create alternative types of opportunities and imply additional entrepreneurial means of exploiting them. At the broadest level, our approach suggests that market failures and imperfections are the sea from which opportunities are drawn and that an understanding of the scope of such failures informs the literature about entrepreneurial opportunities and actions that go beyond those identified

by the Austrian view. At a level specific to environmental issues, the market failure perspective on entrepreneurship suggests that environmental problems result, not from humans' natural tendency to abuse the environment, but from an inadequate conception of entrepreneurship — one which fails to recognize the effectiveness of the entrepreneurial process in developing markets for environmental resources and preserving their value for present and future generations.

We begin our analysis with a review of market theory, the concept of market failure, and the role that market failure plays in environmental degradation. We then review developments in the entrepreneurship literature which parallel some of these thoughts and integrate them with the theory of market failure to arrive at our environmentally relevant conception of sustainable entrepreneurship. Using five classes of market failure that appear consistently within the literature, we then discuss the transaction obstructions that create market failure and provide opportunities for entrepreneurial action. We highlight the entrepreneurial actions necessary to overcome these obstructions and conclude the paper with a consideration of the theory's implications.

3. Theoretical development

3.1. *Market theory and market failure*

Market theory emerged over 120 years ago with the publication of Leon Walras' [Elements of Pure Economics \(1877\)](#), which provided the underpinning for most modern economic reasoning in the form of the general equilibrium model — a mathematical model describing the allocation of resources, or goods, among all the consuming and producing units in the economy. Advancement of the paradigm culminated with the introduction of the [Arrow-Debreu model \(1954\)](#) and [Debreu's \(1959\) Theory of Value](#), which demonstrated that, under certain conditions, a market will result in the efficient allocation of goods and services through the direction of resources to their highest valued uses. These mathematical models of general equilibrium suggest that both individual markets and several inter-related markets can achieve a Pareto-efficient equilibrium state ([Arrow and Debreu, 1954](#)) or Pareto efficiency — a market state in which “no redistribution of goods or productive resources can improve the position of one individual without making at least one other individual worse off” ([Arrow and Debreu, 1954](#): 265). Pareto efficiency is largely considered the benchmark by which to judge the efficiency of markets, and markets which meet a defined set of assumptions have been mathematically proven to live up to this ideal. Furthermore, Pareto efficiency is often equated with a state of perfect competition in which prices are equal to average total costs and, as a result, economic profits, or rents (profits above all costs including a risk-adjusted return to capital), are non-existent ([Scherer and Ross, 1990](#)). In practice, perfect competition is considered to be an ideal that is not often, if ever, attained. By implication, this implies that the ideal state of Pareto Efficiency is also not attained.

We broadly classify the body of literature that addresses departures from Pareto efficiency and perfect competition as the market failure literature. From the perspective of a welfare economist, market failure means “markets fail to implement all the gains that can be achieved through trade” ([Zerbe and McCurdy, 2000](#): 11). Perhaps most relevant to the

present discussion, Bator (1958) defined market failure as “the failure of a more or less idealized system of price-market institutions to sustain ‘desirable’ activities or to stop ‘undesirable activities’” (Bator, 1958:351). Furthermore, the literature suggests that both the complete failure of a market to arise (e.g., Akerlof, 1970), as well as the inability of an existing market to achieve Pareto efficiency are included within the concept of market failure.

Pigou, who is considered to be the father of welfare economics (Pressman, 1999), provides a relatively simplistic means of understanding the market failure concept and its effects on social welfare, particularly in terms of its effects on the natural environment (Pigou, 1932). Pigou distinguished between the private costs of production and the social costs of production. Private costs of production include those incurred only by the private firm or individual producing a given good or service. Social costs include the private costs as well as those incurred by society at large but not by the private producer. In the case of steel production, the additional social costs not incurred by the steel producer include, for example, such consequences as health and environmental effects of the factory’s smoke. Pigou argued that whenever the social costs (or benefits) of production vary from the private costs (or benefits) of production, a socially optimal allocation of resources will not result (Pigou, 1932). For example, if a producer does not incur the full costs of production (e.g., the health damage costs of smoke emissions from a factory on the surrounding community), then welfare economists argue that the producer is unlikely to consider these costs in its production function and will, consequently, produce too great a quantity of both the factory’s product and its smoke.

3.2. Market failure and environmental degradation

Largely based on the theory of market failure, the field of environmental economics focuses on how various types of market failure create environmental damage (Cropper and Oates, 1992; Dorfman, 1993). Environmental economics approaches pollution primarily as an economic problem. Many environmental assets or natural resources (such as the atmosphere) have characteristics which make them less amenable to market allocation (Dorfman, 1993). Consequently, the air makes a relatively poor economic good because of its transitory and indivisible nature (Dorfman, 1993), and climate change resulting from human emissions of greenhouse gases provides a specific illustration of this problem. Literally, billions of individuals throughout the globe contribute to climate change on a daily basis because of the greenhouse effect of carbon dioxide emissions (Oreskes, 2004). From the burning of manure for cooking to the driving of automobiles, the actions of individuals throughout the globe release carbon dioxide into the atmosphere. Although individuals enjoy the benefits of these actions (a hot meal and more convenient travel from point A to point B), they incur only a percentage of the costs (the effects of climate change on societies). In such a scenario, the nature of the atmosphere prevents the market from ensuring accountability for reductions in environmental sustainability, and environmental degradation thereby ensues. As effects such as pollution (in its effects on surface water), clear cutting (in its effects on the renewability of the forests), overfishing (in its effects on the fishery) are repeated for these other valuable environmental resources, the market process fails to ensure the sustainability of natural assets and diminishes the earth’s ability

to provide for future generations (Dorfman, 1993; Boulding, 1966; Ehrlich, 1968; Schmidheiny, 1992; United Nations, 1987, 1999, 2004; World Resources Institute, 2004).

The environmental economic approach to environmental problems suggests that the elimination or correction of market failure enhances the Pareto efficiency of markets while simultaneously reducing environmental degradation and pollution effects (Buchanan and Faith, 1981; Demsetz, 1967; Pigou, 1932). If, for example, steel producers are required to internalize the costs of pollution, their production function will be altered and their decision-making will tend toward minimizing pollution and associated damages. Thus, environmental economists are fundamentally concerned with the means of eradicating market failure because they believe that it reduces environmental degradation and enhances economic and ecological sustainability.

We refer to market failures which have detrimental impacts on environmental resources as environmentally relevant. Although they are a subset of the entirety of market failures, environmentally relevant market failures may deserve special attention because natural and environmental resources may be particularly susceptible to overuse and abuse (Dorfman, 1993). In addition, environmentally relevant market failures detract from the sustainability of an economic system by allowing the degradation of natural assets which are necessary to generate future economic value, whether privately or publicly owned (Costanza et al., 1997; Dorfman, 1993; Solow, 1993).

3.3. Market failure and entrepreneurial opportunity

The entrepreneurship literature exhibits a similar focus on market failures, but for entirely different reasons and with somewhat different language. In discussing the link between incomplete market conditions and entrepreneurial opportunity, several entrepreneurship theorists have proposed that imperfectly competitive markets imply opportunities for entrepreneurial action and economic profit. For example, Leibenstein's (1979) theory of X-efficiency related market gaps and imperfections to departures from the ideal state of perfect competition and correlated the amount of expected entrepreneurial activity to the magnitude of those departures. Similarly, Kirzner (1985, 1997) spoke of market errors and inefficiencies, which he attributed to a dynamic market process and the widespread ignorance of market participants. In her treatise on the growth of the firm, Penrose (1963) refers to "interstices in the economy" (p. 223) that are created by changes inherent in growing economies.

Considering these and other discussions of the sources of opportunity, Eckhardt and Shane (2003) distinguish two important themes within the literature. The first focuses on exogenous shocks which alter either the demand (i.e., tastes and preferences) or supply side (i.e., new product or process technologies) of markets. The resulting changes in the fabric of the market then produce opportunities for entrepreneurial action in the form of Penrose's (1963) interstices or Leibenstein's (1979) gaps. In contrast, the second theme focuses upon asymmetries in awareness to these market changes resulting from individual differences in, for example, knowledge (Hayek, 1945) or alertness (Kirzner, 1973, 1985). Consistent with a number of prominent Austrian theories of entrepreneurship (e.g., Kirzner, 1979), this latter argument explains the existence of opportunity and superior profit potential primarily in terms of widespread ignorance of market conditions.

The theoretical problem of the exogenous shocks approach is that, without some barrier (i.e., widespread ignorance) to the immediate exploitation of these gaps, they would exist only for an instant and would not result in superior profitability for those who discover them (Rumelt, 1987; Shane and Venkataraman, 2000). Thus, a complete theory of the nature of entrepreneurial opportunities must include consideration of the barriers to widespread and rapid exploitation of opportunities which arise from exogenous shocks. To date, the discussions of the nature of such obstructions within the entrepreneurship literature has been limited. For the most part, authors have followed Kirzner's approach and focused primarily upon information asymmetries across producers regarding the nature of demand or the means of supply (Sarasvathy et al., 2003).

It is here that environmental and welfare economics and the theory of market failure can provide some insight beyond that of Kirzner (1997) and other Austrian-based approaches (Eckhardt and Shane, 2003; Shane and Venkataraman, 2000). Like the Austrian school, environmental economists assume the economic system to be in a state of disequilibrium. However, whereas Austrians view this disequilibrium as the natural order of things, which is corrected when recognized by self-interested economic agents, environmental economists tend to focus upon situations in which market failure persists despite potential recognition by actors who desire its correction. The persistence of the state of market failure is argued to be the result of certain barriers which prevent the exploitation of opportunities.

Thus, the environmental and welfare economics literatures recognize not only the ignorance of producers or potential producers, but other barriers that, when overcome, allow the generation of economic rents and the movement of markets towards superior states of equilibrium and efficiency (Buchanan and Faith, 1981; Demsetz, 1967, 1970; Anderson and Leal, 2001). Consideration of these barriers as entrepreneurial opportunity rests in an understanding of the more specific foundations of the theory of market failure. Because market failure represents a departure from Pareto efficiency, the implication is that gains to trade exist and that removal of the barriers that cause market failure will allow entrepreneurs to seize those gains to trade.

Thus, the application of the theory of market failure to the literature on entrepreneurial opportunity suggests that other types of barriers to the efficient functioning of markets exist and that the understanding of these barriers enhances our knowledge of the nature of entrepreneurial opportunities (Dean and McMullen, 2002). But most importantly for present purposes, the combination of the conclusions of the market failure literature with the literature on entrepreneurial opportunities provides a foundation for the concepts of sustainable and environmental entrepreneurship.

3.4. Market failure, entrepreneurial opportunity, and sustainable and environmental entrepreneurship

A synthesis of the literature on market failure from economics with opportunity-oriented discussions of market imperfections and failures from the entrepreneurship literature implies the concepts of sustainable and environmental entrepreneurship. Whereas environmental economics concludes that environmental degradation results from the failure of markets and the entrepreneurship literature concludes that opportunities

are inherent in market failure, the logical conclusion is that environmentally relevant market failures represent opportunities for simultaneously achieving profitability while reducing environmentally degrading economic behaviors. In other words, some market failures which result in environmental damage provide entrepreneurial opportunities whose exploitation promises profit and improvements in social welfare. Assuming that an environmentally relevant market failure represents a “problem” that people would pay to have removed if given a cost-effective solution, an opportunity exists for prospective entrepreneurs. Moreover, by alleviating the market failure, entrepreneurial action contributes to environmental sustainability and social welfare as it enhances the efficiency of markets and helps eliminate economically undesirable environmental degradation. Thus, building on Shane and Venkataraman’s (2000) conception of entrepreneurship, we offer the following:

Definition 1A. Environmental entrepreneurship is defined to be: the process of discovering, evaluating, and exploiting economic opportunities that are present in environmentally relevant market failures.

Definition 1B. Sustainable entrepreneurship is defined to be: the process of discovering, evaluating, and exploiting economic opportunities that are present in market failures which detract from sustainability, including those that are environmentally relevant.

Thus, environmental entrepreneurship is presented as a subset of the broader concept of sustainable entrepreneurship, focusing on the resolution of market failures which result in environmental degradation. Furthermore, the specification of these definitions permits us to propose entrepreneurial action that follows logically from the existence of environmental entrepreneurship. Accordingly,

Proposition 1. In their effort to achieve economic return, environmental entrepreneurs enhance ecological sustainability by ameliorating environmentally relevant market failures.

The role of entrepreneurs in resolving these environmentally relevant market failures and moving society toward sustainability has been little explored. Although [Anderson and Leal \(1997, 2001\)](#) promote a free market approach to environmental issues and discuss the role of entrepreneurs in resolving environmental problems, our research reveals little other theoretical work that seeks to explain how entrepreneurs influence the sustainability of the environment. Though not addressing environmental issues directly, authors have examined the manner in which entrepreneurs overcome market failure. For example, [Buchanan and Faith \(1981\)](#) examine the role of entrepreneurs in internalizing externalities as an alternative to political solutions to market failures. [Coase \(1974\)](#) describes how private lighthouse keepers resolve public goods problems inherent in the provision of lighthouse services by obtaining the right (from port authorities) to charge for their services at nearby ports. Finally, [North and Thomas \(1970\)](#) and [Demsetz \(1970\)](#) discuss how entrepreneurs encourage or institute the development of property rights regimes for personal gain, and in that process resolve market failures. However, with the exception of [Anderson and Leal \(1997, 2001\)](#) not one of these theoretical explanations addresses environmental issues directly.

Not only does the theory of market failure provide insight into the conception of sustainable entrepreneurship, it also illuminates the obstructions that environmental entrepreneurs must overcome and thereby suggests where to look for opportunities for sustainable entrepreneurship. Historically, welfare and environmental economists have identified five categories of market failure, including public goods, externalities, monopoly power, inappropriate governmental intervention, and imperfect information, which we have earlier suggested to be the basis for a typology of entrepreneurial opportunity (Dean and McMullen, 2002). Though seemingly distinct, each category nevertheless represents the same theoretical discrepancy between private and social costs. However, owing to a unique blend of market conditions that lead to its emergence, each category represents a slightly different manifestation of this discrepancy (Coase, 1960; Randall, 1993).

Below, we use research on market failure to examine the nature of opportunities for sustainable entrepreneurship using the five previously noted categories of market failure that can be seen to be manifest in environment-degrading discrepancies between private costs and social costs. Drawing from a legacy of research devoted to identifying and describing the market conditions that are responsible for the emergence of various categories of market failure, we seek to provide both a better understanding of the structural barriers leading to each discrepancy and of the ways in which entrepreneurs have overcome these obstacles to achieve personal profit while concurrently improving the efficiency of the market and the ecology.

3.5. The nature of opportunities for environmental entrepreneurship

Historically, the literature on market failure has identified five types of market failure (see, for example, Tietenberg, 2000). However, because no underlying theoretical foundation exists that suggests that these categories are mutually exclusive or collectively exhaustive, we do not argue that they create a comprehensive typology. For the purpose of making our point that environmental degradation is in part related to an insufficiently broad conception of entrepreneurship, however, we employ the five most common types of market failure. Public goods, externalities, monopoly power, inappropriate governmental intervention, and imperfect information each present, to a different degree, conditions that are ripe for sustainable entrepreneurship. In the following paragraphs we briefly discuss in a standard order: (1) the implication of each category for environmental degradation, (2) the conditions that lead to the existence and persistence of each category of market failure as it applies to the environment, and (3) (in the form of propositions and examples) what environmental entrepreneurs have done or can do to overcome these conditions to produce profitable transactions.

3.5.1. Public goods

Public goods are a particularly well-known form of market failure that may be the most susceptible to environmental degradation and therefore possibly the most promising opportunity for sustainable entrepreneurship. The discrepancy between private costs and social costs that is characteristic of public goods is typically attributed to their non-excludability, which refers to their openness to consumption by all individuals regardless

of whether an individual has paid for such use (Cowen, 1988). Furthermore, non-excludability results from the absence of property rights or their effective enforcement. Non-excludability engenders overuse whenever a public good is rivalrous (one person's use diminishes the amount or quality of the good available to others) (Randall, 1993) because, in the absence of property rights, each individual has an incentive to exploit a resource as quickly as possible (Cowen, 1988). This can result in a resource-degrading misalignment in incentives more commonly known as the "tragedy of the commons" (Hardin, 1968). For example, because international waters are not owned by any individual or sovereign, too many actors in the commercial fishing industry have sought to harvest the fisheries as quickly as possible rather than conserve the resource and maximize output over time. This has led to damaging fishing practices, the elimination of breeding stocks, and the rapid depletion of these resources. Other examples of public goods currently facing similar pressures include national forests, regional air resources, and global climate.

The problem of environmental degradation due to public goods therefore represents unmet societal demand for a cost-effective solution and a potentially profitable opportunity for sustainable entrepreneurship. In recognition of Nobel Prize winning economist Ronald Coase's study (1974) of "The Lighthouse in Economics", we refer to entrepreneurs who develop property rights regimes for previously non-excludable public goods as Coasian entrepreneurs. Coasian entrepreneurs translate public goods into excludable private ones through both political and technological mechanisms (Dean and Pacheco, 2005). Political strategies involve motivating government agencies to implement or enforce property rights regimes that allow the efficient functioning of a market for public goods (Goldin, 1977; North and Thomas, 1970; Demsetz, 1970). For example, in Coase's seminal article, he describes how private lighthouse keepers resolved the excludability problem inherent to lighthouse services by gaining the right from port authorities to charge incoming vessels for the lighthouse services. In Africa, governments have had some success in protecting elephant herds by assigning rights to the herd to local tribes who are economically motivated to preserve the herds (Anderson and Leal, 1997). Similarly, in the western United States, the assignment of property rights to water has allowed entrepreneurial development of agricultural lands, reduced pollution of existing water supplies, and enabled more efficient allocation of water to its highest valued use. In another example, Anderson and Leal (1997), show how a local entrepreneur convinced government entities to provide him the right to collect the roe of Montana paddlefish to sell on the caviar market. Prior to his actions, fishermen were causing environmental harm by disposing the eggs and the rest of the fish innards around local streams. For the right to collect the roe (through a free fish-cleaning service) the entrepreneur agreed to give half of the net proceeds back to the state for paddlefish research and management (Anderson and Leal, 1997). The new property rights regime helped preserve the fishery while enhancing the economic value of that fishery for the local tourism industry.

Coasian entrepreneurs can also enable the private provision of public goods through technological strategies that seek to transform a good from non-excludability to excludability (Goldin, 1977). In other words, technologies can help to protect property rights by excluding freeloaders from using public goods by allowing the enforcement of property rights and ensuring their provision (Furubotn and Pejovich, 1972). For example,

barbed-wire fencing allowed large landowners in the Western United States to cost-effectively exclude mobile cattle owners from trespassing on their lands and grazing their cattle without payment or consideration for the future productivity of the property. Hence we propose:

Definition 2. *Coasian entrepreneurship is defined to be:* the process of establishing excludability for public goods through the development and enforcement of property rights regimes by profit-motivated economic actors.

The specification of this definition then permits us to propose entrepreneurial action that follows logically from the existence of the Coasian entrepreneurship process. Accordingly,

Proposition 2A. Public goods present opportunities for entrepreneurial action when entrepreneurs can develop excludability for those goods.

Proposition 2B. Environmental entrepreneurs reduce environmental degradation and capture economic value by developing excludability for public environmental resources.

3.5.2. Externalities

Externalities are another well-known and pervasive type of market failure that have a substantial effect upon environmental degradation and that can create opportunities for environmental entrepreneurs. An externality is “a cost or benefit arising from any activity which does not accrue to the person or organization carrying on the activity” (Black, 1997:169), or the effect of one individual’s actions on the utility of another individual (Cowen, 1988). Externalities can also be viewed as side effects associated with market transactions (Kahn, 1995). Positive externalities, such as the impact of one person’s disease vaccination on the probability of another person contracting the disease, are those actions that have a beneficial effect on another individual, while negative externalities, such as the impact of industrial smoke on the health and environment of the surrounding community, are those actions that have a damaging effect on another individual (Cowen, 1988). Where externalities exist, resources are not allocated efficiently because the incentives of economic actors are misaligned, and those creating external costs may not be incurring their consequences (Buchanan and Stubblebine, 1962).

Economic theory attributes externalities to prohibitive transaction costs (Cole, 2000; Dahlman, 1979; Furubotn and Pejovich, 1972). In short, it is argued that, with the exception of transaction costs and unassigned property rights (Demsetz, 1966; Sternberg, 1996), no a priori reason exists that would prevent the market from properly allocating scarce resources. Therefore, under conditions of defined property rights, transactions to alleviate the externality are not completed because the cost of those transactions exceeds their benefit (Dahlman, 1979). For example, in the case of a factory that is polluting a neighboring community, individuals may choose not to seek compensation for damages or reduction of emissions because the transaction costs of doing so would exceed the potential gains. Such transaction costs include the costs of proving that the emissions from a given factory are actually causing harm (a sort of causal ambiguity), hiring legal professionals to either write a contract or sue the creator of the externality, and bearing the

opportunity costs associated with the time spent pursuing the issue. “Transaction costs are therefore a necessary condition for the persistence of unwanted effects from externalities, for with zero transaction costs side effects will be internalized and will not negatively affect resource allocation” (Dahlman, 1979: 142).

Environmental entrepreneurs can capture economic value and reduce environmental degradation by reducing the transaction costs associated with environmentally relevant externalities. This is achieved by institutional entrepreneurs (Dean and Pacheco, 2005) who are self-interested profit-seeking actors who establish or modify institutions to reduce transaction costs. Transaction costs “consist of the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights and policing and enforcing agreements” (North, 1990: 27). In other words, transaction costs represent the costs of exchange, as opposed to the costs of production or transformation. As a result, they are highly dependent upon institutions which act as “the humanly devised constraints that shape human interaction” and “structure incentives in human exchange whether political, social, or economic” (North, 1990: 3). Despite the integral role of entrepreneurship in institutional change, however, theory and research from both economics (e.g., North, 1990; Demsetz, 1970) and sociology (e.g., DiMaggio, 1988; Garud et al., 2002; Maguire et al., 2004) has only recently begun to recognize the role of entrepreneurs in establishing or altering institutions (North, 2005). For example, recent sociology-based research on institutional entrepreneurship investigates how entrepreneurs develop institutions such as technology standards and HIV/AIDS treatment advocacy to further their own self-interest (Garud et al., 2002; Maguire et al., 2004).

This self-interest need not run counter to society’s interests (Smith, 1991). For example, the Chicago Climate Exchange (CCX) was recently created by entrepreneur Richard Sandor to serve as a marketplace for carbon emission credits. The exchange serves as a platform through which members can trade carbon emission allowances, thereby enabling firms with relatively low emission reduction costs to sell credits on the exchange to firms with higher costs. The resulting institution has produced a reduction in the aggregate emissions at the least possible cost by minimizing the transaction costs of carbon trading through the development of uniform carbon commodity standards, legal instruments that provide evidence of ownership, auditing mechanisms, and the actual trading technology which serves as a mechanism of price discovery (Sandor, 2001). Thus, through the entrepreneurial development of CCX, Richard Sandor, member companies, and society have benefited from a reduction of transactions costs.

Perhaps a more familiar example of institutional entrepreneurship is observed in the lawyer or coordinator of a class action lawsuit. Many negative externalities, such as the health effects of factory pollution, persist because the victims of the effects are numerous, and the transaction costs of pursuing the enforcement of property rights alone are high. Coordinating the interests of these parties through an organization that represents their rights can substantially reduce the costs of bargaining and contracting with the producer of the externality while promising enough entrepreneurial profit to motivate the coordinator of the group action. Entrepreneurs may also use technology to reduce transaction costs (Furubotn and Pejovich, 1972). For example, one of the factors that prevent sufferers of externalities from gaining retribution from polluters is the inability to prove that pollutants actually harmed the individuals. Emerging chemical “fingerprinting” technologies allow

researchers to trace the source of various chemicals that end up in certain locations, providing solid evidence of the source of contamination (Anderson and Leal, 1997). Entrepreneurs can market or use such technologies to protect potential sufferers or gain restitution for damages incurred. Hence, we propose:

Definition 3. Institutional entrepreneurship as we use it in this analysis is defined to be: the process of reducing transactions costs through the development of economic institutions by profit-motivated economic actors.

The specification of this definition then permits us to propose entrepreneurial action that follows logically from the existence of the institutional entrepreneurship process. Accordingly,

Proposition 3A. Externalities present opportunities for entrepreneurial action when entrepreneurs can reduce transaction costs through the development of economic institutions.

Proposition 3B. Environmental entrepreneurs reduce environmental degradation and capture economic value by reducing transaction costs that are associated with environmentally relevant externalities.

3.5.3. *Monopoly power*

Models of perfect competition assume that sellers are numerous, such that each seller's output decisions have no perceptible influence on the market price (Scherer and Ross, 1990). When this occurs, sellers are price takers, resigned to sell their products at the competitive market price, and markets have the potential to achieve Pareto efficiency. At the opposite extreme is the condition of monopoly that is characterized by a single seller. Monopoly, or more generally monopoly or market power, is considered to be market failure because it implies that profit maximization on the part of the monopolist will result in an under-provision and over-charging for goods (Bator, 1958). This outcome is not Pareto efficient because it results in a loss of consumer surplus that is greater than the monopolist's economic profit (producer surplus) (Scherer and Ross, 1990). In other words, private benefit exceeds social benefit and an opportunity-creating discrepancy exists.

Predictions regarding the effect of monopoly power on environmental degradation are mixed. On the one hand, firms with monopoly power are argued to be highly inertial because they are not subject to the pressures of competition. Consequently, they may be less likely to adopt new technologies and methods of production that would enhance their efficiency and, presumably, better their use of natural resources. They may also be less inclined to adopt more environmentally friendly technologies, which is a familiar criticism of the electrical utility industry for underutilizing wind power. On the other hand, because monopolists tend to overprice for their products or services, the equilibrium quantity produced is less than it would otherwise be. In the case of highly polluting industries this reduction in equilibrium output may serve to reduce the amount of environmental degradation relative to the equilibrium quantity.

The presence of monopoly power produces opportunities for entrepreneurs because of the economic value that may be captured from the destruction of the monopoly

position. Because of the pricing and output policies of firm's with market power, customers who are willing to purchase at prices above the costs of production remain in the market. To capture this potential market, entrepreneurs must break the monopoly position(s) of the incumbent(s). In the case of statutory monopolies (those resulting from government restriction of competition), entrepreneurs must overcome the legal restrictions to entry. In the case of natural monopolies (those resulting from large economies of scale relative to total demand or anti-competitive behaviors), entrepreneurs must either develop efficient small scale production technologies or overcome other market barriers. We refer to entrepreneurs who break monopoly positions of existing firms as *market appropriating entrepreneurs* because they appropriate part of the market from the incumbent firms.

In some cases, market appropriating entrepreneurship can have negative effects on the environment. More specifically, in situations in which the monopoly constraint of output is benefiting the environment, market appropriating entrepreneurship can increase environmental degradation because it increases the quantity of industry output, and therefore the level of pollution resulting from the industry. On the other hand, in cases where the monopoly position is preventing the adoption of environmentally superior business methods, the dissolution of monopoly power can have substantial positive effects on the environment. For example, the deregulation of the telecommunications industry by the entrepreneurial efforts of MCI resulted in a more competitive industry in which new technologies were rapidly developed. Many of these technologies, such as microwave towers and cell phones, reduced reliance on more resource intensive technologies such as copper transmission lines.

The electric utility industry provides a similar example in both its history and current state. Prior to the Public Utility Regulatory Policy Act of 1978, small scale producers of electricity encountered substantial resistance from monopolistic providers who controlled the distribution of power. The act required large utilities to purchase power from small-scale electricity producers and enabled entrepreneurs to develop hydro-electric and other renewable energy projects. Currently, many argue that the inertial properties of large organizations in the industry combined with regulatory systems that set rates based on costs prevents the development and implementation of clean energy technologies. Environmental entrepreneurs who overcome the market barriers in this industry may have substantial opportunity to profit from the implementation of renewable energy and distributed generation technologies while reducing environmental impacts.

Thus, environmental entrepreneurs who can overcome market power have the opportunity to profit from the implementation of environmentally superior business methods. Hence, we propose:

Definition 4. Market appropriating entrepreneurship is defined to be: the process of breaking monopoly power (or more generally, market power) of incumbent firms by profit-motivated economic actors.

The specification of this definition then permits us to propose entrepreneurial action that follows logically from the existence of the market appropriating entrepreneurship process. Accordingly,

Proposition 4A. Monopoly power presents opportunities for entrepreneurial action when entrepreneurs can overcome the market power of incumbent firms.

Proposition 4B. Environmental entrepreneurs reduce environmental degradation and capture economic value by overcoming the market power of incumbent firms.

3.5.4. Inappropriate government intervention

Government intervention can also be a cause of market failure, have negative impacts on environmental resources, and be a source of opportunity for environmental entrepreneurs. Government intervention is considered to be inappropriate when it results in Pareto inefficiencies in the economic system. The most common environmental examples are subsidies that support the extraction of natural resources. For example, timber production has been subsidized through below-cost leases from the U.S. government and the construction of roads on federal forests (Stroup and Baden, 1973). Oil extraction is similarly subsidized through tax benefits and regulatory exclusions (Economist, 2001). Subsidies for the extraction of oil result in substantial negative environmental impacts including increased climate change and regional air pollution. Research argues that inappropriate government intervention results from politicians and regulators pursuing their own political and economic self-interests rather than that of the public at large, and implementing programs for which they do not bear the direct costs (Cole, 2000).

Opportunities for entrepreneurship result from the modification of government subsidies, taxes, and other economic incentives through political strategies. Because subsidies of one industry support that industry at the expense of others, changes to the structure of subsidies create economic opportunities. Thus, we refer to entrepreneurs who motivate changes to subsidies or other government incentive structures in pursuit of their own self interest as *political entrepreneurs*. Environmental entrepreneurs can simultaneously create economic opportunity and reduce environmental degradation by motivating the elimination of subsidies or incentives which cause environmental harm. More specifically, when government subsidies or structures support one industry to the detriment of environmental resources, entrepreneurial action to eliminate the subsidy can reduce environmental degradation and create economic opportunities in substitute industries or technologies. For example, eliminating coal industry subsidies would likely improve the business prospects for renewable energy ventures.

Similarly, environmental entrepreneurs can employ political strategies to motivate incentives for more environmentally beneficial industries or technologies. Because of the substantial external effects that are associated with such activities, entrepreneurs can encourage government entities to intervene in the interest of society. This typically requires entrepreneurs not only to justify why changes in subsidization policies are socially desirable but also to explain how these changes are in the self-interest of politicians. For example, the use of automobiles creates substantial externalities both in the effects of emissions on the environment and human health. This has provided entrepreneurs in industries that support public transportation and its relatively low emissions – i.e., bus or train manufacturing – with an opportunity to petition government for subsidization under the motive of improving the environment, increasing jobs

associated with bus or train manufacturing, and providing necessary and affordable transportation for the poor. Many governments have then sought to pay for these subsidies by employing petroleum taxes that are intended to discourage the use of automobiles and their negative side effects. Accordingly, we propose:

Definition 5. Political entrepreneurship is defined to be: the process of motivating changes to subsidies, taxes, or other government incentive structures by profit-motivated economic actors.

The specification of this definition then permits us to propose entrepreneurial action that follows logically from the existence of the political entrepreneurship process. Accordingly,

Proposition 5A. Government intervention presents opportunities for entrepreneurial action when entrepreneurs can motivate changes to subsidies, taxes, and other government incentive structures.

Proposition 5B. Environmental entrepreneurs reduce environmental degradation and capture economic value by altering (through political involvement) the structure of government subsidies, taxes, and other incentives.

3.5.5. Imperfect information

Conditions of imperfect information may also present substantial opportunities for sustainable entrepreneurship. Models of competitive equilibrium usually assume that information is perfect (Scherer and Ross, 1990). Perfect information implies that sellers and buyers have all possible information available (Black, 1997) including that regarding the nature of present and future markets and productive resources and methods. In reality, knowledge is never perfect and the imperfection of knowledge creates market failure as it has been defined in this article.

We divide the nature of imperfect information into two general categories. The first refers to the knowledge that *producers* have about supply and demand conditions. The second refers to the knowledge that *customers* possess regarding the nature of product or service attributes. We address the nature of each of these in turn, discussing the manner in which they can contribute to environmental degradation and present opportunities for environmental entrepreneurs.

3.5.5.1. Producer-focused informational entrepreneurship. Austrian economists and others argue that information is not evenly distributed across *producers* or *potential producers* in an economy. More specifically, information regarding the nature of demand conditions (e.g., customer needs and preferences) or supply possibilities (e.g., product technologies, process technologies, and sources of inputs) is not available to all entities. Changes in technology, social tastes, and demographics alter the competitive landscape continuously bombarding individuals with new information to discover and interpret. These contextual changes, coupled with disparate interpretations, create market gaps (Leibenstein, 1968, 1979) or imperfections that remain until they are perceived by alert entrepreneurs. This information imperfection creates entrepreneurial opportunity because

the unmet demand conditions or unutilized production possibilities are not immediately dissipated by entrepreneurial action. We refer to the process of exploiting opportunities that result from imperfect producer information on demand and supply conditions as *producer-focused informational entrepreneurship*. Because this process is most closely parallel to Austrian conceptions, we also refer to it as *Austrian entrepreneurship* (Kirzner, 1973, 1979, 1997).

Imperfect information among producers and potential producers can result in environmental degradation when environmentally superior means of supply are unknown, or when markets for environmentally superior products are undiscovered (see Sarasvathy et al. (2003) for a discussion of the role of undiscovered supply and demand as entrepreneurial opportunity). Opportunities for environmental entrepreneurs exist to discover and implement new product or process technologies or other means of supply which are less environmentally damaging. Numerous manufacturers have discovered that the implementation of clean technologies can result in substantial cost savings and create advantages over competitors. Dupont, for example, has reduced carbon emissions by over 60% and experienced substantial energy efficiency benefits in the process. Wind power firms are currently experiencing rapid growth as technology has reduced production costs and government tax breaks have provided additional incentives. Clipper Wind formed as an entrepreneurial spin off from Enron Wind (now GE Wind) to capitalize on opportunities in wind turbine manufacturing and wind project development.

Opportunities for environmental entrepreneurs also exist to discover customers who prefer environmentally superior products and services — i.e., the environmental market niche (Reinhardt, 1999). Although the market for products that are differentiated by their environmental characteristics has been rather small as a percentage of total demand, the absolute magnitude of such consumers is substantial and subject to change over time. A number of companies are currently capitalizing on the demand for clean power from customers who are concerned about the environmental degradation that is caused by traditional methods of electricity production. A recent start-up, Renewable Choice Energy, markets wind energy credits to this altruistic market segment without ever producing a kilowatt of electricity. The 26-year-old founder surmised that he could combine the door-to-door sales tactics from the bookselling industry to the marketing of green power. The result is increased revenues flowing to the developers of wind power and the encouragement of renewable energy projects. We therefore propose:

Definition 6. Producer-focused informational (or Austrian) entrepreneurship is defined to be: the process of exploiting opportunities that result from the discovery of knowledge regarding market supply or demand conditions.

The specification of this definition then permits us to propose entrepreneurial action that follows logically from the existence of the producer-focused informational entrepreneurship process. Accordingly,

Proposition 6A. Imperfect information regarding demand and supply conditions presents opportunities for entrepreneurial action when entrepreneurs can discover the nature of demand and supply conditions which are unknown to other potential economic actors.

Proposition 6B. Environmental entrepreneurs reduce environmental degradation and capture economic value by discovering methods of production which reduce environmental degradation or by marketing environmentally superior products to underserved environmental market niches.

3.5.5.2. Customer-focused informational entrepreneurship. The other category of imperfect information refers to the customer's lack of knowledge regarding the nature of product or service attributes. Imperfect customer information about product or service attributes can have substantive impacts on the efficiency of markets. In his seminal analysis of the market for used cars, Akerlof (1970), for example, demonstrated theoretically how information asymmetry between buyer and seller can result in the failure of a market to exist whatsoever. At less extreme levels, imperfect information regarding product or service attributes can prevent markets from rewarding socially desirable economic behaviors. For example, the lack of information regarding on-time arrivals and departures prevented customers from choosing airlines with superior service records and prevented, to some degree, airlines from focusing on this service attribute as a source of competitive advantage.

Customer imperfect information can create opportunities for entrepreneurs who enhance customer information regarding product or service attributes. Akerlof, for example, proposed that warranties can ameliorate the market failure that is present in the market for used cars. In addition, challenges facing airlines with superior arrival and departure records were at least partially resolved by the release of government information on their performance. We refer to entrepreneurs who enhance customer information in the pursuit of profit as *customer-focused informational entrepreneurs*. Customer imperfect information can contribute to environmental degradation because the lack of customer information on the environmental impacts of products or associated production processes prevents them from purchasing products that they might otherwise desire. Customers concerned about both their own health and broader effects on the environment cannot express their desires if they do not have adequate information about the environmental effects of methods of production, product contents, product use, and post-consumer disposal. The resultant customer uncertainty fails to provide advantage to environmentally superior producers (or their offerings), and the market system therefore fails to motivate environmental performance. In short, to the extent that information about the environmental performance of a company or its products or services is unavailable to a customer, that customer is unable to express his/her values in buying behavior. The result is that companies, at the margin, are less inclined to improve their environmental performance.

Environmental entrepreneurs can capture opportunities by informing customers regarding the environmental attributes of products and services. Horizon Organic Dairy, located in Longmont, Colorado, sought to establish a market niche by educating potential customers about differences between organic and conventional milk. By printing on the carton that their milk contains no antibodies, hormones, or pesticides, they effectively informed their customers that conventional milk possesses these attributes while simultaneously and implicitly conveying that such attributes are undesirable. Perhaps more important, Horizon also lobbied aggressively to establish and maintain high

governmental standards to be used in determining what can and cannot be officially labeled “organic.” Through such actions Horizon differentiates a commodity through statutory requirement as well as customer awareness while expanding the acreage under cultivation without the use of artificial pesticides or fertilizers.

Developments in the green building industry provide another example of how the enhancement of customer information can reduce information asymmetries between buyers and sellers, and allow a market to arise. The commercial green building industry is currently experiencing rapid growth as the result of a self-developed certification system for green building projects. Established by the U.S. Green Building Council (a group of industry members), the LEED (Leadership in Energy Efficiency and Design) program certifies that commercial buildings meet energy efficiency, site impact, and other environmental criteria. The certification system assures the purchaser of a building that the commercial building meets its builder’s claims of low environmental impact, cost efficiency, and indoor air quality. The information provided by the system has created substantial traction within the market for green buildings. As a result, entrepreneurs, from green architects to green builders, are benefiting from the growth. Thus, we propose:

Definition 7. Customer-focused informational entrepreneurship is defined to be: the process of exploiting opportunities by enhancing customer knowledge of product or service attributes.

The specification of this definition then permits us to propose entrepreneurial action that follows logically from the existence of the customer-focused informational entrepreneurship process. Accordingly,

Proposition 7A. Customer imperfect information regarding product or service attributes presents opportunities for entrepreneurial action if entrepreneurs can inform customers regarding product or service attributes.

Proposition 7B. Environmental entrepreneurs reduce environmental degradation and capture economic value by informing customers regarding the environmental attributes of products or services.

4. Discussion and conclusion

By synthesizing the literature from environmental and welfare economics with that of entrepreneurship, we have articulated a conception of sustainable entrepreneurship and outlined how entrepreneurial action can overcome barriers to the efficient functioning of markets to contribute to the more efficient use of environmental and natural resources and the development of a more ecologically sustainable economy. Environmental entrepreneurs alleviate environmentally relevant market failures through the discovery, evaluation, and exploitation of opportunities present in market failure.

This conceptualization is based on a number of arguments which may be usefully summarized as follows: (1) Market failures represent a source of entrepreneurial opportunities – that is, unmet market demand exists as a result of discrepancies between private and social costs; (2) Because of the natural characteristics of environmental

resources they are particularly susceptible to market failure and degradation – as a result, they represent a substantial source of entrepreneurial opportunity; (3) Because the exploitation of these opportunities requires the elimination of barriers to the efficient functioning of markets, entrepreneurial action to exploit market failures serves to move markets toward states of superior efficiency; (4) The exploitation of environmentally relevant market failures reduces environmental impacts and moves markets closer to sustainability; (5) Finally, the categories of market failure discussed in the literature provide a foundation from which to gain a better understanding of the nature of these barriers and the manner in which entrepreneurial action may overcome them for economic gain (See [Table 1](#) for a summary).

Our analysis of the various categories of market failure suggests that the barriers which must be overcome include the lack of sufficient property rights regimes, the existence of prohibitive transactions costs, the government support of monopolies or Pareto inefficient industries, and imperfect information. Environmental entrepreneurs who establish more effective property rights regimes for environmental resources stand to gain from the transformation of a public good into a private one or from the elimination of externalities. Those who reduce transaction costs inherent in existing or potential markets enable the capturing of gains to trade which exist because of external effects. Others may create opportunities for themselves by finding ways to eliminate statutory support of competitive industries or firms. Finally, environmental entrepreneurs may find ways to perfect information in a manner that provides, creates, or develops markets or allows the entrepreneur to identify new markets or superior means for serving them. In each of these cases, in which a barrier to the efficient functioning of a market is creating environmental degradation, the act of exploitation has the potential to reduce environmental damage and enhance ecological sustainability.

Our conception of environmental entrepreneurship bears a number of similarities to the Austrian perspective on entrepreneurship ([Shane and Venkataraman, 2000](#); [Kirzner, 1973](#)). Although subject to interpretation by individual actors, opportunities are assumed to exist objectively within existing social and economic systems. We also view markets as existing in perpetual states of disequilibrium with constant alterations from the exogenous shocks which [Eckhardt and Shane \(2003\)](#) and others discuss. Although exogenous shocks push markets even further from equilibrium, exploitation of opportunities by entrepreneurs tends to pull the system towards equilibrium. Finally, because we view entrepreneurship as a process of exploiting market opportunities, we include both the formation of new organizations and the actions of existing organizations in our conception.

At the broadest level, however, our investigation suggests that the Austrian perspective on the domain of the field may be limiting. Our market failure perspective revealed that the barriers to the efficient functioning of markets go well beyond that of imperfect producer information regarding the nature of supply and demand. Opportunities inherent in a wide variety of barriers to the efficient functioning of markets exist and imply a much broader scope for entrepreneurial action than that of the Austrian perspective. We outline a variety of categories of entrepreneur including the Coasian, institutional, market appropriating, political, and informational entrepreneurs. Although we do not argue that we have created a typology of entrepreneurs, per se, the possibility that the domain of the field may extend substantially beyond current perspectives is intriguing and demands further investigation.

Table 1
Market failure, environmental degradation, and opportunities for environmental entrepreneurship

Market failure category	Market barrier	Implications for environmental degradation	Opportunity for environmental entrepreneurship	Category of entrepreneurship
Public goods	Resource non-excludability	Tragedy of the Commons scenario (i.e., depletion of international fisheries)	Develop property rights regimes to create excludability (i.e., develop right to collect and market Montana paddlefish caviar)	<i>Coasian entrepreneurship</i>
Externalities	Prohibitive transactions costs	Lack of market exchange for environmental resources (i.e., toxic effects of pollutants)	Reduce transaction costs through the establishment of economic institutions (i.e., Chicago Climate Exchange)	<i>Institutional entrepreneurship</i>
Monopoly power	Market power: A. Statutory B. Scale related	Mixed effects: Positive—reduced output in pollution-intensive industries Negative—Industries slow to implement beneficial technologies and products (i.e., electric utilities)	Break monopoly position of incumbent firms (i.e., PURPA legislation which required utilities to buy power from small-scale electricity producers and motivated entrepreneurial development of renewable energy resources)	<i>Market appropriating entrepreneurship</i>
Inappropriate government intervention	Public policy: subsidies and other structural incentives	Inappropriate support for pollution-intensive industries (i.e., subsidies for oil extraction/refining)	Alter nature of government subsidies and other incentives through the political process (i.e., petroleum taxes in Europe)	<i>Political entrepreneurship</i>
Imperfect information	Information asymmetry: A. Across producers regarding nature of supply and demand B. Between producers and consumers regarding product attributes	A. Environmentally superior means of supply or environmental market niches unknown B. Lack of consumer information on environmental impacts prevents them from expressing preferences	A. Discover new environmentally superior means of supply or customer segments with environmental preferences B. Enhance customer information regarding environmental attributes of products of processes (i.e., LEEDS Green building certification program)	<i>Informational entrepreneurship</i> A. Producer-focused informational (Austrian) entrepreneurship B. Customer-focused informational entrepreneurship

Based on our analysis, such explorations should be founded on the nature of barriers to the efficient functioning of markets because it is these barriers which allow opportunities to persist long enough to generate returns. For example, knowing that public goods result from non-excludability provides greater insight into the types of resources and strategies that are necessary to equip someone to overcome this obstruction and exploit the opportunity that it creates. Each type of entrepreneurship may imply substantive differences in processes, required skills and competencies, risks, and outcomes.

Therefore, our approach differs somewhat from the traditional Austrian approach by integrating ideas from institutional economics (North and Thomas, 1970) and, of course, environmental and welfare economics. First, we focus more on the ability of entrepreneurs to influence the social and economic system and, through that agency, overcome the barriers which create market failure. In this respect, we see social and economic systems as subject to modification by various economic agents, including profit-motivated entrepreneurs. Second, we view economic systems as largely evolutionary in the sense that the foundational institutions (including property rights) which drive economic behaviors are subject to change over time. Though not always the case, this evolution tends to align social goals and private incentives, or stated differently, social and private costs. Thus, at least partially as the result of entrepreneurial action, economic systems develop over time to resolve social and environmental ills. This implies an additional departure from the Austrian view. For the most part, the Austrian view sees disequilibrium as the result of new or relatively recent exogenous shocks which are not instantly discovered by alert entrepreneurs. Our more institutional perspective recognizes the importance of such external changes but also emphasizes the fact that the economic system is a continually changing set of institutions which, hopefully, evolves to ameliorate both recent and longstanding market imperfections.

This conception of environmental entrepreneurship and the role of entrepreneurial action in eliminating environmentally relevant market failures also suggest an alternative to many scholars' view that market failure provides a *prima facie* case for government regulation. Our position coincides with that of institutional economists who suggest that market systems and the institutions that define them evolve over time in a manner that can resolve social ills. Thus, we emphasize the role that entrepreneurs can play in overcoming the barriers to the efficient functioning of markets and the resolution of environmental issues. This approach, however, requires intelligent and non-self-serving cooperation on the part of governmental actors. Rather than suggesting that government has no role to play in helping to resolve environmental issues, our analysis points to the important role government plays in establishing appropriate institutions that reward environmentally sound, entrepreneurial behaviors and that dissuade environmentally degrading ones. Thus, appropriate public policy is that which establishes property rights regimes and other economic institutions for environmental and natural resources in a manner that ensures their proper management for future generations. It also involves eliminating subsidies for environmentally damaging behaviors and perhaps developing policies that support more sustainable ones. Accordingly, it seems that the least effective form of government policies are economically restrictive regulations, especially those which directly prescribe the use of specific technologies or limit emissions without the right to trade emission credits. Perhaps most importantly, the proposed conception of environmental entrepreneurship

recognizes the role of profit-seeking entrepreneurs in motivating the development of property rights regimes in a manner that can reduce environmental degradation. Finally, the view that entrepreneurs play a role in motivating changes in public policy, and the classification of that role as an entrepreneurial act, is somewhat unique, but not inconsistent with existing conceptions of entrepreneurship. To the extent that exploitation of opportunity is considered part of the process of entrepreneurship (i.e., [Shane and Venkataraman \(2000\)](#), who define entrepreneurship as the process of opportunity discovery, evaluation, and exploitation), motivation of government action may be viewed as entrepreneurial.

It is not our intention to suggest that all entrepreneurial behavior results in enhanced environmental welfare. Quite to the contrary, entrepreneurial behavior in a system that inhibits environmental entrepreneurship as we conceptualize it will naturally tend toward environmental degradation and natural resource exploitation. Entrepreneurs who externalize costs because of unprotected public goods or, worse yet, governmentally created, environmentally degrading discrepancies between private and social costs, will continue to contribute to the degradation of our environment and ecological sustainability. Furthermore, proposing that entrepreneurs can help resolve market failures does not imply that all market failures may be resolved by entrepreneurial action or that all markets can work to the benefit of society and/or the environment. Instead, we wish to point out the possibility and manner in which entrepreneurial action is capable of alleviating market failures and environmental degradation.

Accordingly, we view our conception of sustainable entrepreneurship as a subset of the general concept of entrepreneurship, and environmental entrepreneurship as a subset of the broader concept of sustainable entrepreneurship. First, we recognize that many entrepreneurial actions can actually increase market failure and result in additional environmental degradation. While these actions may be classified as entrepreneurial, they do not fall within the domain of sustainable entrepreneurship. Examples of such market-degrading actions include efforts of entrepreneurs to monopolize industries or externalize costs by releasing pollution into waterways. Second, because not all market failures are relevant to environmental resources, a set of opportunities for the elimination of market failures exists which are classifiable as sustainable entrepreneurship but not environmentally relevant. In short, sustainable entrepreneurship represents a specific class of entrepreneurship which addresses, among other areas, the capturing of opportunities present in environmentally relevant market failures wherein the exploitation of the opportunity alleviates the market failure and reduces environmental degradation. However, the notion of sustainability also addresses issues such as inequality, poverty, and disease. Although we chose to demonstrate the efficacy of the framework as it applies to the reduction of environmentally relevant discrepancies between private and social costs, there is reason to believe that the proposed theoretical framework could be used to provide theoretical insight into other issues of sustainability.

In conclusion, we believe that we contribute to the understanding of the role of entrepreneurs in moving the economy to an environmentally sustainable future. Viewing economic systems as dynamically adapting to emerging environmental challenges, we see that entrepreneurs play a role in breaking down barriers to the efficient functioning of markets and eliminating the market failures which produce environmental degradation and

sustainability. Guided by intelligent public policy which enables sustainable entrepreneurship, it seems that the innovative power of entrepreneurship could be captured to build a sustainable world. Given the substantial challenges facing the global environment, we agree with *The Economist's* observation that the environment presents a substantial opportunity for enterprise and invention, and suggest that it may indeed be time that we both realize the importance of entrepreneurship to sustainability, and enable entrepreneurs to achieve its vision.

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