Fall 2017

The Maker Movement and Urban Economic Development.pdf

Laura Wolf-Powers
Greg Schrock
Marc Doussard, *University of Illinois at Urbana-Champaign*

Journal of the American Planning Association

ISSN: 0194-4363 (Print) 1939-0130 (Online) Journal homepage: http://www.tandfonline.com/loi/rjpa20

The Maker Movement and Urban Economic Development

Laura Wolf-Powers, Marc Doussard, Greg Schrock, Charles Heying, Max Eisenburger & Stephen Marotta

To cite this article: Laura Wolf-Powers, Marc Doussard, Greg Schrock, Charles Heying, Max Eisenburger & Stephen Marotta (2017): The Maker Movement and Urban Economic Development, Journal of the American Planning Association, DOI: 10.1080/01944363.2017.1360787

To link to this article: http://dx.doi.org/10.1080/01944363.2017.1360787

Published online: 12 Sep 2017.

The Maker Movement and Urban Economic Development

Laura Wolf-Powers, Marc Doussard, Greg Schrock, Charles Heying, Max Eisenburger, and Stephen Marotta

Problem, research strategy, and findings: The maker movement is placing small-scale manufacturing development on mayoral agendas across the United States and promises to reinvigorate production economies in central cities. To make effective policy, planners need more knowledge about the entrepreneurs at the center of this phenomenon. Here we present a qualitative investigation of urban maker economies. We draw on semistructured interviews with firms and supportive organizations in Chicago (IL), New York City (NY), and Portland (OR). A limitation of our approach stems from the unavailability of population parameters; we cannot confirm that our sample reflects the universe of maker enterprises. We find that makers draw on ecosystems comprising mainly for-profit firms. The public and nonprofit sectors are important in areas where markets do not provide the resources that fledgling makers require. We find 3 distinct types of maker enterprise: micromakers, global innovators, and emerging place-based manufacturers. Each makes a different contribution to local and regional economic development.
Takeaway for practice: Planners can maximize the potential of the maker movement by distinguishing among the 3 types of maker firms. Practitioners focused on employment creation should prioritize emerging place-based manufacturers, helping them build supply chain connections and ensuring that they have affordable space into which to expand. Artisanal micromakers also generate economic benefits, as do global innovators focused on product design and prototyping. But emerging place-based manufacturers have the highest potential for employment creation, both directly and via the business growth they stimulate.

The maker movement is commanding attention and resources in city halls across the nation. The term *making* refers to the design and fabrication of consumer products, often via newly accessible technologies. Making encompasses a range of activities undertaken by learners, do-it-yourselfers, and businesspeople and takes place in community centers, classrooms, public library branches, incubators, and factories. The significance of the maker movement to economic development planning, however, lies principally in the emergence of new small-scale manufacturing enterprises that integrate design with production. The confidence of elected officials that this new manufacturing trend can revive local economic bases animates many local efforts to support maker economies.

Much of the business press and the innovation literature hails the maker movement as part of a changing paradigm for manufacturing. Local economic development planners follow this lead—often uncritically—by embracing predictions that maker-entrepreneurs will spur innovation, generate jobs, and breathe new life into urban manufacturing clusters. Yet answers to basic questions about maker businesses and their roles—existing and potential—in local economies are lacking. Our research addresses that knowledge gap by qualitatively investigating maker economies in Chicago (IL), New York City (NY), and Portland (OR).

We ask two major questions: How do maker enterprises function in cities whose primary economic bases have shifted from production to services? And what can maker enterprises contribute to local economic development? We find that maker enterprises function within city- and sector-specific entrepreneurial

Keywords: local economic development, maker movement, urban manufacturing
About the authors: Laura Wolf-Powers (lwolfpowers@gc.cuny.edu) is an associate professor of urban planning and policy at Hunter College, City University of New York. **Marc Doussard** (mdouss1@illinois.edu) is an assistant professor and **Max Eisenburger** (meisen4@illinois.edu) is a doctoral candidate in urban and regional planning at the University of Illinois Urbana–Champaign. **Greg Schrock** (gschrock@pdx.edu) is an associate professor, **Charles Heying** (heyingc@pdx.edu) is an emeritus professor, and **Stephen Marotta** (smarotta@pdx.edu) is a doctoral candidate in urban studies at Portland State University.
Color versions of one or more of the articles can be found online at www.tandfonline.com/rjpa.

Journal of the American Planning Association, 2017
DOI: 10.1080/01944363.2017.1360787

ecosystems that help makers overcome production, finance, marketing, and distribution challenges. Makers pursue distinct business strategies, each of which contributes in a different way, and to a differing extent, to the economic development of cities. We identify three types of maker firms: 1) *micromakers*, whose activities contribute to a city's artistic and cultural vibrancy; 2) *global innovators*, who contribute innovations to products, processes, and materials; and 3) *emerging place-based manufacturers*, who make products in place and who contribute most directly to the goal of employment growth. We conclude that economic development planners can maximize the potential of the maker movement by distinguishing among the three types of maker firms. Practitioners concerned with promoting cultural distinctiveness should take measures supporting micromakers. Practitioners concerned with seeding innovation should work to support global innovators. Practitioners concerned with employment creation, and particularly with production jobs, should prioritize emerging place-based manufacturers.

In the next section we provide an overview of the maker movement and introduce the work that frames our research questions: the emerging literature on the maker movement itself, a longer standing literature on the benefits of planning for urban manufacturing, and yet another literature on entrepreneurial ecosystems. We then describe the methodology we used to study maker economies in Portland, New York City, and Chicago and expand on the findings we outline above and our suggested directions for practice.

The Promise of the Maker Movement for Economic Development

The maker movement is the result of changes in both technology and consumption (Anderson, 2012; Dougherty, 2012; Hatch, 2013; Marsh, 2012). The accessibility of open-source design software and rapid-prototyping technologies such as three-dimensional printers, personalized computer-numerically controlled machine tools, and printed circuit boards dramatically reduces the resources necessary to engage in product design and fabrication. This puts technology directly into the hands of people who want to create unique material objects. Falling prices for this advanced equipment make it progressively easier for would-be entrepreneurs to experiment with designs and refine their skills. Individuals yearning to reconnect with the material world want to "engage passionately with objects in ways that make them more than just consumers" (Dougherty, 2012, p. 12) and support new interest in making. Makerspaces provide affordable and shared access to capital-intensive equipment and serve as learning communities in which people take classes, share technical knowledge, and connect with peers (Browder, Aldrich, & Bradley, 2017; van Holm, 2017). These spaces can either require membership or allow access to the public.

Many makers treat their work as a hobby, but some establish small-scale manufacturing businesses, creating clothing and fashion accessories, furniture, specialty food products, and connected devices that use sensors and telemetry to enable a variety of applications. Barriers to market entry for these small-scale producers continue to fall. Online and in-person communities of practice help maker-entrepreneurs define production specifications. Web-based technology enables them to prototype, refine, and then generate small batches of products. Social media, as well as internet marketing platforms such as Etsy, allow maker-entrepreneurs to reach consumers easily. Changes in consumption also support maker enterprises: Consumers increasingly want to eat, wear, and use products created locally through neo-artisanal production methods (Heying, 2010; Roy, Acott, Preston, Cogliantry, & Lee, 2015) and to purchase goods customized to personal specifications (Bryson, Clark, & Mulhall, 2014; Maker Media & Deloitte Center for the Edge, 2013).

Researchers find makers to be more collaborative than typical entrepreneurs; makers gather both in online communities and in makerspaces to "share tools, expertise and ideas in a very practical way" (Browder et al., 2017, p. 17). Maker enterprises, most of which operate as sole proprietorships, remain nearly invisible to business databases such as Reference USA or Dun & Bradstreet or to conventional employment statistics.

Elected officials and planners have responded enthusiastically to the maker movement because its growth coincides with a general resurgence of interest in and advocacy for manufacturing in the United States. Manufacturing refreshes the advanced knowledge crucial to economic diversification and helps designers to develop better products (Balland & Rigby, 2017; Clark, 2013, 2014; Pisano & Shih, 2012). Regions where firms have integrated innovation and design with manufacturing production capacity have grown faster and added more jobs than regions that have remained specialized in one or the other (Doussard & Schrock, 2015; Lowe & Wolf-Powers, 2017). Makers' focus on relinking manufacturing production with design thus positions the maker movement as a potential means of rebuilding local manufacturing capabilities.

The maker movement holds particular attraction for central city–based planners because maker economies

appear to rely on physical density. Proximity to peer firms, skilled labor pools, and sophisticated, high-income consumers creates a fertile environment for maker-entrepreneurs, particularly at the beginning of the lifecycles of many firms, when they produce in small batches and often rely on shared equipment (Friedman & Byron, 2012). Fewer vehicle miles traveled and relatively well-paying jobs are good reasons for local governments to plan deliberately for industrial activity in urban areas despite high land costs (Chapple, 2014). The small firms identified with the maker movement do not face declining space at affordable rents to the extent that larger manufacturers do (Hum, 2016; Leigh & Hoelzel, 2012), but availability of space becomes relevant if they scale up and add employees.

Existing scholarship suggests that the economic development benefits of the maker movement extend beyond the generation of employment. Growth in urban production creates jobs directly (Berger, 2013). Manufacturing, however, makes other contributions to economic development, such as stimulating product and process innovation and building a region's endowments of skill and technical knowledge (Balland & Rigby, 2017; Malizia & Feser, 1999). Small manufacturers who channel consumer spending toward locally produced goods, including artistic products, help to circulate income locally, to spark new export industries, and to build distinctive and attractive places (Markusen & Schrock, 2006, 2009). Makers often identify strongly with the localities in which they operate and place importance on sourcing inputs locally (Heying, 2010; Roy et al., 2015).

Many policy efforts now aim to support maker communities (Hirschberg, Dougherty, & Kadanoff, 2016; National League of Cities, 2016; Obama White House Archives, 2015a, 2015b). Understanding how planners can most effectively support maker businesses, however, requires answers to several questions. Little is known about how makers operate their businesses, how or where they intend to expand, their motivations, the challenges they face, or the resources they rely on as small-scale manufacturers operating in cities whose economic development efforts typically focus on service sectors (Clarke & Gaile, 1998). Will these businesses add employees or remain small? Will they produce locally or outsource production to scale up? Will they generate economic development benefits that do not stem directly from local employment generation?

We also embed our investigation of urban maker economies in the economic development literature on entrepreneurship development. This literature suggests that local environments condition the ability of innovators to form and grow firms. Scholars use the term *entrepreneurial ecosystem* to refer to place-specific institutional support structures that foster thick networks of relationships between start-up firms and the external resources they need to thrive. These external resources include business service providers, suppliers, financing sources, and providers of technical assistance. External resources also include forums and venues in which peer businesses connect with one another. A growing consensus in entrepreneurship research argues that promoting a soft infrastructure of interfirm relationships should take precedence over providing direct interventions such as tax subsidies or business incubators (Auerswald, 2015; Mason & Brown, 2013; Motoyama & Knowlton, 2016; Motoyama, Konczal, Bell-Masterson, & Morelix, 2014).

The role economic development planners can play, however, remains unsettled. Entrepreneurs may themselves generate many of the external resources needed for successful industrial clusters (Feldman, Francis, & Bercovitz, 2005). The question of how economic development policy should support the maker movement therefore intersects with broader questions about how local maker entrepreneurial ecosystems (MEEs) develop and function.

How We Found Makers and Learned About Their Businesses

Determining how local economic development planning should approach the maker movement requires learning about makers' origins, goals, and challenges as well as identifying how they interact with other local actors. A team comprising a senior colleague with extensive expertise on artisan economies, three graduate students, and three economic development scholars designed and conducted a cross-sectional study of maker-entrepreneurs and supporting institutions in Chicago, New York City, and Portland between April 2015 and April 2016. The three research sites vary considerably in terms of size, market conditions, and industrial composition, yet each contains a critical mass of maker activity. Figure 1 summarizes the age (i.e., time in business) and number of employees of the 95 firms whose principals we interviewed (26 in Chicago, 39 in New York, and 30 in Portland).

We precisely defined the term *maker-entrepreneur;* we excluded hobbyists and crafters from our sample and interviewed only makers who were generating revenue from the production and sale of products they had designed; that is, they operated a commercial enterprise. We also included only firms that manufactured or craft-produced physical end products. We did not interview visual artists making one-off pieces or makers creating software and digital media. The sample encompassed both makers engaged full time in managing enterprises and

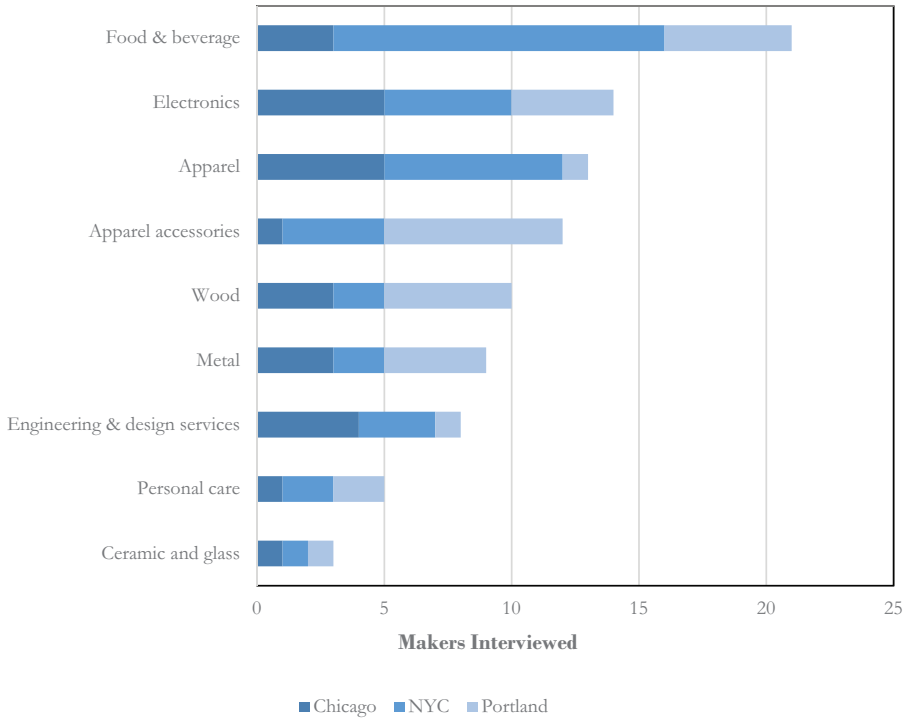

Figure 1. Makers by sector and city. NYC = New York City.

those whose firms functioned as side businesses or sources of secondary income. Our definition emphasized the integration of design and production activities, but our sample included some firms that had transitioned from in-house to outsourced production while scaling their operations. Table 1 shows the categories into which we stratified our sample of firms to achieve industry and product diversity.[1]

Our semistructured interview protocol focused on company and founder background; production methods and process; sales and market geography; and relationships with public, private, and nonprofit support organizations. We also asked respondents to characterize their plans for their businesses going forward. The team pretested the interview protocol with a small group of firms in each city in April 2015, refined the protocol, and then conducted the interviews in the summer and fall of that year (both principal investigators and graduate assistants conducted interviews). We generated written interview summaries that we converted to usable data in two ways. We first used the summaries to generate an extensive set of descriptive statistics on the enterprises. Graduate assistants (and in some cases the principal investigators) then coded the summaries thematically, using the web-based qualitative analysis software Dedoose and referring to codebooks developed collaboratively by the entire team. Researchers from each site independently coded the same sample interview excerpts to ensure consistency and reliability.[2]

The team used methodological triangulation to determine how maker firms grew, how they differed, and how they operated within the entrepreneurial ecosystems of their cities. We strategically compared each conclusion we

Table 1. Maker-entrepreneurs by product type.

	No. of firms interviewed			
Products made	**Chicago (IL)**	**New York City (NY)**	**Portland (OR)**	**Total**
Durable and/or household craft goods, including apparel, furniture, and jewelry	14	18	20	52
Food and beverage products and artisanal/craft-produced goods	3	13	5	20
Technology-based and/or -embedded objects, including robots, internet-connected devices, and wearable technology	9	8	5	22
Total	26	39	30	95

drew with data from other interviews and existing scholarship, and subjected each tentative finding to scrutiny from every member of the research team. This process enabled us to determine how makers contribute to economic development and to draw inferences about how economic development practitioners can support them.

We also characterized the entrepreneurial ecosystem of each case city, following the same approach we used with maker-entrepreneurs. We conducted 41 interviews with key personnel at public agencies, private firms, and nonprofit organizations serving maker enterprises. We identified them inductively through online and other data sources. We also contacted groups and firms we learned about while interviewing maker enterprises. Interviews focused on a firm's institutional history, activities and functions, and value propositions (i.e., how each firm understood its contributions to local maker ecosystems). The principal investigators interpreted data that the team had gained from maker-supporting organizations, inferring the broader institutional environments surrounding maker firms in each place.

Our approach has four limitations. First, we cannot know the actual population parameters for our site-based samples or confirm how representative our sample is because we lack a comprehensive inventory of maker-identified businesses. We may also have faced response bias; those we interviewed may have been more enthusiastic about the growth potential of their businesses, or more devoted to social goals, than the larger population of maker firms. Second, our data come from three cities that possess the advantages of density, a concentration of human capital, and historical industrial diversity and thus may not be representative of all cities. Third, our research focuses on central cities, not addressing the broader metropolitan context for maker economies. Fourth, because we focus on revenue-generating businesses we did not address the potential value for local economic development of youth-oriented initiatives that situate making-related technologies in schools, libraries, and community centers.

Understanding Maker Enterprises

Maker firms tap into technologies that enable them to easily and cheaply generate product prototypes, engage in small-scale production at a low cost, and use crowdsourcing and social media to reach and cultivate customers. Makers in our sample, as shown in Table 1, manufacture three broad types of product: durable craft goods, artisanal food and beverages, and products that combine materials and design knowledge with expertise in software and computer-programmable machinery. These product types originate from distinct sets of technical capabilities, entrepreneurial motivations, and values.

Makers in the apparel, food, and household goods sectors tend to value craft and artisanship. The owner of a preserved fruits and vegetables company in New York City discussed the pride she takes in her connection to the food she creates and to the people who consume it:

> Being part of a community is important. We all want to be a part of a tribe. Seeing a group of people making things, it makes me proud to be a part of it. Having been in bigger business, I realized that in America, we don't make things anymore. There has got to be a group of people like us to help grow the economy, and to make good use of people's time and energy and money.

Makers creating electronic devices and machines (or hardware), in contrast, appear to value the culture of open-access technology and digital fabrication. They emphasize the development of a community of peers concerned with and curious about the possibilities of robotics and remote sensing and demonstrate eagerness to generate precise, elegant products programmable by their users. A Portland-based entrepreneur, for example, produces a soldering iron that runs on a solar battery; a Brooklyn company has a machine that makes specialty coffee beverages to custom specifications; a Chicago-based firm makes a global positioning system (GPS) tracker that enables bicycle owners to locate and recover their bicycles after loss or theft. Makers in the electronics sector often post specifications for their product prototypes on websites for others to replicate.

Our interviews indicate that many maker-entrepreneurs become business owners reluctantly or accidentally. Table 2 shows that a plurality have art and design backgrounds, whereas many others trained as engineers. Their businesses often started as hobbies, design projects, or problem-solving exercises. Many makers focus more on products than markets; many assert that making things itself constitutes a valuable end. Makers tend to express strong value orientations and to see themselves as part of a social project that extends beyond individual ventures and into social and geographic communities.

The desire of many maker-entrepreneurs to change the world around them extends to norms of work, production, and consumption. One Portland entrepreneur whose company makes high-end razors remarked that when he was studying the business side of engineering in college,

> outsourcing the manufacturing overseas [was] presented as "This is just how it's done," [but] when you

Table 2. Educational backgrounds of principals in maker firms.

Bachelor's degree type	Count	Share
Art and design	39	41%
Science and engineering	18	19%
Business and law	17	18%
Social science and humanities	11	12%
Other fields	10	11%
Total	95	100%

Table 3. Market sales range for makers.

Location of primary end market	Count	Share
Local	10	11%
Regional	13	14%
National	37	39%
International	35	37%
Total	95	100%

> can't see a product being made you don't know how it's being made or who's making it. If the manufacturing is being done here, I care about the employees because I know them and see them. One of our goals is to create jobs for others, and to have these jobs be qualitatively enjoyable.

A Chicago fashion producer discussed her effort to promote a "quality over volume" approach to consuming clothing:

> People don't know about the sweatshops or pollution associated with "fast fashion." It's better to get people to wear something more than once rather than buy 10 pieces they wear once…. What would it take to convince women to wear a piece continuously rather than replacing it every year?

A plurality of our respondents conveyed strong investment in the future of the places where they live. Several respondents understood employment multiplier effects. A Portland-based maker of specialty textiles asserted,

> Most appliqué work has been exported to Asia over the years…. [The business] is happy to pay extra to do this in house. I understand the local multiplier effect that occurs when you pay someone to do the work in house.

Figure 1 demonstrates that maker-entrepreneurs are small and that they have typically been in business a relatively short time. All but two of the firms we interviewed have 25 employees or fewer. Half are sole proprietorships. The average firm has 4.5 employees, and the median has 2 employees. Just 20% have more than 10 employees. Moreover, 95% of the firms in our sample were founded after 2000, with 51% founded after 2010. Yet as the data in Table 3 demonstrate, 76% of the firms we interviewed export their products outside their regions in spite of their size and relatively short time in existence. Approximately 40% of the firms in our sample sell their products nationally, and 37% sell internationally. A Portland producer of specialty microphones exemplifies makers' attachment to their places of origin and their ability to reach external markets. This entrepreneur began making microphones as a hobby, developed his product in the Portland local music scene, and identifies with Portland. But he now ships to musicians all over the country. A Chicago producer of specialty food bars, who now employs 10 people, provides another example. He began by producing his own brand for distribution to local retailers. Eighty percent of his revenue currently results from manufacturing energy bars for mainly nonlocal companies. The ease of online marketing and sales and the availability of drop-ship distribution help makers capture and serve nonlocal customers more easily than they would have been able to do even 10 years ago.

Maker-Enabling Entrepreneurs

Four elements—attention to product design and the act of making, habits of collaboration with peers, a sense of a social mission, and attachment to place—link maker-entrepreneurs across the three case cities. Each case city also manifests a robust set of intermediary firms and organizations, or maker-enabling entrepreneurs (MEEs), that address the challenges makers face as they build commercial. Table 4 identifies six different functions that MEEs perform: technology access and prototyping, real estate and affordable workspace, business technical assistance, finance and capital access, sales and marketing platforms, and networking and community building.

Most MEEs perform multiple functions. Evergreen in Brooklyn (NY) provides technical assistance and business skills to fledgling food entrepreneurs and advocates for municipal policies, such as industrial zoning enforcement, that will enable firms to expand and add employees while remaining in the city. Portland's ADX and Catalyze in Chicago offer the founders of early-stage manufacturers access to tools and prototyping equipment while also functioning as social communities whose staff and members

Table 4. Services provided by maker-enabling entrepreneurs.

Service type	Services provided	Representative organizations
Technology access/ prototyping	Makerspaces where maker-entrepreneurs share manufacturing equipment (laser cutters, 3D printers, CNC lathes) and knowledge. Access can be paid or open to the public.	ADX Portland (OR) Brooklyn (NY) Fashion and Design Accelerator Catalyze Chicago (IL)
Real estate/affordable workspace	Shared spaces where maker-entrepreneurs rent workspace below market rents. Many operate as incubators providing business assistance or as collectives with informal knowledge exchange and mentoring.	Organic Food Incubator, NYC Industrial Council of Near West Chicago Tillamook Station, Portland
Business technical assistance	Services such as input sourcing, personnel management, branding, and product distribution.	Evergreen Exchange, NYC MakerBiz Chicago Crowd Supply, Portland
Finance/capital access	Organizations providing networking, access to investors, and working capital for business expansion.	New York City Partnership Fund Sandbox Industries, Chicago Craft3, Portland
Sales/marketing platforms	Platforms and venues for maker-entrepreneurs to market their goods and connect with customers locally and globally, including online marketing sites, retail establishments, and fulfillment services.	Etsy, NYC Wolfbait & B-Girls, Chicago Made Here PDX, Portland
Networking, community building, and advocacy	Soft infrastructure organizations build peer networks, brand identity, and local sales. Collectively, these organizations take up political issues, including industrial land use.	New York's Next Top Makers (NYC Economic Development Corporation) Portland Made Collective

Note: 3D = three-dimensional; CDC = computer-numerically controlled; NYC = New York City.

mentor younger firms and connect them with investors, business opportunities, and subcontractors. The director of Catalyze, who also runs a firm that creates connected devices, spoke about the organization's hybrid role:

> As we built this initially, we thought sharing the tools was going to be the best benefit, but what we saw was that the community was so much more important. Being able to sit next to an electrical engineer is amazing and an industrial developer, and an iOS [i-branded operating system] developer. Just having all those skills, those are the skills I needed to build [companies] but didn't have.

Table 5 shows that MEEs contain more for-profit firms than nonprofits or government agencies. We find that maker firms look to other for-profit entrepreneurs to help them build their businesses. A growing set of for-profit service providers now mines the commercial opportunities inherent in helping start-up makers get to scale, find financing, and reach customers. Some makerspaces operate as for-profit businesses. For-profit intermediaries also play a major role in assisting makers who want to produce at scale but who have limited or nonexistent manufacturing experience. The Portland firm Crowd Supply, for example, takes on clients who have viable prototypes but cannot raise start-up capital and operationalize manufacturing. Crowd Supply gets a percentage of the capital its clients raise and a percentage of their product sales in exchange for helping clients raise funds and make supply chain connections.

Makers also rely on for-profit firms as sales and market outlets. Such enterprises provide online sales and fulfillment platforms, represent maker businesses at trade shows, and provide brick-and-mortar retail spaces that sell makers' products. Made Here PDX, located across the street from the iconic Powell's Bookstore in downtown Portland, stocks 180 different brands of locally made goods on consignment. Wolfbait & B-Girls retails clothing, accessories, and merchandise from more than 170 Chicago artisans at its storefront in the Logan Square neighborhood. For-profit intermediaries dominate local maker ecosystems, echoing entrepreneurship research that concludes that emergent industrial clusters are to a large degree self-created by entrepreneurs (Feldman et al., 2005).

Not-for-profit organizations and the public sector remain important, however, in areas where resources that fledgling firms require are unavailable through the market. City governments and nonprofit groups make important contributions to place branding and marketing, for example, by sponsoring "Made In ____" campaigns that

Table 5. Maker-enabling entrepreneurs by primary function and sector.

Primary function	For profit	Nonprofit	Public sector	Total
Technology access/prototyping	3	8	0	11
Sales/marketing platforms	10	0	0	10
Real estate/affordable workspace	3	4	2	9
Business technical assistance	3	2	1	6
Finance/capital access	1	3	0	4
Networking, community building, and advocacy	0	1	0	1
Total	20	18	3	41

help build demand and signal official support for local manufacturers (Urban Manufacturing Alliance, 2013). Nonprofit organizations or government entities in all three cities make deliberate efforts to cultivate mutually beneficial relationships among makers, local suppliers, local contract manufacturers, and financial investors. In New York City, for example, Futureworks Incubator (formerly the Next Top Makers program) coordinates incubation support services that help start-up maker firms in the digital technology area refine their products, build business knowledge, and connect to established manufacturers in the city.

Cities and nonprofits also play a part in ensuring that fledgling manufacturers have physical space, going beyond the now-standard intervention of providing or supporting makerspaces. Developing makerspaces stands as a priority for cities aspiring to grow maker businesses, but makerspaces do not address the real estate needs of fully incubated firms ready to expand. Mission-driven industrial landlords that take a double bottom-line approach to their rental properties appear to be more central than makerspaces to the survival and growth of maker enterprises. New York's Greenpoint Manufacturing and Design Center and Brooklyn Navy Yard, Tillamook Station in Portland, and the Industrial Council of Near West Chicago charge enough rent to cover their operating expenses but accept less revenue than the highest and best use in the marketplace would generate. A crucial factor in the ability of urban maker-entrepreneurs to thrive and expand is having affordable space convenient to their homes, suppliers, and customers.

There are important variations as well as similarities among MEEs in Chicago, New York City, and Portland. Ecosystem institutions in each city target the dominant maker-entrepreneur populations. A cluster of hardware and electronics entrepreneurs in Chicago reflects the continuing strength of manufacturing and industrial design in that city, whereas the balance in New York City and Portland tips more toward craft and artisan makers. Table 6 shows that New York City's makers draw directly on its historic specialization in food and fine arts, just as Portland makers draw from the city's wood products and metal-working sectors. Two New York maker-enabling entrepreneurs focus on the fashion sector, one serves food producers, and others draw from the city's arts culture. Maker culture in Portland draws on that city's environmentally and socially responsible enterprises as well as its computer hardware and software scenes.[3]

Three Types of Makers and Their Contributions to Economic Development

Local officials devote increasing resources to supporting the maker movement, often in the hope of reviving flagging manufacturing economies. Yet most makers currently operate as start-ups or sole proprietors. A key question for economic development practitioners is whether makers will generate significant local employment growth in the future and, if so, whether they will boost demand for

Table 6. Maker product specializations by metro area.

Product type	Chicago (IL)	New York City (NY)	Portland (OR)
Apparel	5	7	1
Apparel accessories	1	4	7
Ceramic and glass	1	1	1
Electronics	5	5	4
Engineering and design services	4	3	1
Food and beverage	3	13	5
Metal	3	2	4
Personal care	1	2	2
Wood	3	2	5
Total	26	39	30

Table 7. Average full-time equivalent (FTE) employees by firm type.

Firm type	Average FTEs	Total employees
Micromaker (n = 23)	3.7	84
Global innovator (n = 20)	3.95	79
Emerging place-based manufacturer (n = 52)	5	264
All maker firms (N = 95)	4.5	427

production workers. We use firms' responses to questions about their production locations, and about their intentions with respect to future expansion, to address these questions. We segment the respondents into three categories. *Micromakers*, as we define them, produce within their local regions but want to maintain their current size. The firms we call *global innovators* want to grow or to be acquired yet have chosen to produce outside of their regions of origin, either elsewhere in the United States or overseas. The enterprises we refer to as *emerging place-based manufacturers* produce within their regions, and their principals report the intention to expand. Data on these firms validate the premise that the maker movement can be a source of job growth. As we report below, however, these firms remain relatively small for the time being, and they face barriers to scaling up.

Table 7 shows that micromakers (n = 23) account for 24% of the firms we interviewed. Micromakers express a commitment to craft production—making as its own reward—and value direct, daily involvement in the manufacturing process. They fear that rapid scale-up will outpace their skills and resources and diminish the time they can spend on design and craft. A New York City ceramicist noted,

> I don't want to grow so much that I need to hire employees. I'm trying to use social media more and be more informal about showing my work. Other than that, there's no 5-year plan…. I rarely think of myself as a small business owner. I'm really an artist, but I recognize that in order to succeed in [New York City], you need to think of yourself as a business.

A Chicago producer of hand-turned decorative wood products said,

> People tell me I should just do it with a [computer-numerically controlled] router, but the whole reason I started doing this was to get away from the computer, and my customers like that it's handmade and each one slightly different.

Our interview results suggest that micromakers will likely not affect local economies directly as employers. They chiefly contribute to regional economic development by providing livelihoods for their sole-proprietor owners and nurturing the cultural distinctiveness that makes places attractive for living and working. Micromakers also support specialized producer services enterprises (see Markusen & Schrock, 2006, 2009).

Global innovators (n = 20) account for 21% of our sample. These enterprises rely on talent and resources in their cities of origin to design products and iterate prototypes and typically conduct early-stage production there. They then use global outsourcing arrangements when they begin scaling up to manufacture for larger markets. They make this decision based on both cost per item and the presence in Southeast Asia of complete and easily navigated supply chains often unavailable in the United States. A New York–based maker of durable fashion accessories noted that despite geographic distance, working with a contract manufacturer in China saves both costs and effort. An entrepreneur whose company made internet-connected thermostats[4] explained the decision to outsource to China once the firm was doing product runs of 5,000 or more:

> The electronics supply chain is in China. We would really have just manufactured the stuff in the U.S., but it was legitimately really hard at this point to do this. You had really high-end guys who wanted to do like specialty stuff or you had people doing the cheapest possible stuff. There was not expertise at doing stuff nimbly and inexpensively.

We conclude that companies that outsource production do not create local production jobs, although they still contribute creative energy to urban economies. They employ engineers, industrial designers, and programmers, and they generate business for dozens of auxiliary enterprises, from crowdfunding platforms to advertising agencies to law firms.

Emerging place-based manufacturers, which we define as firms that produce locally or regionally and whose principals report the intention to grow, make up more than half of the maker enterprises we surveyed (n = 52).

We find that the principals of many emerging place-based manufacturers have strong place attachments and social commitments, strive to source materials locally, and think of their businesses as social enterprises. Many produce goods, such as food and beverages or bespoke products, that require manufacture close to their end markets. Some have returned to local production after finding global outsourcing unsatisfactory. The principal of one Chicago

shoe company returned to domestic operation after ordering 1,200 pairs of shoes from a Chinese contractor, which arrived "6 months late and poor quality":

> They fell apart almost immediately. I think it was because the factory was busy with bigger orders and made changes to my process because they thought I didn't know what I was doing.… I had to disassemble the 2,400 shoes from China and reassemble them. Because I had to be more systematic, the process taught me how to subdivide tasks. It taught me that I could scale up to mass production on my own.

This entrepreneur faces challenges despite her success; she struggles to raise capital and avoids hiring production employees even when they would lighten her own burden. She was beginning to participate in a local women in tech mentorship program when we interviewed her and was considering collaborating with an entrepreneurship center at a local university. Her experience suggests the importance of local entrepreneurial ecosystems for this type of manufacturer.

The Chicago shoe manufacturer is not an isolated case. Emerging place-based manufacturers appear likely to have organic connections to local institutions that connect them with larger, longer standing industrial businesses. The president and chief executive officer of the Brooklyn Navy Yard Development Corporation, a nonprofit real estate provider that hosts both makers and more traditional industrial tenants, articulates this point:

> What we find is that makers are drawing from the strengths of [New York's] economy, the explosion of creative design happening here—drawing on those things but also making a physical product.… The home run for us is when a maker goes from a maker to a manufacturer.

The fact that more than half of the firms we interviewed both produce locally or regionally and intend to expand indicates potential for job growth. Most firms in the emerging place-based manufacturer category are still quite small, however, with 35 employing fewer than five people and 14 remaining, for the time being, sole proprietorships. Table 7 shows that with five full-time equivalent employees on average, they are only slightly larger than the micromakers and global innovators in the sample. They aspire both to produce locally and to grow, adding new employees. But this desired growth path will likely prove daunting in practice. The failure rate for start-up businesses is high, and there is no guarantee that as these firms scale up (or as other firms acquire them) they will not decide to relocate production, either domestically or overseas. The company MakerBot, which manufactures three-dimensional printers used by many in the maker community, grew between 2009 and 2015 from a small collective of founders to an enterprise with 400 production employees in Brooklyn. But its New York City workforce shrank after the industrial printing company Stratasys, which had acquired the firm in 2013, relocated production to China. Our data suggest that other makers will remain local but will manage high costs by specializing in luxury and custom goods, thus limiting their expansion potential.

Implications for Economic Development Planning

Elected officials and planners are responding enthusiastically to the economic development possibilities the maker movement presents. Yet most appraisals of the movement base their conclusions on broad generalizations about technological change, reports of the newfound popularity of makerspaces, or anecdotal data on specific business enterprises. We use a large qualitative data set, drawn from in-depth interviews in three cities, to offer a more informed understanding of maker firms and to assess their potential to promote local economic development. We directly investigated both maker businesses and supportive institutions, or maker-enabling entrepreneurs.

Makers produce a variety of products for a range of markets, and this is part of why they differ in significant ways relevant to planning practice. Maker-entrepreneurs are often idealistic and socially minded, expressing the desire to change the world around them by adhering to alternative norms of work, production, and consumption. Producers of durable craft goods (apparel, accessories, and household furnishings) and artisanal food value craft, artisanship, and attachment to local places and local production. Makers creating electronic devices and machines (or hardware), in contrast, value the culture of open-access technology and digital fabrication. Maker-entrepreneurs are small and have typically been in business a relatively short time. Yet in spite of this, 76% of the firms we interviewed export their products outside their regions. Our examination of MEEs reveals that maker firms tend to look to other for-profit entrepreneurs to help them build their businesses. But we also identified cases in which solely market-driven organizations fall short of these needs.

Our data help to address the question of whether the maker movement will lead to a significant increase in production employment in U.S. cities. Each of the three

types of makers we identify has a different likelihood of growing and producing in place. Global innovators appear to expand the capacity of cities for innovation and high-tech entrepreneurship, but they do not generate production jobs. Micromakers provide sources of income for artists and creatives who build economic vibrancy and distinctive places; the frequency with which they operate as sole proprietors and their desire to remain small, however, limit their potential to become major employers.

Emerging place-based manufacturers do have the potential to generate employment at a larger scale. This category of makers needs robust entrepreneurial ecosystems to achieve large-scale employment. Our interview data show that the scalability of emerging place-based manufacturers depends on the thickness of peer networks that furnish mentors and supply chain connections and on the existence of cultural support for consumption that reflects ecological and social values. Their scalability also depends on the availability of adequate real estate: Affordable space appears to matter more to these makers than does access to makerspaces.

Our findings suggest that economic development practitioners should moderate their most exuberant expectations, particularly the hope that the maker movement will lead to a significant increase in production employment in the United States. Yet our results lend support to the more modest premise that maker firms are a positive force for urban economic development. Economic development planners can improve their effectiveness by targeting their policy approaches in ways that account for unevenness in makers' motivations, aspirations, and market contexts. They need to understand both the benefit that each type of maker offers and the interventions appropriate to that type.

Micromakers benefit from technical assistance to sole-proprietor owners. Planners can develop policies that help micromakers comply with local regulations, enforce contracts, keep current with skills and technology trends, and engage in personal and business financial planning. Global innovators need what other professional services businesses need: transparent and consistent local regulations, high-quality higher education institutions, responsiveness from city departments in charge of providing basic infrastructure, and amenity-rich residential neighborhoods to attract highly mobile workers. Such measures already dominate policy efforts focused on improving local business climates. Practitioners focused on employment creation should prioritize support for emerging place-based manufacturers. Planners should consider policies and supportive actions that help address the market failures that these enterprises experience. These include branding campaigns that promote locally made products; efforts that connect maker-entrepreneurs with more established local manufacturers with whom they might contract for materials, components, or assembly; and programs to retain industrial land and write down rents for start-up businesses.

The maker movement remains in its infancy. Our findings suggest that maker ecosystems have potential to build urban creativity and distinctiveness, to spur innovation, and to generate some new employment opportunities, both directly and via the multiplier effect. Planners should bear in mind, however, the limited likelihood that makers will replace traditional urban manufacturing jobs lost to deindustrialization and (in growing cities) high land costs. This suggests that rather than hopping completely onto the makers bandwagon, planners should continue to support more traditional industrial retention efforts as well as industrial diversification.

Notes

1. A key criterion we used to define makers—the integration of design and production activities—is not easily observed in secondary data. We used a set of decision rules developed by Heying and Marotta (2015) to build a database of firms that met the criteria of a) developing and marketing new and novel products and b) engaging (or having recently engaged) in the manufacture of those products. We identified a total of 1,900 making candidates by compiling master lists of firms from a) lists provided by local organizations and programs such as Portland Made and Made in NYC, b) lists of past and present participants in makerspaces and maker faires, and c) internet searches for craft and artisanal manufacturers. Using our decision rules, we culled those lists, yielding databases of more than 200 makers in each city. We identified websites and social media accounts for each maker and used those resources to confirm that the maker remained active. Each active maker was then categorized according to type of product.

2. Interrater reliability tests produced a pooled Cohen's kappa statistic of .54, which indicates a fair degree of consistency in how the individual members of the research team applied the codes. See Wolf-Powers et al. (2016) for further detail about the interview protocols and process.

3. A fuller discussion of the variation and historical character of local maker ecosystems is beyond the scope of this article. We address this at greater length in Wolf-Powers et al. (2016).

4. A larger company acquired this company several years ago, and they now develop only software that enables people to communicate with their home heating systems via their computers and smartphones.

Acknowledgments

We are grateful to individuals representing numerous firms and organizations who gave their valuable time for interviews. We wish to thank Annie Levers for excellent research assistance and the Pratt Center for Community Development in Brooklyn (NY) and ADX in Portland (OR) for helping us generate our sample of maker enterprises.

Research Support

The Ewing Marion Kauffman Foundation metropolitan entrepreneurship research program funded this study.

References

Anderson, C. (2012). *Makers: The new industrial revolution*. New York, NY: Random House.

Auerswald, P. (2015). *Enabling entrepreneurial ecosystems: Insights from ecology to inform effective entrepreneurship policy*. Retrieved from http://www.kauffman.org/~/media/kauffman_org/research%20reports%20and%20covers/2015/10/enabling_entrepreneurial_ecosystems.pdf

Balland, P. A., & Rigby, D. (2017). The geography of complex knowledge. *Economic Geography*, *93*(1), 1–23. doi:10.1080/00130095.2016.1205947

Berger, S. (2013). *Making in America: From innovation to market*. Cambridge, MA: MIT Press.

Browder, R. E., Aldrich, H. E., & Bradley, S. W. (2017). *Entrepreneurship research, makers, and the maker movement*. Retrieved from https://www.researchgate.net/publication/312609426

Bryson, J. R., Clark, J., & Mulhall, R. (2014). The third industrial revolution and the city? Digital manufacturing and the transformation of homes into miniature factories. In K. Nawratek (Ed.), *New (industrial) revolution and the city* (pp. 107–116). New York, NY: Punctum Books.

Chapple, K. (2014). The highest and best use? Urban industrial land and job creation. *Economic Development Quarterly*, *28*(4), 300–313. doi:10.1177/0891242413517134

Clark, J. (2013). *Working regions: Reconnecting innovation and production in the knowledge economy*. New York, NY: Routledge.

Clark, J. (2014). Manufacturing by design: The rise of regional intermediaries and the re-emergence of collective action. *Cambridge Journal of Regions, Economy and Society*, *7*(3), 433–448. doi:10.1093/cjres/rsu017

Clarke, S. E., & Gaile, G. L. (1998). *The work of cities*. Minneapolis: University of Minnesota Press.

Dougherty, D. (2012). The maker movement. *Innovations*, *7*(3), 11–14. doi:10.1162/INOV_a_00135

Doussard, M., & Schrock, G. (2015). Uneven decline: Linking historical patterns and processes of industrial restructuring to future growth trajectories. *Cambridge Journal of Regions, Economy and Society*, *8*(2), 149–165. doi:10.1093/cjres/rsv003

Feldman, M., Francis, J., & Bercovitz, J. (2005). Creating a cluster while building a firm: Entrepreneurs and the formation of industrial clusters. *Regional Studies*, *39*(1), 129–141. doi:10.1080/0034340052000320888

Friedman, A., & Byron, J. (2012). High-tech, high-touch, and manufacturing's triple bottom line. *Innovations: Technology, Governance, Globalization*, *7*(3), 83–95. doi:10.1162/INOV_a_00141

Hatch, M. (2013). *The maker movement manifesto: Rules for innovation in the new world of crafters, hackers, and tinkerers*. New York, NY: McGraw-Hill.

Heying, C. 2010). *Brew to bikes: Portland's artisan economy* (1st ed.). Portland, OR: Ooligan Press.

Heying, C., & Marotta, S. (2015). *Tracking Portland's artisans/makers: Some notes and observations on database curation methodology*. Portland, OR: Portland State University.

Hirschberg, P., Dougherty, D., & Kadanoff, M. (2016). *Maker city: A practical guide to reinvention in American cities*. Retrieved from https://makercitybook.com/

Hum, T. (2016). *The hollowing-out of New York City's industrial zones*. Retrieved from http://www.metropolitiques.eu/The-Hollowing-Out-of-New-York-City.html

Leigh, N. G., & Hoelzel, N. Z. (2012). Smart growth's blind side. *Journal of the American Planning Association*, *78*(1), 87–103. doi:10.1080/01944363.2011.645274

Lowe, N. J., & Wolf-Powers, L. (2017). Who works in a working region? Inclusive innovation in the new manufacturing economy. *Regional Studies*. Advance online publication. doi:10.1080/00343404.2016.1263386

Maker Media & Deloitte Center for the Edge. (2013). *Impact of the maker movement: Notes from the Maker Impact Summit*. Sebastopol, CA: Maker Media.

Malizia, E. E., & Feser, E. (1999). *Understanding local economic development*. New Brunswick, NJ: Rutgers University, Center for Urban Policy Research.

Markusen, A., & Schrock, G. (2006). The artistic dividend: Urban artistic specialization and economic development implications. *Urban Studies*, *43*(10), 1661–1686. doi:10.1080/00420980600888478

Markusen, A., & Schrock, G. (2009). Consumption-driven urban development. *Urban Geography*, *30*(4), 344–367. doi:10.2747/0272-3638.30.4.344

Marsh, P. (2012). *The new industrial revolution: Consumers, globalization and the end of mass production*. New Haven, CT: Yale University Press.

Mason, C., & Brown, R. (2013, November). *Entrepreneurial ecosystems and growth oriented entrepreneurship*. Presented at the workshop organized by the OECD LEED Programme and the Dutch Ministry of Economic Affairs on Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship, The Hague, Netherlands. Retrieved from http://www.oecd.org/cfe/leed/entrepreneurial-ecosystems.pdf

Motoyama, Y., & Knowlton, K. (2016). From resource munificence to ecosystem integration: The case of government sponsorship in St. Louis. *Entrepreneurship & Regional Development*, *28*(5–6), 448–470. doi:10.1080/08985626.2016.1186749

Motoyama, Y., Konczal, J., Bell-Masterson, J., & Morelix, A. (2014). *Think locally, act locally: Building a robust entrepreneurial ecosystem* (SSRN Scholarly Paper No. ID 2425675). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract = 2425675

National League of Cities. (2016). *How cities can grow the maker movement*. Retrieved from http://www.nlc.org/Documents/Find%20City%20Solutions/Research%20Innovation/Economic%20Development/Maker%20Movement%20Report/Maker%20Movement%20Report%20final.pdf

Obama White House Archives. (2015a). *Building a nation of makers*. Retrieved from https://obamawhitehouse.archives.gov/blog/2015/05/04/building-nation-makers

Obama White House Archives. (2015b). *Seven days of making!* Retrieved from https://obamawhitehouse.archives.gov/blog/2015/06/23/seven-days-making

Pisano, G. P., & Shih, W. C. (2012). *Producing prosperity: Why America needs a manufacturing renaissance*. Boston, MA: Harvard Business Press.

Roy, K., Acott, P., Preston, M., Cogliantry, J., & Lee, A. (2015). *Portland made: The makers of Portland's manufacturing renaissance*. Portland, OR: Kelley Roy.

Urban Manufacturing Alliance. (2013). *UMA toolkit: How to develop a locally made branding platform*. Retrieved from http://urbanmfg.org/uma-content/uploads/2013/05/UMA-Local-Branding-Toolkit-Final1.pdf

van Holm, E. J. (2017). Makerspaces and local economic development. *Economic Development Quarterly*, *31*(2), 164–173. doi:10.1177/0891242417690604

Wolf-Powers, L., Schrock, G., Doussard, M., Heying, C., Eisenburger, M., & Marotta, S. (2016). *The maker economy in action: Entrepreneurship and supportive ecosystems in Chicago, New York and Portland. Portland,* OR: Portland State University.