March 28, 2012

Human-capital-centred Regionalism in Economic Development: A Case of Analytics Outpacing Institutions?

Laura Wolf-Powers, University of Pennsylvania

Available at: https://works.bepress.com/laura_wolf_powers/16/
Human-capital-centred Regionalism in Economic Development: A Case of Analytics Outpacing Institutions?

Laura Wolf-Powers

[Paper first received, July 2011; in final form, January 2012]

Abstract

Drawing on the case of the Delaware Valley Innovation Network, a regional consortium funded under the US Department of Labor, the paper argues that sophisticated analytical tools developed to facilitate workforce- and occupation-led economic development are running ahead of the institution-building required to put new approaches into practice. There are two main reasons for this. First, tensions persist around the role of the public-sector workforce system in regional development initiatives. Secondly, regional stakeholders disagree about whether ‘knowledge economy’ investments should include the training of manufacturing, transport and logistics workers. The documentation of regional occupational specialisations, ‘talent gap’ analyses and the clarification of career pathways are crucial components of human-capital-centred regionalism in economic development. However, best analytical practices are of little use without the institutional capacity to translate analysis into coherent, effective policy.

Parallelling a reassertion of regionalist thinking in economic development policy in the 2000s has been an increased emphasis on human capital as a source of innovation and competitive advantage. As a result, human capital has become a focus of economic development analysis and policy. Scholars, many of them funded by the US Economic Development Administration, have developed empirical techniques for investigating regions’ occupational profiles and have proposed ways in which knowledge about human capital can be used to devise smarter growth strategies. While scholars and practitioners advocate regionally implemented policy efforts that rest on developing human capital, actual instances of such efforts remain underinvestigated. In the context of human-capital-centred regional economic development,
development, how do analytics inform practice? I investigate this question with reference to the case of Greater Philadelphia, where between 2006 and 2010, workforce and economic development actors undertook a regional human-capital-centred development effort pertaining to the area’s leading ‘knowledge economy’ industry: life sciences. The Delaware Valley Innovation Network, begun by a Philadelphia-based economic development non-profit organisation dedicated to attracting professionals to the region and sparking the growth of innovative businesses, received a $5.1 million grant from the US Department of Labor’s Workforce Innovation in Regional Development (WIRED) Initiative (US Department of Labor, 2007/2010). Over four years, a governing body populated with representatives of industry, state and local economic development officials, and local (but US DOL-funded) workforce boards oversaw a multifaceted effort to understand the region through the lens of a major industry cluster and to act on the knowledge gained in the interest of talent-driven economic growth.

While the Delaware Valley Innovation Network produced a wealth of data, disseminated more than $3 million in training funds, and built relationships and skills among partners, this case suggests that the tools developed to facilitate workforce- and occupation-led economic development are running ahead of the institution-building required to put regional strategies into practice. Regional human capital development efforts invariably begin with analysis: documentation of regional occupational specialisations, supply/demand and ‘talent gap’ studies, and maps of career pathways. In this paradigmatic case, however, best analytical practices were of little use when collective efforts to translate analysis into coherent, effective policy broke down. This finding raises questions about both the implementing capacity of regional economic development partnerships and the goals of human-capital-centred regional policy.

Methodological Approach

This article uses a single, paradigmatic case to provide insight into the implementation of regional economic development partnerships centred on human capital assets. As will become clear in the next section, most of the literature in this area focuses on analytical techniques that produce actionable knowledge (Feser, 2003; Markusen, 2004). Following a methodological path endorsed by Barzelay (1993) and Flyvberg (2001), I have selected a single factual context as the subject for an inquiry into what occurs when leaders charged with implementing regional initiatives apply analysts’ empirical findings within a context-specific realm of action.

The DVIN case is paradigmatic in the context of the research question for two main reasons. Partnership members were using a talent strategy to strengthen and grow a key ‘knowledge sector’—life sciences—in a region where this sector, once prosperous, had begun to trail peer regions on key indicators of innovation and growth. This is the type of context in which a successful human capital strategy is considered pivotal to sectoral rejuvenation. Secondly, the research conducted in the early stages of the grant period aligned with best practices, producing actionable knowledge that it became the partnership’s responsibility to implement. To interpret the case through the lens of my research question, I relied on several types of data. For contextual knowledge, I reviewed documentation about the goals and outcomes of the WIRED initiative produced by the Department of Labor and on interviews with DOL representatives. I interviewed
DVIN Executive Board members and other workforce and economic development professionals familiar with the project. Finally, I relied on official studies, reports and newsletters generated by DVIN over the course of the project, and especially on its final report, entitled *Building the region’s life science talent together* (DVIN, 2010).

In the sections that follow, I first review the literature proposing and testing techniques to enable economic development policy-makers to pursue the ‘talent imperative’. I then describe the life sciences industry in the Delaware Valley region—which forms the backdrop for the case—and the formation of the DVIN. After elucidating the analytical project in which the partnership engaged, I identify four factors that made it difficult for its leaders to translate their findings into a cohesive programme for talent-based regional transformation: an awkward ‘region’; ambivalence about public-sector workforce development entities’ participation in the effort; contrasting visions for the growth of the bioscience industry, particularly the role of middle-skill jobs within that industry; and a budget and time horizon that were out of scale with the size of the industry and the challenges it faced.

**Literature Review: The Analytics of Human-capital-oriented Economic Development Practice**

Social scientists and practitioners have long stressed the logic of region-wide approaches to economic development (see Bartik, 2007; Berube 2007). Literature on the innovation process stresses labour markets’ regional nature and asserts a ‘distinct geography of innovation’ that is region-based (Simmie, 2005). Simultaneously, there is strong consensus that growth has been most durable in regions where innate advantage and shrewd policy have combined to retain, attract and develop skilled labour. Audretsch and Feldman (1996) find that the spatial clustering of innovation tracks the product life cycle and they conclude that, at every stage of the cycle, the knowledge embodied in workers makes clustering more likely. The ability of older cities such as Boston to overcome cost and geographical disadvantages is attributed to the capacity for reinvention and economic opportunism that accompanies an educated, adaptive labour pool (see Glaeser, 2005). Further, while it may rely upon a base of ‘knowledge workers’ with advanced degrees, the attraction and retention of innovative industries also poses opportunities to develop human capital for jobs that rely on workers with credentials obtained in technical schools and community colleges (Christopherson and Clark, 2007; Lowe, 2007).

Economists and economic geographers have proposed techniques for incorporating this ‘talent imperative’ into economic development policy-making. The most basic proposed change is that analysts investigate occupational specialisation in addition to industrial specialisation: in the words of Edward Feser, that they learn “what regions do rather than make” (Feser 2003, p. 1937). This is particularly important given the acceleration of the product cycle. Scholars have proposed several methodologies for ‘reading’ a region through an occupational lens.

**Occupational Cluster Analysis**

Many researchers have conceptualised regional occupational clusters and used them to identify strengths and specialisations. Barbour and Markusen (2007) examined patterns of occupational concentration in Californian metropolitan areas, focusing on science and engineering workers. They suggest that regional occupational distinctiveness (the extent to which a region’s occupational structure in an industry
differs from the nation’s) is particularly pronounced for science, engineering and information technology occupations. This indicates that regional-level occupational cluster analysis is especially important for innovation-led development policy.

Working at a national level, Koo (2005) distilled 20 ‘occupation clusters’ from 661 occupations identified in the Bureau of Labor Statistics’s ONET system; he then identified groupings based on the skill requirements of associated jobs and examined growth trends in these clusters in the Cleveland metropolitan area, drawing ominous conclusions about the decline of high-knowledge occupations there.

Nolan et al. (2011) resolved difficulties experienced by early researchers in meaningfully linking industries with occupations by proposing a combined ‘occupation cluster/industry cluster’ (OCIC) construct. Their OCIC location quotient (OCIC-LQ) enables scholars to identify region-specific occupational concentrations for leading industries—for example, a preponderance of managerial workers within a region’s chemicals industry (p. 29) where occupational analysis alone would have yielded separate data about managerial occupations and said little about the industries in which they were concentrated. Currid and Stolarick (2010), however, claim that most analyses rely on categories too highly aggregated to produce a detailed portrait of ‘what a region does’. Their corrective is to use census microdata, which simultaneously capture both occupation and industry for a sample of workers in a sub-metropolitan region. Currid and Stolarick’s data describe one industry/occupation cluster in the Los Angeles PMSA—information systems/information technology—and reveal the ‘thickness’ of the region’s labour market for certain kinds of workers in the cluster. It is also through the use of census microdata that Markusen et al. (2008) and Markusen and Gadwa (forthcoming) show significant variation across metros in the occupation-by-industry employment patterns of visual and performing artists, musicians and writers. Emphasising that regions specialised in cultural industries feature sharply distinct disciplinary groupings of workers, they underscore the perils of conducting ‘creative class’ attraction policies absent a clear understanding of spatial divisions of labour by occupation.1

**Gap Analysis**

While insights from occupational cluster and industry/occupation cluster analysis are useful for understanding a region’s existing assets and competitive (dis)advantages, development practitioners often are eager for data that help them opportunistically to adapt to changes and shocks. Peters (2005) emphasises both the labour force matching and the business attraction applications of occupation/industry-focused gap analysis. Using mathematical cluster analysis, Peters constructs 49 ‘industry-based labour complexes’, each of which groups firms from multiple industries based on similarities in employment patterns and skill requirements. Working with industry and occupation data for Missouri, he identifies growing and declining industry sectors within labour complexes in particular parts of the state. Workers displaced from declining sectors can be matched to jobs in growing or stable sectors in nearby counties. Peters recommends that practitioners employ labour complex analysis to seize what might be called ‘windows of occupational compatibility’ in efforts to repurpose local skills and talents. He also recommends that Missouri officials use the labour complex concept to identify existing pools of specialized labor needed by a particular industry, which can be used in
marketing efforts to attract firms in this industry to locate in Missouri (Peters, 2005, p. 152).

Sector Partnerships and Career Pathway Analysis

As human capital policy integrates with economic development policy, the analysis of career pathways has grown more important. Investor and employer decisions since 1980 have changed the contours of the employment relationship; with the decline of the vertically integrated Fordist corporation and the internal labour market, firm-provided training and internal promotion are rarer than they were in the past and the use of independent contractors and other ‘non-standard’ workers is more common (Capelli et al., 1997). What the ‘new economy’ means for many workers is diminished attachment to their workplaces and less obvious lines of progression between steps in their careers. What it means for employers, particularly small ones, is often a need for trained workers in the absence of the internal infrastructure to perform training (Osterman, 1999; Christopherson and Clark, 2007). There is therefore a market-correcting role for government and the education and training sector in providing small employers with technical assistance and training as well as providing information and skill development opportunities to individuals navigating careers that involve multiple employers (Herzenberg et al., 1998). Sector partnerships, under which economic development agencies, employers, industry associations and providers of education and training collaborate to build and enhance labour ‘pipelines’ in strategically important industries and occupations, often play this role. According to the National Skills Coalition, an advocacy group

Successful sector partnerships leverage partner resources to address both short- and long-term human capital needs of a particular sector, including by analyzing current labor markets and identifying barriers to employment within the industry; developing cross-firm skill standards, curricula, and training programs; and developing occupational career ladders to ensure workers of all skill levels can advance within the industry (National Skills Coalition, 2009, p. 1).

Organisations and initiatives engaged in sectoral partnerships document typical lines of progression within occupations or groups of related occupations, from basic to advanced levels of skill and experience (Wolf-Powers, 2005). Knowledge about career pathways—gained from the examination of occupation/industry matrices and supplemented through interviews with employer and industry association representatives—is an important tool for economic development officials striving to build industry-specific human capital stocks. The literature on regional economic development and competitiveness is rich in techniques for measuring the human capital assets of places. The US Economic Development Administration has invested significant resources in the development of these tools. Feser asserts that

The specific occupational mix, breadth and depth of various clusters in given regions can … inform the training offerings of universities and community colleges (Feser, 2003, p. 1953).

Markusen and Gadwa similarly recommend that economic developers supplement their portfolios of industry-based incentives with investments that shape human capital formation and the recruitment and retention of valued labour.

Life Sciences in Greater Philadelphia

The Greater Philadelphia metropolitan region was perhaps the first bio-sciences
hub in the United States. Feldman and Schreuder (1996) argue that this is due to a set of conditions that conferred initial advantage and repeatedly prompted firms to innovate. The first of these was medical and technical expertise in Philadelphia in the 18th and 19th centuries; Philadelphia’s ‘firsts’ include the first hospital, the first medical school and the first college of pharmacy. The second condition was a tradition of reputable pharmaceutical wholesaling activity that involved quality control and certification and that led to a strong specialisation in marketing and distribution. Thirdly, when wholesalers and other entrepreneurs began to move from batch to mass production, process technology expertise resident in the city’s labour force and in existing firms offered a significant competitive asset in manufacturing, as did proximity to chemical manufacturing. In the latter part of the 19th century, partly due to the superiority of its port, New York City overtook Philadelphia as a pharmaceutical manufacturing and distribution centre. However, an industrial corridor developed in New Jersey that united the separate industry complexes in Philadelphia and New York, and this mid-Atlantic corridor has remained resilient as a cluster of research and development, of the manufacture of therapeutics and devices, and of specialised distribution and marketing enterprises. Today, Greater Philadelphia, which includes counties in Pennsylvania, New Jersey and Delaware, retains a strong concentration in the industry, with a location quotient by employment in 2009 of 3.2 in therapeutics and devices, which encompasses research, development and manufacturing in biotechnology, pharmaceuticals and medical devices (DeVol et al., 2009).

Feldman and Schreuder emphasise the historical adaptability of the pharmaceutical sector in the mid-Atlantic corridor, noting its persistence in the face of shifts from botanical products to alkaloids and biologicals and, finally, to synthetic drugs. In the late 20th century, however, the focus of the industry shifted from the fine chemistry practised by the pharmaceutical industry to a molecular biology approach practised by university-based research facilities and dedicated biotechnology firms or DBFs (Cooke, 2004a, 2004b). The trend towards DBFs as the main source of innovation and growth in life sciences poses distinct challenges for the Greater Philadelphia region because Greater Philadelphia, compared with other life-sciences-specialised metropolitan regions, has low rates of concentration and growth among these enterprises. Moreover, there are relatively few instances in the region of ‘big pharma’ alliances with extramural DBFs (Cortwright and Mayer, 2002; DeVol et al., 2009). In the aftermath of the pharma-to-DBF paradigm shift, other leading metropolitan areas—Raleigh–Durham, San Francisco and Boston—have increased their relative dominance.

Greater Philadelphia’s life science labour force is an asset. DeVol et al. measured the Greater Philadelphia region’s intensity in 13 distinct life sciences job categories—from chemical and material engineers to microbiologists to biological and chemical technicians—and compared intensities in these occupations with those of 10 other life-sciences-specialised regions. Greater Philadelphia exceeded the average for the metropolitan areas studied in almost every life science occupation considered; it is particularly strong in chemical engineers, biochemists and chemical technicians. DeVol et al. did not collect data on skilled production workers, perhaps concluding that this occupation was sufficiently cognate with jobs in technical services. They also noted that the region could improve its competitive position by enhancing its concentration of biological technical services workers (p. 64).
The Delaware Valley Innovation Network

Notwithstanding the region’s relatively ample supply of highly educated life sciences workers, a consensus developed among Greater Philadelphia economic and workforce development officials in the mid 2000s that improving the workforce in the biotechnology sector was a regional priority and that public/private entities with the ability to co-ordinate actors across institutions and across states had a role to play in the creation of this ‘talent pipeline’. When the US Department of Labor unveiled an initiative to promote regional partnerships for economic development through talent development in late 2005, the group Innovation Philadelphia positioned itself for this role.

Innovation Philadelphia was a group of Philadelphia-based business and government executives dedicated to promoting the region’s knowledge economy by providing networking opportunities for creative individuals and firms and by promoting Greater Philadelphia as a location for companies in ‘knowledge-intensive’ industries. Founded in 2001 by business and education leaders with the goal of “helping to grow the technology and knowledge industry sectors of Philadelphia’s economy” (Innovation Philadelphia, 2011), it differentiated itself from other business groups with an explicit focus on providing resources and seed funding to start-ups, supporting entrepreneurs and attracting coveted 25 to 34-year-old professionals to the city. Initially funded by the City of Philadelphia under Mayor John Street, and with an emphasis on growing firms and attracting population within the city’s boundaries, the organisation soon portrayed itself as a regional entity—for example, with the publication of Creative Footprint (which estimated the economic impact of for-profit arts, media, design and information technology firms) in 2007 and the Greater Philadelphia Entrepreneurs Resource Guide in 2009.

Given the existence of Pennsylvania Bio as a distinct advocate and trade association for the bio-pharmaceutical sector, Innovation Philadelphia initially focused on attracting and incubating companies in the digital media, information technology and the design fields. It moved opportunistically into the life sciences, however, when the US Department of Labor’s Employment and Training Administration announced a new federal programme to fund partnerships for regional talent development. The organisation’s staff and board assembled a team of stakeholders, created an entity called the Delaware Valley Innovation Network (DVIN) and responded to the Department of Labor’s Solicitation for Grant Applications for the programme, known as Workforce Innovation in Regional Economic Development (WIRED). While not chosen for a first round of 13 $15 million WIRED grants (“Generation I”), the Delaware Valley consortium was, with 12 other regions, awarded a $100 000 planning grant in April 2006 and designated a ‘virtual region’, with an invitation to participate in programme activities and to create an implementation plan. In January 2007, the Department of Labor awarded DVIN and its 12 counterpart organisations in these “virtual regions” three-year grants of $5 million each to implement the plans they had devised. This came to be known as WIRED Generation II.

Throughout the approximately three-year life of the DVIN, Innovation Philadelphia served as its fiscal agent. However, the partnership had its own bylaws and was governed by an executive committee whose members included staff of the three state governors’ offices, the three state departments of labour, the three state bio-science industry associations and one Workforce Investment Board from
each state whose role was to represent all local workforce investment boards in that state. A project director—a Delaware workforce development official who had originally been a member of the organisation’s Executive Committee—was hired to oversee the committee’s work and implement the activities outlined in DVIN’s plan, assisted by programme staff that eventually numbered three.

DVIN was not sustained as an organisation following the three-year WIRED grant period. Moreover, in April 2010, shortly after the end of the DVIN grant, the executive director of Innovation Philadelphia stepped down and the organisation’s board did not replace her. At that point, the Chair of Innovation Philadelphia’s board announced that that organisation was re-evaluating its strategic role. The organisation has not officially disbanded and, according to a more recent posting on its website (which describes the DVIN and hosts related documents), the members of its board continue to deliberate as to its future. As noted earlier, this study relies on documentation related to the case, produced both by the Department of Labor and by DVIN itself and on interviews with former DVIN Executive Board members, with other stakeholders in economic and workforce development in the region and with US Department of Labor representatives.

Defining the Region

Regional economists typically define regions by their labour markets (also called commuter-sheds) and, in the US, Metropolitan Statistical Area (MSA) categories issued by the federal Office of Management and Budget follow this practice. MSAs, which may cross states, consist of component counties and are centred on one or more urban agglomerations. Economic development regions defined for policy purposes, however, are often distinct from MSAs, although they too are usually comprised of county ‘building blocks’. As scholars have noted, regions function as containers not just of households and business establishments, but of shared identity (see Markusen, 1987; Kanter, 2000). Governing economic development partnerships in regions with multiple political jurisdictions represents a sizeable challenge, one that is magnified when a region spans two or more states (Hollenbeck and Hewat, 2010).

The Delaware Valley region as defined by DVIN consisted of 14 counties, 10 of which were part of the 11-county Philadelphia–Camden–Wilmington Metropolitan Statistical Area (Figure 1). In addition to leaving out Cecil County, Maryland, the project added four non-MSA counties, two in New Jersey (Cumberland and Mercer) and two in Pennsylvania (Berks and Lancaster). Motivating these modifications was a desire to capture the supply relationships associated with life science supporting industries like packaging and bioscience-specialised market research/advertising/public relations, which were centred in outlying geographies not technically part of Greater Philadelphia’s labour-shed. However, the 14-county DVIN region was not a coherent regional labour market and the component counties did not hold an economic identity in common. The fact that the region’s second-most-important county in volume of biotechnology research jobs (Mercer County, NJ, second after Montgomery County, PA) and its second-most-important county in volume of biotechnology manufacturing jobs (New Castle County, DE, second after Chester County, PA) did not have a state government in common with the primate city—as well as the fact that the primate city itself was not a clear leader in job density or growth in biotechnology—posed barriers to collaboration.
The Analytical Project

DVIN’s work began in early 2007 with an exercise whose aim was to “evaluate and prioritize current and anticipated gaps” in order to “better understand, expand and refine the region’s workforce pipeline for the life science industry” (DVIN, 2008a, p. 1). Unveiled in December 2008, the DVIN’s ‘talent gap analysis’ (DVIN, 2008b) consisted of a standard industry profile with projected employment growth in eight industry sectors; a profile of regional concentration in 88 life-sciences-related occupations, with a demand forecast component; a career navigation tool depicting potential pathways of advancement within nine bioscience ‘job families’ featuring 55 of the original 88 life science occupations examined; and estimates of the supply of life science graduates to fill impending demand, based on an analysis of programme completions at the region’s 241 post-secondary life sciences education programmes. DVIN employed all three of the analytical methods discussed earlier, although they did not attempt to cross-reference industries with occupations, nor did they link the career pathways analysis with occupational demand data (Table 1).

A pivotal moment came in late 2008 when the DVIN’s Executive Committee and staff—as they prepared the Talent gap analysis report for publication—synthesised their data into a regional portrait that would guide the organisation’s remaining work. Consulting their research, the group concluded that markets for education and training appeared to be working; there was not a need to increase the flow of workers positioned for available life science jobs in the Delaware Valley. Instead, the main priority was a need to build teamwork, non-technical business skills and entrepreneurial skills.
Table 1. Delaware Valley Innovation Network analytics

<table>
<thead>
<tr>
<th>Task</th>
<th>Data</th>
<th>Findings/Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth estimates by industry sector</td>
<td>Researchers reported 2003 employment, 2008 employment and trend-based estimates of 2013 employment in NAICS industries 3254 (pharmaceutical and medicine manufacturing); 334510 (electromedical and electrotherapeutic apparatus manufacturing); 334516 (analytical laboratory instrument manufacturing); 334517 (irradiation apparatus manufacturing); 3391 (medical equipment and supplies manufacturing); 54138 (testing laboratories); 541711 (research and development in biotechnology) and 541712 (physical, engineering and biological research, except biotechnology)</td>
<td>Employment in life sciences will rebound 4.2 per cent by 2013 after declining 1.1 per cent from 2003–08; most new jobs will be added in research and development (1400) and pharmaceuticals (1100) Two of three medical device sub-sectors are slated to have high rates of growth from 2008 to 2013, but these sectors represent only 4 per cent of the region’s life science employment and thus not much absolute job growth Pharmaceuticals employment has shrunk in both absolute and relative terms compared with employment in research and development over the 10-year span, although a small amount of 2003–08 job loss in that industry will be recovered by 2013. (In 2013, there will be 37 700 employees in research and development, compared with 31 000 in 2003, whereas in pharmaceuticals there will be 20 000 employees in 2013 vs 24 500 in 2003)</td>
</tr>
<tr>
<td>Employer interviews and focus groups</td>
<td></td>
<td>In an industry ‘paradigm shift’, growth is expected to occur in small and medium-sized companies. Discovery research takes place within small firms, which partner with or are acquired by larger ones. Medium-sized firms engage in early-stage manufacturing and testing and bring drugs and devices to market</td>
</tr>
<tr>
<td>Occupational demand forecast</td>
<td>Researchers calculated concentration quotients for the region in 88 life science occupations for 2008 and 2013. They also estimated net new positions and replacement positions by occupation in the region between 2008 and 2013, using Bureau of Labor Statistics data. Skill, knowledge and education requirements for all 88 occupations, based</td>
<td>The region is highly specialised in medical scientists, biochemists, biophysicists, biological and chemical technicians and biomedical engineers Taking both net new positions and replacement positions into account, job growth will be strongest for scientists (2086 openings), production/repair workers (1218</td>
</tr>
</tbody>
</table>

(continued)
Table 1. (Continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Data</th>
<th>Findings/Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life science career lattice</td>
<td>Researchers obtained information about job titles, job requirements and progression among jobs from the US Department of Labor, BIOCOM, the Biotechnology Benchmark Compensation Report and Bio-Link; this information was validated through interviews</td>
<td>Life science occupations in the Delaware Valley Region can be divided into nine ‘families’: bioinformatics/data management, clinical development, facilities, regulatory, product/process development, manufacturing, discovery research, quality and medical affairs/education. Each entry in the succession of job titles within a family demands progressively greater credentialisation, skill and experience</td>
</tr>
<tr>
<td>Life science programme inventory and completion statistics (supply analysis)</td>
<td>Researchers listed and mapped post-secondary life science education programmes in the region; programme completion data (2004–06) were compiled from the Integrated Postsecondary Education Data System (IPEDS) and compared with occupational forecasts</td>
<td>The region hosts 241 programmes in the biological and biomedical sciences; pharmaceutical sciences and administration; animal sciences; business, marketing and management; engineering/technology; and health and clinical sciences Programme completions increased by 30 per cent from 2004 to 2006, from Associates to PhD level “The DVIN region should produce enough graduates in relevant life science degrees to fill the yearly average openings for the majority of the Top 10 Job Creator occupations” (p. 15).</td>
</tr>
</tbody>
</table>

on data from O*Net, were inventoried in a database (see ‘career lattice’) Employer interviews and focus groups

Hard to fill positions include jobs in bioinformatics, database management, financial operations, scientific research, quality assurance and production/process management Skills in short supply include communication, entrepreneurial and non-technical business skills as well as experience with software-controlled instruments

Life science career lattice researchers obtained information about job titles, job requirements and progression among jobs from the US Department of Labor, BIOCOM, the Biotechnology Benchmark Compensation Report and Bio-Link; this information was validated through interviews

Life science occupations in the Delaware Valley Region can be divided into nine ‘families’: bioinformatics/data management, clinical development, facilities, regulatory, product/process development, manufacturing, discovery research, quality and medical affairs/education. Each entry in the succession of job titles within a family demands progressively greater credentialisation, skill and experience

The region hosts 241 programmes in the biological and biomedical sciences; pharmaceutical sciences and administration; animal sciences; business, marketing and management; engineering/technology; and health and clinical sciences Programme completions increased by 30 per cent from 2004 to 2006, from Associates to PhD level “The DVIN region should produce enough graduates in relevant life science degrees to fill the yearly average openings for the majority of the Top 10 Job Creator occupations” (p. 15).
Main challenges for region are to train and retain people for life science occupations that require computer and information science backgrounds, and to help future and incumbent employees of small- and medium-sized firms to develop non-technical business skills

Interviews with representatives of educational institutions

- Challenge to build and maintain relationships with life science firms, particularly small start-ups
- Among community colleges, a barrier to enrollment in life sciences programmes is students’ lack of understanding about life science careers and their wariness of science courses
- Funding needed for the development of new educational programmes

Interviews with workforce investment board representatives

- “Many of the WIBs focus on training unemployed and lower-skilled incumbent workers. The WIBs face the challenge of transitioning these workers to meet the high-skill needs of the life science industry” (p. 16)

Sources: Compiled by author from DVIN (2008a, 2008b) and DVIN Life science career lattice (2008).

<table>
<thead>
<tr>
<th>Task</th>
<th>Data</th>
<th>Findings/Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main challenges for region are to train and retain people for life science occupations that require computer and information science backgrounds, and to help future and incumbent employees of small- and medium-sized firms to develop non-technical business skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Challenge to build and maintain relationships with life science firms, particularly small start-ups.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Among community colleges, a barrier to enrollment in life sciences programmes is students’ lack of understanding about life science careers and their wariness of science courses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funding needed for the development of new educational programmes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Many of the WIBs focus on training unemployed and lower-skilled incumbent workers. The WIBs face the challenge of transitioning these workers to meet the high-skill needs of the life science industry” (p. 16).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

aChiefly medical scientists and chemists.
bChiefly team assemblers, inspectors/testers/sorters/samplers/weighers, and mixing and blending machine operators, tenders and setters.
cChiefly industrial engineers.
among incumbent life sciences employees. The firms in which these skills were most needed were the small and medium-sized research and product/process development firms that had become the likeliest source of future growth. Moreover, the employees in need of this cross-training were high-end employees. According to the Talent gap analysis report

Examinations of the workforce system revealed that the region is not facing a gap in the number of graduates (with the possible exception of information technology), but rather it faces a gap in skills and competencies. It also revealed workers’ ability to deal with a changing work structure will require greater flexibility, adaptability and dynamic cooperation. Strains in workforce availability are expected to appear in higher-end positions in management and research, not in production (DVIN, 2008b, p. 17).

The essential conclusion drawn from the data—namely, that the ‘talent gap’ in the region’s life science sector consisted primarily of a need to cross-train skilled workers at the region’s small and medium-sized companies—gave shape to the work of the Delaware Valley Innovation Network during 2009 and 2010. A second conclusion—that elementary and secondary school students in the region and among science majors at the area’s colleges and universities lacked awareness of life science career opportunities—also drove DVIN’s agenda.

From Analytics to Implementation

However, several factors, ranging from the grant’s limited time horizon, to difficulty in forging a regional identity and strategy, to disagreement about what the talent gap findings portended for policy and programme, posed barriers to the ‘regional transformation’ envisioned by the creators of WIRED at the US Department of Labor.

Regional Confusion

The architects of the WIRED programme at the US Department of Labor proceeded from the premise that to be competitive and prosperous, economic regions must actively connect separate systems governing workforce development and economic development (US Department of Labor, n.d.) Funding for the programme derived from fees charged to employers seeking H1B non-immigrant visas for workers in specialty occupations. WIRED pursued a theory that in order for the ‘growing of workers in place’ to succeed at reducing demand for high-skilled immigration, training needed to be integrated with economic policy at the level of the region.

However, from the first, it was problematic to define and enact collaboration involving 14 counties in three states. Some representatives of Delaware and New Jersey chafed at the centrality of Pennsylvania, and particularly Philadelphia, to the initial planning and grant-writing stages. The Executive Committee’s composition achieved equivalency by state in governance, but the notion of a tri-partite effort was then complicated by the fact that Mercer County, the New Jersey county with the most biosciences employment, became part of a New-Jersey-specific biotechnology collaboration that received WIRED funding in June 2007. An endeavour whose regional components lay within the same state was immeasurably easier than one in which three Governors, three state Departments of Labor and three state economic development and business recruitment operations were involved. By several accounts, New Jersey’s interest in the Delaware Valley effort soon waned.
A second factor was weak incentives for collaboration among economic development officials concerned for their own states. One interviewee attributed the eventual cohesion of the DVIN’s governance structure to the ultimate emergence of a leadership core among state and local workforce development representatives.

The economic developers … were initially in charge. But economic developers don’t play well together … Economic developers seem to me antithetical to the whole WIRED idea … they’ll kill each other. The Workforce Investment Act is a federal programme and [workforce development officials] don’t care [about cross-border competition for job growth].

In the view of this respondent and others, the initial dominance of state economic development officials hampered the common talent development project. According to them, only after Workforce Investment Boards began participating fully in the effort did functional collaboration develop.

Another regional issue concerned the relationship of the primate city/county, Philadelphia, to the less urban counties in the partnership. In all of its work, Innovation Philadelphia promoted a creative Philadelphia at the heart of a competitive region. Yet this entailed some legerdemain (a majority of ‘creative professionals’ highlighted in its 2007 ‘creative footprint’ report worked in outlying counties, for example) and underscored persistent tensions in Greater Philadelphia over the city’s declining share of regional employment and its large population of poorly educated residents. Philadelphia hosts the bulk of the region’s university-based research, but it is not a hub for private-sector biotechnology research and production, which in any case is a field in which even lower-level technical and production positions typically require post-secondary credentials. As the talent gap analysis revealed, Philadelphia has a total of 111 post-secondary life science programmes, but only one of these offers sub-baccalaureate training, even as only slightly more than a fifth of the city’s residents aged 25 and over hold bachelor’s degrees and “adult learners typically enter post-secondary education through two-year or community college programmes” (DVIN, 2008b, p. 13). This tension underlay the regional dynamics of the DVIN and provoked scepticism about the extent to which the development of human capital for the biotechnology sector would or could increase revenues for the fiscally distressed central city, as well as raising questions about what training and employment opportunities the effort had to offer job-seekers who did not hold bachelor’s degrees.

Ambivalence about the Role and Capacity of the Public Workforce System

Ambivalence about what role to accord local workforce agencies in a talent pipeline development endeavour is a second institutional factor. Historically, public workforce programmes have been means-tested and targeted at the poor, conceived as a service to the disadvantaged rather than a response to growth imperatives (see Weir, 1933). However, the states involved in the DVIN, particularly Pennsylvania, have been leaders in industry partnership programmes, which represent a departure from this paradigm. Guided by state policy, Workforce Investment Boards assemble employers in related sectors, consult with them about industry partnership programmes, which is particularly important in sectors where firms lack
internal mechanisms for the imparting of skills.

Several interviewees suggested that the most logical strategy would have been to tap workforce boards to apply the industry partnership model in the DVIN case. However, top officials at the US Department of Labor deliberately vested fiscal agency and implementing authority under WIRED in organisations whose primary affiliation was not with the workforce system. The Assistant Secretary of Labor for Employment and Training at the time, said one respondent

was not a proponent of her own system [of Workforce Investment Boards] .... She wanted to use the dollars outside the system rather than reforming it. She didn’t think the Workforce Investment Boards could step up.

As the WIRED programme progressed, the Department of Labor required greater involvement from the public system. In the Delaware Valley’s case, the participation of state departments of labour and county workforce investment boards was institutionalised late in 2007, and these entities participated in the talent gap analysis. This distinguished the DVIN from other WIRED projects in which the workforce system became involved at later stages. Even so, interviewees reported that Workforce Investment Boards were not fully integrated into DVIN’s executive committee structure until mid 2008.

Conflict over the Aim of ‘Talent Development’

One interviewee suggested that the best way to proceed would have been to have state officials perform a gap analysis and only then choose representatives for an Executive Committee from relevant counties’ workforce systems and economic development divisions. It is likely, however, that this would not have resolved a third institutional issue: disagreement about the policy implications of the talent gap analysis. Some members of the Executive Committee—those representing several of the Workforce Investment Boards and community colleges—pointed to evidence that projected labour demand in production and technical occupations requiring sub-baccalaureate degrees was comparable with projected demand for scientists. This, they maintained, suggested that DVIN’s brief should go beyond the cross-training of high-end employees and seize an opportunity to prepare non-college-bound candidates for advanced manufacturing and technical positions. Economic development officials and representatives of the biotechnology industry associations disagreed, \(^5\) despite well-documented growth projections for production-related occupations.

As the DVIN released over $3 million for life-sciences-related training and outreach during 2009 and early 2010, those who favoured a focus on high-end workers prevailed over those who advocated investment in middle-skilled employees. Each group of advocates claimed that the analytics were on their side. However, the stances of both groups rested less on occupational data than on pre-formed notions about what a growth path for the region’s bioscience sector should look like and what the aims of publicly funded regional talent development should be. While the mass production operations of the pharmaceutical companies had shrunk, proponents of the ‘middle-skill’ path argued that Greater Philadelphia could build on its manufacturing legacy to improve its capacity in early-stage drug and prototype device manufacturing, as well as the manufacture of pharmaceutical and medical device packaging. Because proximity between research and manufacturing is important early in the product cycle, a supply of trained...
employees (technicians, operators and repairers of software-controlled machinery, quality control specialists) could help retain research and development firms whose executives wanted to manufacture in-house or nearby. While it has been argued that research firms tend to outsource early-stage production to low-cost regions (Bagchi-Sen *et al.*, 2004), the counter-claim is that, in biotechnology, close control over the manufacturing process is preferred as it allows accelerated time to market and extends companies’ proprietary position (Feldman and Ronzio, 2001). With an unproven new product, the process innovation that is possible when manufacturing and research are proximate may be critical to long-term advantage. Under this paradigm, a strong commitment to human capital infrastructure for biotechnology manufacturing might have influenced growth in this part of the cluster.

A final consideration has to do with the scale of the $5 million DVIN effort in the context of an industry that, according to a report by the Milken Institute (DeVol *et al.*, 2009), generated $20.2 billion in earnings and $39.7 billion in output in 2007. This amount of workforce investment, regardless of how it was directed, was unlikely to make a significant impact on economic outcomes. This is particularly true in light of board and staff interviews with educational institutions revealing that many high school graduates in the region were insufficiently prepared for the post-secondary training deemed necessary for even entry-level employment in biotechnology. This insight prompted awareness and alarm about pervasive deficits in workplace literacy in the Delaware Valley, particularly its high-poverty cities. This finding points to the severe fragmentation of primary, secondary and post-secondary labour force preparation systems not only in the economic region encompassed by the DVIN but within the individual jurisdictions that comprised it. Neither the brief, the scope, nor the resources of the WIRED programme, however, encompassed counties’ need to overhaul flawed school systems or improve literacy rates among working adults.

**Conclusion: Programme Implementation and the Aims of Talent Development**

In 2009, DVIN’s Executive Committee awarded grants to a total of 26 individual projects. The grant awards largely adhered to the Executive Committee’s premise that the priorities for regional talent development should be, on the one hand, cross-training in business and teamwork for the high-skilled employees of the region’s fledgling small biotechnology companies and, on the other, enhanced awareness of life science career opportunities among elementary and secondary school students in the region and among science majors at the area’s colleges and universities. In all, 40 per cent of the grant funding was allocated to projects focused on high-skilled workers and 26 per cent to awareness and skill-building for K-12 students. Eighteen per cent of the funds went towards training for moderately skilled incumbent and dislocated workers at area firms, while 11 per cent went to programmes focused on credentialisation of ‘middle-skilled’ workers through community colleges (1 per cent was focused on career navigation for high-skilled professionals displaced from the conventional pharmaceutical sector). Among stakeholders consulted for this article, two views of the DVIN’s grant-making strategy emerged. The first was that the strategy was sound, but fell short of the ‘regional transformation’ envisioned in the WIRED programme design. Reasons cited for this include the awkward and often counter-intuitive definition of the region and
strict limitations on the project timeline (per Department of Labor regulations, all funds had to be expended by 31 January 2010). In this view, DVIN provided resources to worthy projects, each of which advanced a cogent strategy for life sciences talent development. However, DVIN underperformed as both a region-building and a talent-building enterprise for several reasons: fragmentation among the jurisdictions participating in the DVIN, the urgency with which the organization had to expend its funds and the relatively insignificant potential impact of $5 million in a $20 billion industry. Challenges of regional and institutional cohesion were underscored by the dissolution of the Delaware Valley Innovation Network at the close of the grant period and, soon after, by the dismantling of Innovation Philadelphia as a staffed entity.

A second interpretation is that DVIN’s strategy, while it responded to some needs identified in the talent gap analysis, failed to take up a growth opportunity that was suggested by the talent gap data but which did not correspond to some stakeholders’ understanding of what human capital development in a ‘knowledge economy’ cluster involved. The proposal to focus on preparing workers with advanced production skills—skills that might be drawn upon by dedicated biotechnology firms looking to scale up production quickly in proximity to their research staff, or by firms engaged in designing and manufacturing innovative biopharmaceutical packaging—aligned with Workforce Investment Boards’ dual mission: offering employers training assistance while facilitating opportunities for the non-college-educated and non-college-bound in the workforce. Yet this approach would have meant a more proactive role for DVIN in shaping the industry it aimed to strengthen, requiring it to advance among employers and education providers a human capital strategy based on promoting growth in the manufacturing sector.6 This approach would have positioned the organisation as a labour market intermediary whose goal was to influence employer choices (see Fitzgerald, 2004; Giloth, 2004; Lowe et al., 2011).

The difference between the conviction that a focus primarily on college-educated and college-bound workers was a missed opportunity and the conviction that it represented the only viable strategy for DVIN illustrates a distinction that Clark and Christopherson (2009) characterise as ‘investment’ vs ‘progressive’ (or ‘equity’) regionalism. Concerned primarily with the attraction and development of top talent, investment regionalists champion public investment in the physical infrastructure, research, and labor market skills that foster innovation and increase firm productivity in the export sectors (Clark and Christopherson, 2009, p. 342).

Equity regionalism, by contrast, fuses an investment approach with an orientation towards narrowing intraregional gaps in resources and opportunity. A key premise of this position is that policy-makers should look beyond elite-level workers and develop ‘middle-skilled’ workers whose competencies support and sustain the innovative milieu (Holzer and Lerman, 2007; Council of Economic Advisors, 2009). Research on the impact of economic development incentives suggests that this path is also desirable from an efficiency perspective; mid-level job positions that are likely to be filled by unemployed and underemployed people from the surrounding region exert a larger welfare effect than higher-paying jobs more likely to be filled by in-migrants (Persky et al., 2004).

The consensus among those interviewed for this article was that the DVIN’s strategy, while informed by the talent gap analysis, fell short of the ‘regional transformation’ envisioned in the WIRED programme design. First, mounting a co-ordinated
economic development initiative among 14 counties that held no pre-existing common economic identity was a problem that could not be resolved through better analysis. Past research has demonstrated the challenges associated with implementing regional cooperation in the context of fragmented governance structures (Simmie, 2005; Niedt and Weir, 2010), and the experience of the DVIN confirms these findings.

A second major barrier to the deployment of analytics in the service of a growth agenda was uncertainty within the partnership about whether investment in the knowledge economy should include the training of production workers and the promotion of the region as a location for advanced manufacturing. Workers who stood to benefit from growth in life sciences production employment (and from the pursuit of intermediation strategies that increased the likelihood of blue-collar job growth) were not well represented in the governance of the DVIN until Workforce Investment Boards assumed a larger role in 2008. Even then, conflict emerged around the viability of training people for middle-skill jobs in a context in which high-level scientific innovation was seen by many as the key to growth.

Formal evaluations of the 39 WIRED regions, forthcoming from the Department of Labor, will shed further light on the institutional barriers to regional talent development (see Hollenbeck and Hewat, 2010). The implication for regional development scholars of this case, however, concerns the circumscribed value of analysis in the absence of cohesive multijurisdictional organisational structures and of common strategies for engaging public-sector workforce development institutions, including secondary schools and community colleges, in the talent development project. The Delaware Valley’s experience suggests that economic development scholars should complement efforts to enhance the precision of analytical tools with greater attention to discerning and elaborating the conditions under which regional consortia successfully overcome institutional challenges like the ones described here.

Notes
1. Markusen and Gadwa (forthcoming) point out that the census, in addition to offering a higher level of detail, provides data on self-employed individuals, which is particularly important to the analysis of creative workers and sectors.
2. This represented a change from a similar assessment in 2005, which had identified a shortage in the engineering disciplines.
3. While technically part of the Philadelphia–Camden–Wilmington labor-shed, Cecil County hosted little activity in the life sciences sector. Including this county also would have required the partnership to integrate the institutions of a fourth state.
4. Cumberland County, NJ, was added because it shares a Workforce Investment Board with Salem County.
5. While the position of industry association representatives might be interpreted as dispositive, several interviewees argued that the trade groups had limited awareness of non-research occupations in the life sciences.
6. Fitzgerald (2004), Lowe (2007) and Lowe et al. (2011) describe a community college-based strategy in North Carolina that has pursued this strategy with that state’s growing bio-sciences industry.

Funding Statement
The research for this article was funded by the University of Pennsylvania’s University Research Foundation.

Acknowledgements
The author wishes to acknowledge two individuals whose research assistance was instrumental: Lauren Nolan and, especially, Christine Caggiano.
References


DVIN (Delaware Valley Innovation Network) (2007) WIRED implementation plan, final draft. DVIN, Philadelphia, PA.

DVIN (2008a) Life science occupational forecast table. DVIN, Philadelphia, PA.


