

Breaking the Waves: Innovation at the Intersections of

Economic Development Policy

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Abstract

Economic development is often presented as a choice between discrete policy alternatives in competition for scarce resources. In particular, entrepreneurship and industrial recruitment are frequently presented as opposing strategies with vastly different economic targets and political sensibilities. This paper presents an illustrative case study from North Carolina's bioscience industry to demonstrate that knowledge and practice improve when industrial recruitment and entrepreneurial development are intentionally and institutionally conjoined. This case illustrates more than a simple economic development balancing act. Rather, it provides an example of mutual reinforcement whereby practitioners draw lessons, insights, and resources from one defined area of economic development policy and apply them to another. This case therefore challenges the assumption that regional economic development involves a linear succession of independent policy approaches, or "waves." Thus, this paper provides a potential road map for other places wishing to bring seemingly distinct development tools and targets into closer alignment.

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Economic development is often presented as a choice between discrete policy alternatives in competition for scarce resources. Scholars and practitioners often describe distinct ‘waves’ of practice involving strategies that compete rather than work in tandem to achieve the dual objectives of stimulating innovation and creating jobs. This is especially true for entrepreneurship and industrial recruitment, which are associated with vastly different economic targets, political sensibilities, and interests. It is little wonder, then, that intensified use of industrial recruitment to stimulate job growth in the wake of the U.S. Great Recession has raised concern among development scholars that policy commitments to support entrepreneurship will soon be reversed. While this return to recruitment is often justified on the grounds of immediate job creation, it is also criticized for potentially undermining longer-term innovation gains.

This paper examines the idea that enhanced economic development practice can result when industrial recruitment and entrepreneurial development are intentionally and institutionally conjoined. We present an illustrative case study of North Carolina’s Biotechnology Center (Biotech Center), which, when tasked with developing jobs in a specific, technology-intensive industry, took steps to combine economic development strategies and leverage the resulting sources of “productive friction” to achieve its development objectives (Stark 2009). This paper extends a multiyear study of North Carolina’s bioscience industry, combining archival materials and in-depth interviews with practitioners and industry executives. Before presenting the empirics of the case, we offer a longer discussion of established policy classifications in local economic development planning and their limitations for understanding sources of policy interaction and mutual reinforcement.

Catch a Wave and You're Sitting on Top of the World

Metaphors have long been used to categorize and inspire improvements to planning practice (Bingham and Mier 1993; Schön 1993). For economic development planning in particular, the metaphor of waves has dominated scholarly and practitioner discourse in recent decades (Blakely and Leigh 2009; Glasmeier 2000; Ross and Friedman 1990). Economic development scholars commonly use waves to signify changes to planning practices and priorities in the mid-1980s and again in mid-1990s—most notably, a move away from industrial recruitment and toward strengthening initiatives and partnerships that promote “home-grown” technologies and enterprises.

The concept of waves was first applied to local economic development planning in the United States in the early 1990s, inspired by Peter Eisinger’s detailed account of the economic development profession. While Eisinger did not explicitly use the term *wave* in his influential *The Rise of the Entrepreneurial State* (1988), he made the case for separating U.S. policy approaches into two distinct and well-defined camps. Eisinger described policies enacted before the mid-1980s as traditional and supply-side, given the main emphasis on recruiting outside companies and investors—that is, “established, potentially mobile capital” (Eisinger 1988:12). This approach contrasted with others adopted by state and local governments later in the 1980s, which he described as demand-side and entrepreneurial, with emphasis on new firm formation and the development and “nurturing of indigenous resources” (12). Eisinger ultimately positioned himself as a strong advocate of demand-side approaches, claiming that

they were not only a more efficient use of scarce public resources but also more accountable to local community needs and interests.

Numerous writings since Eisinger's seminal work have reinforced this perspective of one economic development strategy prevailing over previous approaches, echoing his criticism of industrial recruitment and his preference for policies that emphasize home-grown entrepreneurial activities. The concept of waves (also described as "orientations" or "phases" of development) has prevailed in scholarly and practitioner-oriented writings about economic development (Blakely and Leigh 2009; Glasmeier 2000; Hanley and Douglass 2014; Mathur 1999; Olberding 2002). Following Eisinger's lead, *first wave* policies describe those oriented toward external capital, whereas *second wave* approaches are "endogenous," or inward-looking, with a strong orientation toward local capital formation, indigenous technological development, and entrepreneurship.

Over time, new waves or phases have been added, though with internal disagreement over what constitutes a new phase of economic development policy. For example, some analysts have used the term *third wave* to capture new approaches to governance, such as increased reliance on public-private partnerships and private financing for state and local economic development (Glasmeier 2000; Ross and Friedman 1990). According to Andy Isserman, in the third wave, "emphasis [is] on how things are done, *not* on what is done" (1993, 78; emphasis added). Others have used *third wave* to categorize attempts by practitioners and their allies to move beyond the narrowly defined goals of competitiveness and innovation that dominated policy discourse in the 1990s (Malizia 1994) to include equity and sustainability principles as well (Blakely and Leigh 2009; Fitzgerald and Leigh 2002). While partnerships also

play a contributing role in promoting equity goals, this application of third wave offers a more forceful challenge to “trickle-down” perspectives, which presume that broad welfare gains naturally flow from stronger economic and business performance (Pike, Rodríguez-Pose, and Tomaney 2006, 2007). Instead, the equity perspective recognizes communities’ efforts to work through potentially competing development logics and conflicts in ways that allow policy interventions to promote shared prosperity (Campbell 1996). In recent years, the list of emergent waves has grown to include newer policy trends and targets, including inner-city revitalization and the promotion of industrial clusters (Glasmeier 2000; Hanley and Douglass 2014; Porter 1997).

Drawing lines of distinction between policy approaches has clear benefits (Isserman 1993). For starters, it enables scholars, including those active in educating future generations of development practitioners, to better situate applied practice within a broader theoretical context. In addition, these classifications allow scholars to trace the impact of influential and widely experienced economic and institutional transformations on local practice and policy priorities (Bingham and Mier 1993; Birch 1979; Imbroscio 1997; Ross and Friedman 1990). But what we potentially lose with these rigid classifications is an opportunity to identify the innovative ways that policy waves or phases act in relation to one another. Are we simply observing a prescribed policy sequence, as Eisinger initially proposed, that involves marked temporal shifts in priorities so that one approach becomes less popular than another and might even fade away? Or are we instead observing policy concurrence, and if so, do earlier approaches persist in their original form, or do they evolve over time and in light of their interactions with emergent policy priorities and targets?

Empirical analysis suggests that a process of simultaneity and adaptation is more common than a linear progression of clearly demarcated substitutes (Warner and Zheng 2013; Zheng and Warner 2010; Hanley and Douglass 2014), reinforcing Isserman's conclusion that economic development should be "viewed as *layers* of ... policy, not as alternatives" (1993, 89; emphasis added). This and related observations of policy concurrence, especially involving older, well-established policy traditions, have inspired a second round of scholarship that delves more deeply into specific policy areas to identify and draw out variation and adaptation in practice over time and space.

Industrial recruitment, which by many accounts is the oldest and most persistent form of state and local economic development practice (Cobb 1993), has received considerable attention. With this deeper dive, scholars have helped identify the conditions under which some states and localities (though not all) have implemented and sustained more tempered and more accountable forms of industrial recruitment (Lowe 2014; Lowe and Freyer forthcoming; Schunk and Woodward 2003). Much of this research has focused on improvements to the incentive-granting process that typically accompanies recruitment, whereby a state or community offers a cash subsidy or tax break to a company that chooses to locate (or retain) a facility within that jurisdiction (Warner and Zheng 2013; Weber 2007). This research points to steps communities can take to enhance their bargaining power during negotiations involving recruitment incentives, including adding performance requirements and related mechanisms to promote accountability and extend community benefits (Sullivan 2002).

Another thread of empirical analysis recognizes that incentives are rarely a major factor in firm-location decisions (Bartik 2005; Leroy 1997). Survey after survey reinforces this point,

indicating instead the relative importance firms place on quality infrastructure, workforce skills, local market strength, and other nonincentive factors. This realization has motivated some scholars to turn their attention to more strategic approaches to recruitment that enable communities to increase their influence over firm location. A rich example is Ann Markusen and Mia Gray's case study of Colorado Springs (1996), which highlights efforts by practitioners to "parlay" infrastructure, resources, and skills released with the closure of previously recruited electronics firms to attract new industrial targets, including telemarketing firms, international sporting events organizers, and religious nonprofits and book publishers. In this regard, earlier phases of industrial recruitment create a phoenix of sorts, the ashes of which support new rounds of targeted recruitment.

In a related example, agencies responsible for industrial recruitment in North Carolina have focused resources on industrial research to engage prospective investors well before they are in a position to open new production or research and development facilities (Lowe 2014). The goal is to first nurture an appreciation by firm executives of place-specific assets so that this knowledge can play a defining role after locational decisions are made. Such front-loaded efforts, which are designed to "mediate" state and local recruitment efforts, have also been linked to better economic outcomes, including higher rates of employment growth at both recruited and retained firms that have been shepherded through this process (Lester, Lowe, and Fryer 2014). Similarly, mediated recruitment deals have helped reduce the relative size of incentive offers by shifting the focus toward other regional advantages that have greater value to these firms.

Conceptualizing Economic Development Policy as an Instrument Set

We seek to push our understanding of policy innovation even further, not simply through deeper empirical analysis in one policy area but rather by stepping back to observe the feedback loops that emerge with policy “layering.” In particular, we are interested in mutual reinforcement across seemingly disconnected policy areas—that is, industrial recruitment and entrepreneurship. Important here are the intervening steps taken by practitioners to draw lessons, insights, and resources from one defined area of policy and apply them to another. Practitioners bring seemingly distinct tools and targets into greater alignment. Published accounts have hinted at the possibility for policy synergy to arise, especially when policy failure in one area (industry recruitment) frees up resources and staff time that can support a new generation of inward-looking policy approaches (Markusen and Schrock 2006; Schrank and Whitford 2009). Studies of targeted regional economic development have also noted the benefits of combining multiple strategies and tools to build out a targeted industrial sector or geographically concentrated cluster (Goetz, Deller, and Harris 2009). Yet even here, scholars tend to adhere to convention and characterize industrial recruitment as “second best” or inferior to strategies that promote indigenous capital and establishments. Industrial recruitment may be tolerated, but it is not actively encouraged. This viewpoint causes us to lose sight of complementarities—the potential for benefits, both offered and received—that can result when multiple policy approaches coexist and are actively encouraged to commingle.

To create conceptual space for this kind of institutional interaction, it is useful to relax the widely held assumption of resource scarcity and thus competition. It is often assumed that budget constraints at the state and local levels put industrial recruitment strategies in fierce

competition with entrepreneurial strategies. This assumption obscures the ways that industrial recruitment can both influence and be influenced by concurrently enacted entrepreneurial and indigenous technology development. Extending this logic, recruitment is believed to garner more political support and resources from job-hungry mayors and governors, thus threatening to crowd out other policy applications and targets (Markusen and Nesse 2007; Rubin 1988). Critics often use this line of reasoning to explain the stubborn persistence of industrial recruitment. The story is that as elected officials pursue the more immediate political gains that stem from high-visibility ribbon cutting events, they maintain strong support for recruitment even in the face of evidence that it may be implemented in counterproductive ways (Turner 2003).

Moving past this perspective requires first recognizing that policy decisions often involve more than a simple selection of discrete alternatives whereby resources must be assigned to one activity or the other. This view of competing uses has long dominated discourse in economic development planning—and the entire planning profession, for that matter—and intentionally or not reinforces certain policy targets and priorities. This approach has value insofar as it draws our attention to potential trade-offs and conflicts that might be overlooked when viewing multiple policies through an overly optimistic lens that treats them as inherently complementary (Malizia 1994). However, this approach also misses the opportunity to encourage practitioners to engage sources of policy conflict in ways that can result in consensus building and in turn motivate a search for new solutions (and resources) that bring together multiple players and perspectives to achieve common ground (Campbell 1996; Lester and Piore 2004).

Ethnographer David Stark provides a conceptual bridge to get us from a place of conflict to common ground. He argues that “productive friction” involves disruptions to “organizational taken-for-granted, generates new knowledge and makes possible redefinition, redeployment and recombination of resources” (2009, 19). While Stark applies this concept to decision making within firms, it is also relevant to other types of organizations and institutional settings. Stark considers how organizations solve problems when standard policies are inadequate—similar to the way many communities face crises of decline in both the number and quality of jobs without clear policy prescriptions.

Nelson and Sampat (2001) extend this logic by categorizing certain forms of knowledge as “social technologies.” They recognize that even within an organization, knowledge is divided and widely distributed among individuals and groups. Social technologies become tools for coordinating and promoting innovative processes. This know-how is associated with the structure of the division of labor and the procedures for task coordination and management within an organization.

These concepts combine to contribute to an alternative framework that moves beyond the standard winner-take-all or wave view of policy competition. The alternative framework recognizes that “friction between rivaling practices ... increases the rate of [policy] mutation” by allowing actors to “break out of the lock-in of habituated, unreflective activity” (Stark 2009, 18–19). In other words, the dissonance or friction that can arise when development agencies attempt to support multiple economic targets can seed new forms of knowledge and especially new “evaluative frameworks” through which to assess these emergent practices and their effects.

As Stark (2009) also notes, this outcome is far from automatic and instead requires considering the conditions under which dissonance or friction leads to organizational innovation. Stark argues that new forms of knowledge and practice are unlikely to take hold without space in which ideas or competing policies can interact. Rather, new knowledge and practice result when organizations strive to create a more equitable balance between potentially rival ideas and in turn move away from established hierarchies that favor one approach over another.

The world of local economic development planning offers increasing opportunities to apply this framework. New research in the United States points to a return to industrial recruitment in the wake of the Great Recession, reversing an earlier trend in which municipalities and counties shifted their focus toward supporting “home-grown” establishments and technologies (Warner and Zheng 2013). The traditional lens of competing policy alternatives raises the possibility that renewed interest in industrial recruitment could eventually undermine previous commitments to entrepreneurship. If we instead present this as a moment for harnessing productive friction, we can introduce a different set of analytical queries: How might practitioners better navigate and balance these multiple objectives and targets? How might they parlay commitments to entrepreneurship into productive resources for enhancing contemporary approaches to industrial recruitment, and vice versa? What organizational approaches will encourage practitioners to embrace and work through potential sources of friction and in the process use this moment of policy layering as a means to generate new and improved forms of practice? Using these as our motivating questions, we turn to the

details of our case study of the North Carolina Biotechnology Center as an organization tasked with developing an industry.

Empirical Setting: The North Carolina Biotechnology Center

The North Carolina Biotechnology Center was established in 1981 following recommendations by the state's Board of Science and Technology. As the nation's first state-funded bioscience agency, the new organization focused on economic development from Day one. In the 1980s, biotech was a new technology with uncertain outcomes, and few blueprints existed. Entrepreneurial biotech firms had undertaken successful initial public offerings in California (Amgen and Genentech) and Massachusetts (Biogen). Large pharmaceutical firms signaled their intention to align their research with the new biotechnology, suggesting opportunities for industrial recruitment.

The North Carolina Biotechnology Center was the first dedicated, industry-specific economic development entity in the United States. While most economic development activity starts with state or local economic development agencies, the Center was created by state officials as a quasi-public 501(c)(3) organization with a specific mission to develop the nascent biotech industry.

Staff at the Center recognized that economic development based on an emerging technology was a long-term endeavor that could take years if not decades to unfold. They codified this perspective in the Center's first annual report (1984-1985), "anticipating, defining and planning for new opportunities on the cutting edge of biotechnology." Building from this foundation, the Center's outlined two principal economic development tasks in that same

report : *first* to ensure that “North Carolina benefits from the predicted economic return on biotechnology, and *second* to encourage statewide economic development through exploitation of research and commercialization in biotechnology.”. Center staff painted economic development with a broad brush, thereby supporting a range of innovative strategies for managing and combining multiple objectives and targets. Staff focused primarily on bolstering the state’s well-established universities and research institutions, which received the lion’s share of the Center’s early funding.

Since its genesis in the early 1980s, the Center has tightly coupled support for home-grown entrepreneurial firms and technologies with activities oriented toward attracting outside firms. Since the early 2000s, the Center has more tightly connected these activities, in keeping with a state mandate to combine innovation and employment-creation goals. The Center’s overarching commitment to strengthening research and educational infrastructure supports both economic development targets. However, this case illustrates more than just a simple balancing act. It also provides an example of mutual reinforcement whereby economic development practitioners draw lessons, insights, and resources from separate defined areas of policy and apply them to each another, thereby challenging the standard view that regional economic development involves a linear succession of independent policy approaches, or waves. The Center thus provides a potential road map for other places wishing to bring seemingly distinct development tools and targets into closer alignment.

Institution Building

The North Carolina Biotechnology Center intentionally positioned itself as an *enabling* organization, channeling initial support to public and private universities and research institutions. As in the Center's first published annual report stressed, "Each institution across the State identifies its own priorities and implements them to the extent possible. The intent of the Center is *not to duplicate but to complement* these activities through its programs and grants." The decision to complement rather than duplicate university activities was itself informed by a prior conflict that arose between research universities and the Microelectronics Center of North Carolina (MCNC) (Feldman and Lowe 2011). MCNC, another state-funded economic development agency created in the early 1980s, was perceived as directly competing with regional universities for external research grants and funding and eventually lost support from the General Assembly, including a sizable budget allocation, as a result of its strained relationship with university faculty and administrators.

With institutional development as its early focus, the Biotech Center first created a comprehensive database of bioscience research capabilities throughout the state's public and private universities and research laboratories. While this information was eventually made available to individuals and organizations interested in investing in or servicing bioscience firms, the main objective was to identify gaps in specialized knowledge and expertise so that the Center could work to fill them through targeted faculty recruitment. Armed with this information, the Center initiated a program in the mid-1980s that provided universities with substantial salary matches to help recruit eminent scholars to the state. Over the decades, the Center has helped recruit forty-two prominent bioscience scholars to North Carolina, most notably Oliver Smithies, who in 1987 joined the University of North Carolina at Chapel Hill as

one of eight senior faculty in a new formalized microbiology department; in 2007, he was a corecipient of the Nobel Prize for Physiology or Medicine.

The Biotech Center initially invested heavily in basic research activities. For example, the Center was directly involved in the creation of two interinstitutional research programs, the Monoclonal Lymphocyte Technology Center and the Biomolecular Engineering and Materials Application Center. Both facilities included research faculty from Duke, UNC–Chapel Hill, and North Carolina State University. In addition, the Biotech Center provided direct support for faculty-led projects, research seminars, and visiting scholarships. Faculty and postgraduate researchers at various North Carolina–based universities secured a total of three hundred thousand dollars in funding from the Biotech Center in 1985, money that helped to seed thirty-two new bioscience-related projects involving researchers from eight of the state’s institutions.

While prioritizing institutional development as an essential first step in supporting North Carolina’s bioscience industry, the Center also phased in support for business development. This support took the form not only of in-kind activities, including information sharing, interorganizational networking, and small-firm mentoring, but also of collaborations with universities to facilitate industry partnerships, including providing matching funding for corporate-sponsored university-based research. In addition, universities received funding from the Center to host visiting researchers from prominent chemical and pharmaceutical firms, further strengthening university-industry collaboration. In 1984–1985, industry scientists visited from Pennsylvania’s Smith Kline Beecham, Japan’s Takeda Chemical Industries, Minnesota’s Molecular Genetics, and Wisconsin’s Agrigenetics Advanced Research Labs.

Smaller entrepreneurial firms also benefited from assistance in the formative years of the Biotech Center, though rarely with direct funding. In fact, only one out of thirty-two small competitive grants awarded in 1985 went to a home-grown bioscience firm—the state’s first bioscience company, Greer Labs, founded in the 1930s in western North Carolina to manufacture herbal elixirs. Prior to 1987, the Center instead focused on connecting entrepreneurial establishments to venture capitalists and other investors. The Center also provided technical assistance to entrepreneurial companies, often drawing on their extensive academic and research networks. Emphasizing this mediating role, the Biotech Center described itself in the 1984-1985 annual report as “an informational ‘nerve center’” and “a contact point for firms seeking expertise in areas of biotechnology.”

Focus on Business Development

Today, the Biotech Center is far more intentional and direct in its support of business development. While continuing to invest heavily in research institutions and universities, it has greatly expanded its programmatic support to include a range of financing tools and technical assistance designed to meet the diverse and changing needs of bioscience businesses at every stage of development from nascent start-up to mature, vertically integrated Big Pharma and increasingly to firms in between. In fiscal year 2013, almost \$3 million (26 percent of the Center’s annual award budget of \$10.7 million) was allocated to direct business financing in the form of loans and fellowships (NCBC 2014). According to one of its vice presidents, the Center has positioned itself as a “one-stop” shop, “providing a continuum of resources for firms to grow.” (Bullock 2013). In this capacity, it mixes and matches expertise, funding, and technical

assistance to reflect companies' specific growth challenges and needs. The goal is to encourage firm founders and executives to maintain strong relationships with the Center throughout the phases of organizational development.

This ability to customize support to the temporal needs of bioscience firms partly reflects the Center's specialized sector knowledge. Staff at the center are seasoned bioscience industry experts, many of them with years of experience as bench scientists or bioscience experts with investment banks or life science companies. They consequently understand the subtleties of the development cycle of bioscience firms and can anticipate changing needs. Center staff not only work to create a logical sequence of services and supports but also analyze developmental phases to determine what new services are needed for firms that straddle standard organizational classifications.

Still, supporting firms over time and through multiple iterations is neither without conflict or constraint nor automatic. Rather, it entails an ongoing commitment by Center staff members to cross established economic development boundaries and work together to identify and resolve emergent conflicts—both internal and external—to knit together resources and knowledge in novel and innovative ways. Adapting Stark's core concept, Biotech Center staff members harness these challenges as sources of productive friction that ultimately allow the support of a wider spectrum of firms.

This process can be seen in the steps taken by the Center to deepen internal support both to entrepreneurial bioscience start-ups, many with links to prominent research universities, and to large multijurisdictional pharmaceutical manufacturers, most of which had been recruited to the state over the previous four decades. In isolation, the two groups

represent opposite targets of state economic development—home-grown start-ups and recruited industry giants and anchors. Over the decades, the Center has not only intensified its commitment—in resources, staff time, and program development—to both types of establishments but also created an environment that encourages staff to align and connect these strengths to recruit, retain, and further nurture firms somewhere in the murky middle. New targets now include entrepreneurial firms that are internalizing manufacturing, midstage bioscience firms on the cusp of revenue generation, and early-stage bioscience firms that are willing to relocate to North Carolina to secure additional financing.

The Entrepreneurial Push

Support for bioscience entrepreneurship involves assessing risk and, more specifically, evaluating the commercialization potential of prerevenue technologies. The Biotech Center has eased into that role over the past three decades. Before 1988, the Center offered a limited amount of direct financing in the form of research grants to a select number of entrepreneurial firms via its institutional granting initiatives. During fiscal year 1986–1987, the Center increased this support, offering grants to eleven entrepreneurial firms. According to the Center’s 1986-87 annual report, the largest grantee in that funding round was Embrex, a spin-off from North Carolina State University that received \$138,000 to develop a new poultry vaccine.¹

In 1988, the Biotech Center scaled up its support for entrepreneurial ventures, creating the dedicated Economic and Corporate Development Division, described in the 1988 annual report as assisting “North Carolina’s entrepreneurs and companies in addressing these

¹ In 2007, Embrex was acquired by Pfizer in a deal that maintained Embrex’s original production facility in Scotland County and resulted in Pfizer establishing a North Carolina–based global headquarters for animal health.

opportunities” and to encourage “their growth and development.” The new division extended earlier efforts to promote technology commercialization through information sharing, networking, and grant making as well as offered an additional funding mechanism in the form of low-interest loans to support basic research and early commercialization activities. In 1989, the first year the Center provided small-business loans, it provided a total of \$360,000 to three entrepreneurial start-ups.

The Center’s loan program has subsequently expanded, replacing entirely any direct grant support to private businesses. Through the Business and Technology Development Group, the Biotech Center now supports three types of business loans. Company Inception Loans (up to \$50,000) support business activities that the Center’s describes on its loan website as “critical to the early-stage start-up of a company.” Small Business Research Loans (up to \$250,000) support applied research that contributes to the development of commercialized products or processes. And Strategic Growth Loans match angel or venture capital investments for entrepreneurial firms that have cleared the technical proof-of-concept phase and require additional funding for business development. Between 1989 and 2011, the Center offered close to 160 loans to 110 distinct business establishments totaling more than eighteen million dollars (NCBC 2014). Approximately 30 percent of firms in the Center’s loan portfolio have received more than one loan type (Ginsberg 2013). Loans are initially approved with the expectation of repayment within three years. However, Center loans may be extended for a second three-year period if companies provide evidence of progress and pay a fee.

A team of six full-time Center staff members reviews loan applications. Team members have prior experience with financial due diligence, some as employees of bioscience research or

investment firms. External experts in relevant scientific or technology fields review loan requests above seventy-five thousand dollars. The approval process starts with a meeting or phone exchange with a team member from the Biotech Center to determine whether a firm is eligible to submit a preapplication. At this phase, the company is required to outline its management, technology, proposed project, and budget. As part of a recently added eligibility requirement, companies requesting loans must first provide evidence that at least one member of the executive team resides in North Carolina and devotes the majority of his or her time to the applying company, a condition instituted in response to Center staff members' concerns that early stage companies had lower commercialization success when all members of the executive team were juggling other work demands and were not fully committed to the applying company.

Submissions that advance to full applications are assessed on many criteria, including proof of concept behind the technology; market opportunity; level of competition and barriers to entry (including intellectual property); impact on North Carolina and North Carolinians; strength and commitment of the management team; importance of the loan funding to the growth of the program; and likelihood of successful product development. In fiscal year 2013, the Biotech Center received 79 loan inquiries but approved only 18 loans (Ginsberg 2013). This selectivity has resulted in high returns on investment. Notes Peter Ginsberg, vice president of the division that manages the loan program, "For every dollar that we have loaned to companies, those companies have subsequently attracted \$118 in external funding from venture capital firms, big pharma, foundation, angel investors, federal grants, or IPOs" (Ginsberg 2013). In addition, companies receiving loan support have launched thirty distinct

life science products. The center also values job creation, which is included in program performance metrics.

Other U.S. state and regional agencies have established loan programs in support of early stage bioscience companies. However, the North Carolina Biotech Center maintains one of the most extensive state-funded bioscience loan programs in terms of lending capacity and a high degree of coupling with technical and networking assistance. Members of the Business and Technology Division work closely to help firms secure external financing, efforts that include organizing regular trips to meet with venture capitalists outside of North Carolina and angel investor meetings during which life science companies based in the state make presentations to investment groups. The Center also helps make connections to other strategic partners such as multinational life science companies. According to a recent Biotech Center report, “In fiscal year 2013 alone, loan evaluation team members were responsible for 316 company-investor introductions, 85 foundation introductions and 161 partner introductions” (NCBC 2014). And the Center provides this type of assistance to firms that do not apply for loans or that fail to receive loans from the Center, improving their opportunities for later financing success. According to Ginsberg, “We say no more often than we say yes. However, if a company does not get approved for a loan, we will help that company attain certain milestones so that the company in the future might receive one” (Ginsberg 2013).

Recruitment as a Complement

While entrepreneurial supports have primarily centered on technology commercialization, the Center’s foray into industry recruitment was initially driven by an

explicit desire to promote large-scale job creation. In the 1980s and 1990s, particular emphasis was placed on creating jobs for individuals with four-year academic or advanced degrees. And in this regard, the Center's early support for industrial recruitment aligned most closely with the state government's ongoing efforts to lure prominent multinationals to keep scientific and engineering talent in North Carolina. The most prominent example of this strategy is Research Triangle Park, which was established in 1958 to create quality job opportunities for graduates of the state's preeminent research universities (Link 1995; Rohe 2012).

Over time, the Center has expanded its industrial recruitment efforts to extend employment opportunities to a more diverse set of North Carolina residents, including less educated job seekers (Lowe 2007). Most crucial are growing areas of biopharmaceutical manufacturing that can employ those displaced from traditional industries that have experienced steady job losses—textiles, tobacco processing, and microelectronics, among others. Recruitment efforts consequently have broadened to focus not only on scientific and engineering occupations but also those in shop-floor production, machining, and quality assurance positions. The Center's 2004 strategic plan ranked industrial recruitment in biopharmaceutical manufacturing as a top-priority target, alongside continued support for bioscience firm formation. In addition, the Center increased its efforts to strengthen the state's workforce development infrastructure to facilitate skill transference across manufacturing industries (Lowe, Goldstein, and Donegan 2011).

Prior to 2001, industrial recruitment efforts involving the Biotech Center were mostly ad hoc and reactive insofar as Center staff stepped in *after* receiving requests for information or

assistance from out-of-state bioscience firms or from economic developers in the state's Department of Commerce. Under this arrangement, the Center's main task was assembling teams of knowledgeable scientists who could speak to the quality of the local talent pool and strength of institutional supports for bioscience research and development. Rarely did the Center take a proactive stance, actively marketing the state by reaching out to firms, a task that had long been the professional terrain of North Carolina's Department of Commerce.

In 2001, however, the Center, in partnership with the Department of Commerce, created an in-house recruitment position. The department recognized the value of harnessing the Biotech Center's deep knowledge of bioscience industry development for marketing and recruiting purposes. By establishing a dedicated recruiter position, the Center could identify and engage bioscience firms well before they needed to establish manufacturing facilities. In 2007, the Center made additional resources available to support recruitment-oriented activities, resulting in the formation of an Industrial Development team whose primary responsibility remains business retention and recruitment.

The Center's approach to bioscience recruitment is strategic and tempered (Lowe 2014; Lowe and Freyer forthcoming). Center staff use three interrelated strategies to help increase the staying power of relocated firms. First, the Center draws heavily on its national and international bioscience networks to gather and update information on bioscience firms that may be in need of new manufacturing facilities. The Industrial Development team can thus establish contact with influential executives and scientific leaders early in the development process to establish North Carolina as a front-runner for a new facility. Second, the Center

provides an educational resource for communities interested in recruiting bioscience manufacturing firms. Center representatives meet regularly with local economic development practitioners throughout the state and help them understand the specific needs of biomanufacturers. Center staff have also worked closely with the North Carolina Department of Commerce to help communities interested in submitting applications in response to requests for information from bioscience firms or site location specialists. Such outreach efforts are iterative and ongoing, and they ultimately ensure that local practitioners remain focused on promoting regional labor market and institutional strengths and avoid the temptation to compete narrowly on the basis of excessive local incentives. Finally, the Center helps ensure that key institutions are up-front partners during the high-stakes and time-sensitive deal-making phase of industry recruitment, another point at which local and state incentive offers can get out of hand. Most notably, the Center ensures that representatives from state universities and community colleges are involved in these discussions early on, thus helping reinforce bioscience talent and training as top locational advantages for North Carolina. The Center also works to include human resource executives from previously recruited firms to speak to these strengths.

Since 2008, the Industrial Development team has worked on thirty-one successful recruitment and retention projects, generating a net gain of twenty-three hundred jobs for North Carolina. A sizable share of these projects has involved large-scale, multinational biopharmaceutical manufacturers, among them Novartis, Merck, and Novozymes. However, efforts are under way to cast a wider net that will enable the recruitment and retention of earlier-stage firms that display high growth potential.

Innovating at the Intersections

The Biotech Center has simultaneously pursued activities at both ends of the economic development spectrum. In its formative years, the Center combined these activities under the same directive in an effort to support private business development. However, they have now parted ways, with each subject to its own internal division management, metrics, and budget allocation. Recent cuts to the Center's budget, including a significant decline in state funding since 2011, have the potential to create unproductive forms of competition by pitting one group of specialists against another in an internal fight over scarce resources and institutional allegiance. Instead, however, employees of the two divisions have strengthened their cooperation in a way that combines deep professional knowledge in their respective areas of economic development to better identify and target previously underserved areas of the bioscience business community.

Practitioners engaged in the effort see it as a natural coupling and logical fit. In essence, it reflects the Center's long-standing objective of supporting firms along the entire bioscience continuum. But presenting their cooperation as an obvious fit potentially obscures the organizational and institutional struggles and innovative solutions that are in play here and that reflect staff members' ability to use moments of productive friction as opportunities to develop cooperative strategies and services. Leaders from the Center's entrepreneurial and recruitment-retention divisions first had to convince influential individuals both within and outside the organization of the need to extend coverage to firms that did not fit neatly within

one economic development area or the other. Staff also advocated on behalf of the creation of a new, community-oriented funding source that did not depend on standard business development metrics such as revenue generation.

Key beneficiaries of this partnership are clinical and midstage bioscience firms, including those initially incubated in other states, that are on the cusp of revenue generation and/or are anticipating sizable job growth. Several firms from this category have contacted the Biotech Center in hopes of securing additional financing to support business development, but most have been unable to secure Biotech Center loans, either because they were initially based outside of North Carolina or because they had matured just beyond the loan program's primary target group.

Heat Biologics, a 2008 University of Miami spin-off focused on immunotherapeutics for lung and bladder cancer, fell into the first category as a consequence of its South Florida location. In 2010, company executives began searching for an alternative location with a deeper scientific and clinical talent pool that could support company growth. Their recruitment to North Carolina provided an early test case for internal collaboration between members of the industrial recruitment and entrepreneurial teams.

At the time, the company had only a handful of employees. However, with FDA approval to initiate clinical trials for a new immunotherapy product, officials anticipated that they would need to hire additional scientists and support staff and were looking to move their operations. Members of the Biotech Center's industrial recruitment team established contact with Heat Biologics to share information on regional labor market and research strengths. The members

of the Industrial Development team had long been accustomed to making this marketing pitch to multinational biopharmaceutical firms that requested such labor market data but knew much less about the specifics of the Center's entrepreneurial loan program requirements and the extent of technical and networking assistance available for similar clinical-stage firms. Members of the entrepreneurial team, including some with knowledge of the field of cancer vaccines, were therefore invited to participate in this recruitment project. Meetings and informational exchanges were closely coordinated and often involved representatives from both groups.

This collaboration quickly paid off. Heat Biologics opted to move its management team to North Carolina in July 2011, and its entire research division followed in 2014. Company leaders selected the Research Triangle over other well-established bioscience regions in New York, Massachusetts, and California. Stated Heat Biologics CEO Jeff Wolf, "We wanted something in somewhat close proximity to where the research is in Miami. We were looking at talent. We were looking at cost of living. We were looking at a place ... we could recruit people to" (Dalesio 2013). Members of both the entrepreneurial and recruitment teams helped secure temporary workspace for the company CEO at the Biotech Center's Research Triangle Park facility and subsequently helped the firm negotiate its first lease at a commercial building on the Durham–Chapel Hill border. Shortly after moving to North Carolina, Heat Biologics applied for and received a \$250,000 loan from the Center to cover clinical trial expenses. The Biotech Center's entrepreneurial team then included Heat Biologics in meetings with venture capital groups in the Bay Area and Boston in 2011 and 2012. Subsequent bank funding enabled Heat Biologics to pay off the Biotech Center loan within a year, and the Durham-based company is

now publicly traded and employs twelve full-time workers, most hired locally, as it conducts Phase 2 trials.

The Center's entrepreneurship-recruitment partnership further deepened through a 2011 recruitment project involving Sequenom, a midstage molecular diagnostics firm based in San Diego, California. In this case, the company was looking to establish an East Coast diagnostics facility to support its recent launch of an alternative blood test for Down syndrome. Most notably, the Sequenom project revealed constraints within the established incentive-granting protocol; members of the two teams then devised innovative solutions that eventually resolved those issues.

Under the state's Jobs Development and Investment Grant program (JDIG), incentives for recruitment are granted on a case-by-case basis, usually to firms that have established track records of generating revenue. Sequenom, however, was still at the prerevenue stage when it began considering North Carolina for its new facility, complicating the evaluation efforts of staff at the Department of Commerce (North Carolina's incentive-granting authority). Furthermore, the company's diagnostic tool did not require FDA approval, which removed another established metric for evaluating potential success.

Given their long-standing relationship with staff at the Department of Commerce, members of the Center's recruitment team were asked for advice during the incentive-granting review process. The recruitment team, in turn, sought assistance from members of the entrepreneurial team in evaluating the terms of the deal. According to Bill Bullock, vice president of the Biotech Center's recruitment and retention division, members of both the

recruitment and entrepreneurial teams “could work with the state to provide them with an evaluation of what we thought the risk-benefit of this project was [and] even work with the state to modify existing [incentive] programs to accommodate some of the risk of the project” (Bullock 2013). The end result was a novel arrangement that focused attention away from revenue generation and toward market capitalization—more specifically, total financing in the bank relative to the company’s annual burn rate (the amount of its cash reserves from various investors used each year). In their exchanges with Commerce, members of the entrepreneurial team especially stressed the significance of Sequenom’s large cash reserve (\$220 million). Based on the presence of this reserve and staff members’ determination of the high market demand for a noninvasive blood test that identifies Down syndrome, the entrepreneurial team recommended that Commerce award the firm an incentive for the proposed diagnostic facility. Team members also advised adding a new clawback mechanism to the contract to mitigate against potential loss of state revenue: until profitable, Sequenom should be required to keep a sufficient cash reserve to cover at least two years’ worth of burn rate. If the cash reserve were to drop below this amount, Sequenom would no longer qualify for state or local incentives. As a result of this customized recruitment effort, which included a generous nine-year JDIG grant totaling \$2.3 million, Sequenom selected Durham over Dallas, Texas, for the new facility. As of November 2014, the company was on target to meet its goal of creating 240 jobs.

In 2012, with the Sequenom deal complete, the entrepreneurial-recruitment partnership turned to its next challenge—advocating for an in-house incentive program that could institutionalize Biotech Center support for recruiting development-stage firms. But staff from both teams also sought an incentive tool that could help North Carolina communities

retain home-grown entrepreneurial establishments. At the same time that the Biotech Center was recognizing the recruitment possibilities for firms in the middle of the bioscience spectrum, economic developers in other states—particularly those with more robust venture capital markets—were seeking to lure away midstage firms already in North Carolina by promising additional financing. Roughly a dozen clinical-stage bioscience firms, many of which had received extensive early Biotech Center support, left North Carolina between 2005 and 2014. As Bullock notes, “It is incredibly hard work to take a piece of science and create a company, and nurture it along, get it started and then to grow. But if you get them to twelve [employees], which is incredibly difficult, and then they want to grow from twelve to fifty, you have to find a way to capture that growth. If not, you are not getting an adequate return on investment” (Bullock 2013). Echoes Ginsberg, “Wouldn’t it be a waste if a company was about to go from ten to seventy-five people and they do that somewhere else? Without [the recruitment-retention] group, there would be no mechanism to keep them here once we have done all the dirty work.... And that is the phase where they start looking very attractive to other states” (Ginsberg 2013).

In proposing a new incentive program to address this poaching, members of the entrepreneurial and recruitment-retention teams sparked an internal debate with other staff and executives over whether the Center should take on this role. According to Bill Bullock, “There are a lot of opinions on incentives.... Did the Center want to even have the perception that we were now giving them? There was a philosophical difference, where I don’t think anyone has any philosophical issue with us offering loans to start-up companies” (Bullock 2013). Members of the entrepreneurial and recruitment-retention teams worked together to

craft a program that would address these underlying concerns, ultimately proposing a new kind of recruitment-retention tool that took into account the Center's tradition of community outreach. The incentive is allocated to the community rather than directly to the company. Bullock explains, "The ultimate thinking was that [granting incentives] is not a bad thing to do, but let's be very responsible in how we structure it. And in the end it was a win-win. We got to a conclusion that the way we want this to work would be better if we gave it to a community rather than if we gave it to a company. And this was more in line historically with what we at the Center have always done" (Bullock 2013). In making this incentive program community-focused, the recruitment-retention team created a vehicle for engaging local economic developers in a learning exchange to help them better understand the complexities of the bioscience industry. As Bullock relates, this approach enabled staff at the Biotech Center to "educate people about what the science is, what the business model is, to help them answer the question, Should we support this?" (Bullock 2013).

The North Carolina Biotechnology Center Economic Development Award now enables counties and municipalities to meet any required local match to an incentive offer made at the state level by the North Carolina Department of Commerce. Capped at one hundred thousand dollars per year for a single company, the award is modeled on existing state incentive programs and is therefore performance-based, meaning that the community can obtain funding only after the company has met job-creation (or -retention) goals. However, unlike existing state incentive programs that prioritize rural development, the Economic Development Award is not geographically restricted or tiered, thereby enabling urban municipalities to qualify for full funding support. Between 2012 and 2015, the Biotech Center awarded around a half dozen

North Carolina communities (among them Durham, Guilford and Pitt Counties, and the town of Morrisville) incentives to support recruitment and retention of specified midstage bioscience firms.

Since 2013, members of the entrepreneurial and recruitment-retention teams have turned their attention back to the state government, this time working together to convince members of the General Assembly to provide continued funding for the Biotech Center. Here, too, they find additional opportunities for innovative partnering. As Bullock notes, “I am not sure there is a full appreciation of the gaps in the [North Carolina] marketplace in terms of supporting” midstage bioscience companies. He continues, “We need to keep thinking about that” (Bullock 2013). Concurrs Ginsberg, “That is an area for growth for our state” (Ginsberg 2013). Perhaps it is also an area for leveraging new sources of productive friction.

The Toolkit View

As currently applied to economic development policy, the metaphor of waves has helped numerous students and scholars differentiate between and compare strategies and tools. But we have missed an altogether different application: the potential use of waves as a conceptual tool for uncovering overlapping approaches to policy and for better understanding the effects of collaborative forms of learning and innovation that can take hold at the interstices and intersections of practice. In this regard, we might draw inspiration from how the physical sciences understand waves. Waves are not independent but rather are recognized as spaces of intersection, making it difficult to determine where one wave begins and another

ends. Physical scientists present waves as fluid entities containing transient particles and elements that move across porous and flexible boundaries. The materials that make up one wave contribute to and are recombined to form the next. Viewing economic planning through this alternative metaphorical lens frees us from overcompartmentalization of policy and gives us a better framework for recognizing and interpreting opportunities for blended approaches that combine multiple tasks and targets.

The case study of North Carolina's Biotechnology Center thus demonstrates the value of interaction between seemingly disconnected areas of economic development. Recruitment and entrepreneurship are often cast as rival strategies in competition for scarce local resources and policy attention. Pike and his collaborators have helped to challenge this narrow perspective, initially by demonstrating the possibility that local economic developers can leverage recruitment, even of large-sized multinationals, to support "indigenous" entrepreneurship through locally coordinated logistics and supply chain management (Pike, Rodríguez-Pose, and Tomaney 2006). We extend this work by considering the melding of knowledge, resources, and people across areas of practice that on the surface might appear to be in conflict or discord.

In proposing to break the waves, we do not seek simply to offer a new policy classification or phase. Nor are we attempting to justify all forms of industrial recruitment and the related granting of incentives. Rather, our central purpose is to draw attention to the interstices of economic development practices and explore the possibility that practitioners can work collaboratively within these spaces to promote policy innovation and improvement.

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