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# Advancing Manufacturing?: Blinkered Visions in U.S. and Australian Urban Policy

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## ABSTRACT

Advocates argue that urban manufacturing holds potential to promote locally distinctive enterprises, quality employment and more socially-inclusive forms of urban development. However, little is known how urban policy actually supports manufacturing. This paper documents the policy response to urban manufacturing in the U.S. and Australia. We determine how policy documents conceptualise manufacturing and define goals and strategy around land use, business development and workforce development. The analysis demonstrates that manufacturing policy is situated between entrenched visions of deindustrialisation and emerging notions of a renewed, advanced manufacturing sector and that most cities struggle to address the inherent challenges of this condition.

有论者认为城市制造业能够促进地方特色企业的发展，提高就业质量，使城市发展更具社会包容性。然而对于城市政策如何支持制造业，人们知之甚少。本文梳理了美国和澳大利亚针对城市制造业的政策，探究政策文件如何塑造制造业理念，并决定土地使用、商业发展和劳动力开发诸方面的目标和策略。分析显示制造业政策处于去工业化的狭窄视界和新一代制造业的新理念的夹缝之中，大多数城市都在努力应对这种局面带来的内在挑战。

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Manufacturing has persisted in major western cities despite decades of offshoring, job loss and the removal of urban industrial lands under “post-industrial” land use policy (Ferm and Jones 2016). Advocates argue that new forms of urban manufacturing encompassing advanced technologies, customised products and “maker” scenes offer potential to promote locally distinctive enterprises, quality employment and more socially inclusive forms of development (Mistry and Byron 2011; Hirschberg *et al.* 2016; National League of Cities 2016; Wolf-Powers *et al.* 2017; Budge 2018). As a result, the restructuring of manufacturing challenges cities to plan for a *reindustrialisation* of the urban economy (Christopherson *et al.* 2014) with progressive socio-economic outcomes firmly in view (Clark 2012). Yet, smart growth policies continue to rezone urban industrial land for mixed-use infill projects (Leigh and Hoelzel 2012) and property-led redevelopment is geared largely towards higher-end residential and commercial activity and knowledge and creative industries (Wolf-Powers 2005; Curran 2010). A failure to grasp the changing shape of urban manufacturing and the ability to incorporate compatible activity into redevelopment programmes may close off significant economic and social benefits.

The purpose of this paper is to document the planning and policy response to urban manufacturing in this context. We seek to determine how current urban planning and policy documents

conceptualise manufacturing and define policy goals and strategy around land use, business development and workforce development challenges. Our study is based on comparative policy analysis of 66 documents in four Australian and six U.S. cities. We selected the U.S. and Australia due to their similar metanarratives of deindustrialisation, and shared experiences of offshoring manufacturing and subsequent resurgences. Both countries have developed national innovation policies for science, engineering and technology with “advanced manufacturing” squarely in mind.

We find that manufacturing policy is situated between entrenched visions of deindustrialisation and emerging notions of a renewed, advanced manufacturing sector in a knowledge economy. This produces two contrasting visions and strategies of the future of manufacturing. Particularly in Australia, we find the maintenance of a traditional focus on developing outersuburban industrial sites alongside the active removal of central city industrial lands. By contrast, some U.S. cities target urban industrial activity and endeavour to support its preservation and development after years of zoning out industry. However, even where policy-makers support urban manufacturing, they pass over challenges inherent in knowledge economy agendas. Policy tends to emphasise the creation of development opportunities and growing high-tech, advanced manufacturing economies over developing the potential to support working-class jobs or new forms of craft manufacturing.

## 1. Planning and Policy for Urban Manufacturing

For over two decades, cities have planned for post-industrial change, as part of broader governmental agendas that position manufacturing industries as “inevitably in decline” and industrial lands as under-utilised and open to redevelopment (Stanford 2016). This has been underpinned by a powerful assemblage of intertwining discourses and planning and policy agendas around deindustrialisation and the offshoring of low-paid assembly line jobs (Urry 2014; Peck 2017), the emergence of the digital/knowledge economy and its inhabitation of discrete urban spaces such as technology parks and innovation precincts (McNeill 2016); and neoliberal forms of entrepreneurial governance emphasising place marketing and spectacular cultural consumption (Kong 2007; Wolifson and Drozdowski 2017). It is now well understood that response to these trends are variegated and geographically uneven (Brenner *et al.* 2010), and that manufacturing itself has been reconfigured and revived in diverse ways (Bryson *et al.* 2008; Hatch 2013). Yet, the simplistic policy narrative that manufacturing’s decline is inevitable, and that it needs to be replaced with other economic activity remains (O’Connor and Gu 2014; Stanford 2016; Beer 2018).

In contrast to the simplicity and linearity of decline and replacement narratives, research across urban studies has identified empirically four major dynamics reconfiguring urban manufacturing: (1) industry relations (and how they shape the exchange of knowledge, skills, values and work practices); (2) space and urban development (revisiting theories of urban agglomeration in light of changing urban development trajectories and industry characteristics); (3) technological innovation (the influence of digitalisation and new production technologies on production processes, communication, distribution and markets) and (4) the roles of government entities and their interaction with public and private stakeholders in fostering urban manufacturing. This paper focuses on the fourth dynamic, but does so in light of the existing stock of empirical observations regarding the other dynamics.

Competitiveness in contemporary urban manufacturing depends upon innovative design, customised production and collaborative, place-based production environments (Bryson *et al.* 2008; Bryson and Ronayne 2014; Wolf-Powers *et al.* 2017). There are thus significant links to cultural and craft-based production industries (Hatch 2013; Fox Miller 2017; Gibson *et al.* 2017; Grodach *et al.* 2017). At the same time, many cultural industries depend on local craft manufacturers to supply necessary materials and components (Thomas *et al.* 2013), as well as to undertake small batch runs of goods for which design is a key contributor to the commodity’s exchange value (Grodach *et al.* 2017). As manufacturing increasingly interfaces with design and cultural production activities, the social and institutional milieu proves increasingly important. Tacit rules and social norms help determine labour and production relations, access to information and resources, and other facets that shape an industrial field (Storper and Venables 2004). Moreover, innovation processes rely on

specialised and “combinatorial knowledge” bases across different fields and actors (Strambach and Klement 2012) as well as “unrelated diversification”, or new combinations of existing technologies or institutions that enable firms to develop new production innovations and surmount obstacles (Boschma *et al.* 2017). In policy terms, this implies a need to push beyond a traditional sectoral focus in economic development and look towards new policy platforms around shared and complementary knowledge (Asheim *et al.*, 2011; Budge 2018).

Meanwhile, much has been made of the potential of additive manufacturing, artificial intelligence (AI) and digital technologies to reconfigure production and usher in a fourth industrial revolution (Birtchnell and Urry 2016; Schwab 2017). As Clark (2012, p. 3) has succinctly put it, under Obama, “science and technology policy is manufacturing policy”. However, this directive towards advanced manufacturing and Industry 4.0 is not only ill-defined (Livesey 2015), but also may bias R&D-intensive, high-tech industries and lead to underinvestment in established “low-tech” craft manufacturing industries that provide important contributions to local economies and employment (Hansen and Winther 2015). Further, as Rylands *et al.* (2016, p. 969) found, new technologies like additive manufacturing tend to “compliment and strengthen traditional manufacturing value streams rather than replace them”.

Beyond technology, the urban context is vital for manufacturing. Policy-makers often assume that manufacturing needs outersuburban and large-scale greenfield industrial parks adjacent to transport infrastructure and that urban industrial areas have become obsolete (Leigh and Hoelzel 2012). Empirical evidence, however, suggests otherwise. Cities are where agglomeration economies flourish (Storper and Scott 2009; Clark 2014). Cluster dynamics propel the growing cadre of small urban manufacturers towards inner precincts proximate to clients, labour forces and other inter-dependent firms (Fox Miller 2017; Hatuka *et al.* 2017). Typically, these are older, inner-city industrial areas, suitably zoned to enable the use of noisy industrial equipment, chemicals and loading docks and offering flexible arrangements that accommodate multiple enterprises (Gibson *et al.* 2017).

The urban context also sheds light on interactions between evolving forms of manufacturing and hyper-competitive urban land markets. Industrially zoned spaces, including those used by urban manufacturers, are under threat from grand renewal schemes and the push to provide mixed-use housing and retail. Local governments often argue that the land use shift supports the transition to a post-industrial economy and serves to meet housing demand; yet, this may come at the expense of growing new businesses and quality jobs (Leigh and Hoelzel 2012; Lester *et al.* 2014). Moreover, evidence suggests that the decline of manufacturing is due at least in part to the lack of regulation and preservation of industrial lands (Wolf-Powers 2005; Curran 2010; Ferm and Jones 2016). Hence, overlaying the critical issue of how planning and policy supports urban manufacturing are questions of land allocation and the pressures brought to bear on the planning system by industry lobbyists and real estate interests.

Finally, we must recognise that the ways in which cities respond to the industrial, technological and urban spatial dynamics described above is in part shaped by the mobility of powerful policy ideas (McCann and Ward 2011). Although we do not trace how policy travels across jurisdictions here, it is important to stress that the narratives of deindustrialisation, urban transition and the knowledge economy influence governmental agendas towards manufacturing (Beer 2018). The circulation of such narratives trains urban policy actors– including planners, economic development officials and mayor’s offices– to seek supporting policy directives and legitimise decisions that in turn may lock-in specific policy paths (c.f. North 1991).

How governments conceptualise manufacturing in light of the competing policy narratives around manufacturing’s decline and renewal and whether they have developed economic development and land use regulations that respond to the above dynamics remains poorly understood. To this end, we trace the manner in which manufacturing is conceptualised across diverse U.S. and Australian cities, and how this shapes land use, business development and workforce strategies geared towards manufacturing.

## 2. Data and Methods

We conducted a comparative document analysis to determine how urban planning and economic development policy conceptualises and responds to urban manufacturing. We analysed economic development plans, comprehensive plans, district plans, land use plans and industry policy documents at the local and, where appropriate, regional and state levels in Australian and U.S. cities, 2010–2017. We selected Australia and the U.S. because policy discourse in both countries has framed manufacturing within the metanarratives of deindustrialisation and a knowledge economy. We used plans from 2010 because numerous studies mark this as the turnaround year in U.S. manufacturing employment and a growing advocacy for urban manufacturing in both countries (Gibson *et al.* 2012; Helper *et al.* 2012; Mistry and Byron 2011; Lester *et al.* 2014). Building on studies focused on industrial lands (Leigh and Hoelzel 2012), we have elected to conduct a wider analysis to better capture how different municipal agencies with powers to impact manufacturing conceptualise manufacturing and the ways that this influences policy strategy.

We chose to conduct a cross-country analysis to enable identification of a wider range of policy than in a single country, and to compare how policy sits in different contexts. In the U.S., most urban policy is implemented by local governments and quasi-public agencies whereas Australia has a stronger state-level system in which local governments are often more constrained by state intervention. Although both countries exhibit low-density urban development patterns, unlike the multimodal urban structure found in most U.S. cities, Australian cities (except Sydney) remain monocentric with a dominant Central Business District (CBD). At the same time, all regions in the study grapple with competitive real estate markets and, therefore, face similar pressures on industrial lands.

To select documents, we conducted a web search for all plans and studies available from relevant local, regional and state offices (e.g. economic development, planning, redevelopment, mayor's office). In total, we collected 24 documents from four Australian cities and 42 documents from six U.S. cities between 2010 and 2017 (Appendix 1).<sup>1</sup> Case study cities were selected to capture places with varied industrial legacies and shares of manufacturing employment across different regions of both countries. As Table 1 shows, the share of manufacturing employment in the Australian cities varies from just under 60,000 in Adelaide to over 200,000 in Melbourne. However, in both metropolitan areas, the share of manufacturing employment is just over 10%. U.S. study cities have overall higher manufacturing employment, but exhibit more variation in employment shares ranging from just 4.1% in New York to over 10% in Portland. All are currently

Table 1. Case study cities.

Australia	Manufacturing employment	Percentage of metro employment	United States	Manufacturing employment	Percentage of metro employment
Greater Adelaide, South Australia	59,748	10.4	Boston-Cambridge-Newton, MA-NH	150,651	6.22
Greater Brisbane, Queensland	93,623	9.3	Chicago-Naperville-Elgin, IL-IN-WI	384,784	9.34
Greater Melbourne, Victoria	208,621	10.8	Nashville-Davidson–Murfreesboro–Franklin, TN	68,911	8.64
Greater Sydney, New South Wales	175,274	8.5	New York-Newark-Jersey City, NY-NJ-PA	335,792	4.13
			Portland-Vancouver-Hillsboro, OR-WA	101,221	10.34
			San Francisco-Oakland-Hayward, CA	114,521	5.60

Note: Employment data from Australian Bureau of Statistics (2011) and U.S. Census (2015).

dealing with competitive urban property markets, but share an interest in developing their manufacturing sectors as evidenced by the plans and policy documents.

The analysis concentrates on the way in which documents: (1) define and conceptualise manufacturing (including advanced, legacy and craft manufacturing and maker activity), (2) target specific sectors or types of activity (e.g. food or apparel manufacturing, small manufacturing, specific areas or industrial districts), (3) identify and prioritise issues and challenges (e.g. land use conversion, skills training, access to capital) and (4) policy goals and strategies. In the first stage of analysis, two individuals conducted targeted keyword searches for the words “manufactur-”, “advanced manufacturing”, “industrial”, “maker”, “craft” and “artisan” in each document. We selected these words to cover the range of expected references to manufacturing (and its variants) in the policy documents given the recent trends and discussions around manufacturing described above. Second, researchers compared and compiled their initial keyword search results. Finally, using the keyword search as a guide, the individuals independently conducted detailed readings of each document to identify and determine the association between priority issues, policy goals and strategies in relation to manufacturing. This information was extracted, sorted and compared for analysis based on each of the four categories in table form.

A limitation of our study is that, in focusing on plan content, we do not analyse the actual construction or implementation of policy. However, studies of policy discourse and texts contribute to better understanding how policy decisions are legitimised and organised (Jacobs 2006). We also hope that this work can serve as a foundation for future research on policy implementation (see Budge 2018). Moreover, developing a better understanding of recent urban policy directions for manufacturing can help policy-makers identify strategies that attend to the legacy of “post-industrial” planning and support urban manufacturing.

### 3. (Re)Conceptualising Manufacturing

Policy documents in both countries— Australia in particular— attempt to rebrand manufacturing within the narrative of a high-tech, innovation-driven advanced manufacturing economy. While this responds to lingering notions of manufacturing as suffering “rust belt” decline, it sets up a policy blindside when it comes to “low-tech” (Hansen and Winther 2015) and craft manufacturing. By contrast, in the U.S., we find a more varied conceptual framing of manufacturing within and between cities. Although the advanced manufacturing discourse is strong, a number of cities also attempt to incorporate urban manufacturing tied to legacy industries and cultural and “maker” economies.

#### 3.1. Australia

Australian cities uniformly frame manufacturing around the narrative of inevitable decline (Stanford 2016). Planning and economic development policy documents alike point towards a loss of manufacturing employment as global changes drive competitive advantage in knowledge and creative industries. The Adelaide strategic plan (Adelaide, 2016, p. 7) expresses concern that “economic growth is subdued as we shift from manufacturing and mining to new knowledge-based industries”. Melbourne’s metropolitan plan similarly recognises that the city “has progressively moved from an inwardly focused manufacturing economy to a globally focused, knowledge-based service economy” (VPA, 2014, p. 3). In inner-city Sydney, industries “with lower rent sensitivities have relocated to less expensive land often on the urban periphery. Others have simply stopped operations in Sydney or altogether” (Leichardt (2013, p. 20). Consequently, localities like suburban and historically industrial Parramatta (2011, p. 13) in Sydney seek a “knowledge-based economic identity” to address a continued decline in manufacturing.

As a result, Australian economic development and industry policy-makers make a case for manufacturing by aligning it with a growing knowledge economy. The state of New South Wales (NSW, 2012, p. 1), which encompasses planning responsibilities for Sydney, argues that “a thriving, diverse and modern manufacturing sector is fundamental to a balanced NSW economy...[it] creates diverse skilled jobs within aligned sectors, fuels innovation and continuous improvement in research and development”. South Australia (GSA, 2012b, p. 6), home to Adelaide, claims that “a competitive and strong manufacturing industry will be critical to South Australia’s future in the global knowledge economy”. Similarly, RDA Brisbane (2013, p. 98) claims “Brisbane is an evolving city with a growing “knowledge economy”, one which will increasingly be characterised by high-value professional services and skilled manufacturing”. Plan Melbourne and the Inner Melbourne Action Plan view advanced manufacturing as among the city’s “knowledge-based industries” (Melbourne, 2016; VPA, 2014).

Indeed, Australian cities and states foremost target “advanced manufacturing” industries. As Queensland’s Department of State Development (QDSD, 2016, p. 5) envisions, “It is not about mass manufacturing of goods...It is going to be of higher value and highly-specialised manufacturing”. Supporting this, the Southeast Queensland Regional Plan, which covers greater Brisbane, includes advanced manufacturing among its target industries (Qld, 2016). Similarly, South Australia (GSA, 2012b) targets “high value manufacturing” and seeks “a critical mass of innovative manufacturing firms and high-performance workplaces with the knowledge, skills and capabilities to compete on value, not cost”. Its *Look North Economic Plan* (2016, p. 22) sees “the transformation of traditional manufacturing to new advanced manufacturing processes and markets [as] central to the region’s future economic health”. In Greater Sydney, Liverpool (2013) sees an opportunity to develop a competitive advantage in advanced manufacturing, and Parramatta (2011, p. 41) around “advanced manufacturing/ecoindustrial jobs growth”. Advanced manufacturing is also among Inner Melbourne’s “specialist economic clusters” (Melbourne, 2016, p. 31). Additionally, planning documents in each city target industrial areas for the development of advanced manufacturing often calling for co-location with other knowledge industries.

However, most plans fail to provide a definition of advanced manufacturing that goes beyond broad reference to the application of new or high-technology production systems. Advanced manufacturing may at once encompass retooled legacy sectors including the automotive industry or food manufacture and emerging areas such as biotechnology, robotics and recycled materials. Some do not identify specific industries at all. The broad emphasis on technological processes may create problems for targeting policy to what are very different industries and, as others have noted, poses challenges for comparative analysis of advanced manufacturing industries (Livesey 2015). Moreover, this emphasis may explain why Australian policy virtually ignores urban and craft manufacturing despite its apparent revival.<sup>2</sup>

### 3.2. United States

U.S. planning and economic development entities exhibit more variation in how they frame manufacturing. Most echo the Australian argument that manufacturing “remains a strong economic contributor” (CMAP, 2014, p. 40) and is “critical to our city’s economic health” (New York, 2014, p. 4). San Francisco’s Planning Department (SFPD, 2014, p. 1) and SFOEWD (2016, p. 4) go further, claiming that manufacturing “support[s] the sectors that drive San Francisco’s economy” and contribute to “economic equity, creating a more inclusive workforce and building a more robust and diverse foundation for economic development”.<sup>3</sup> Likewise, Portland (2016) and Boston (BRA, 2012) recognise manufacturing for its living wage opportunities.

Cities also concentrate on advanced manufacturing activity tied to growing a knowledge economy. Nashville (2013, p. 30) claims that its “Knowledge City role is precisely what

manufacturing requires and desires”. The New York (2015, p. 50) comprehensive plan finds that “innovation industry firms have helped increase opportunities in traditional industries, such as manufacturing”. Boston’s (2017, p. 202) comprehensive plan notes that “economic activity has shifted to the knowledge sectors” and seeks to “grow new forms of manufacturing”. As in Australia, advanced manufacturing is defined in different ways: as a target industry (Chicago, Nashville, Portland), an eclectic variety of local production encompassing guitar makers, kitchen appliances and computers (New York, San Francisco), or another term for high-tech-related manufacturing in areas such as biotech (Boston).

Some U.S. cities, however, broaden the advanced manufacturing-knowledge economy narrative to incorporate established manufacturers. Chicago anticipates a manufacturing “renaissance... toward more advanced products and processes” (WBC, 2012, p. 19), but also observes that “the vast majority of companies employing advanced manufacturing techniques are traditional manufacturers” (Chicago, 2013b, p. 6). This includes machinery, metal products and food manufacturing (Chicago, 2013a). San Francisco’s *Advanced Manufacturing Playbook* claims to provide a “new workforce paradigm” that seeks to associate established manufacturing industries with “the Maker Movement with its DIY values and use of high-tech processes” (SFOEWD, 2016, p. 7). Likewise, Portland’s planning and redevelopment policy seeks to “balance the needs of traditional and new industrial uses” (Portland, 2013, p. 1; 2015, p. ii).

New York, Portland and San Francisco specifically direct this attention to an urban manufacturing base. According to New York Economic Development (NYCEDC, 2013, p. 2), policy-makers “fail to contemplate the potential and current role of Cities as manufacturing hubs”. The agency emphasises that manufacturing has not disappeared from cities, but that it “has changed form”, defined by a “landscape of small manufacturers and entrepreneurs” (p. 4). San Francisco considers itself a “leader in the urban manufacturing movement” and claims that a “manufacturing revolution is being driven by our cities” (SF Made, 2016, p. 3; SFOEWD, 2016, p. 3). Portland (2013, p. 8), likewise, sees “a manufacturing revolution” taking place in the central city “characterized by small businesses making specialty goods in modest spaces... They manufacture their concepts onsite, using traditional techniques as well as advanced manufacturing tools”.

Urban manufacturing, moreover, is not simply associated with knowledge industries. Each of the cities that focus on urban manufacturing call attention to manufacturing tied to the cultural economy. Because many cultural industry firms are small-scale and depend on proximity to related services, suppliers and labour, they tend to concentrate in urban areas. In New York City, manufacturers “leverage strong ties to industries... such as Theater, Architecture, Design, Fashion and Advertising”. (NYCEDC, 2013, p. 4). New York Economic Development (NYCEDC, n.d.) includes food and fashion manufacturing among its target initiatives. San Francisco targets the city’s “makers” in food and beverage, apparel manufacturing and “lifestyle products” (SF Made, 2016; SFPD, 2014). Similarly, Portland’s urban manufacturers include those “that specialize in food preparation, brewing, distilling, and bicycle manufacturing and repair (Portland, 2013, p. 8).

#### 4. Policy Challenges, Goals and Strategies

The ways that policy-makers conceptualise manufacturing have direct implications for how they view key challenges and define policy goals and strategy. Documents in both countries target policy around land use, business development and workforce development. The predominate concern with restructuring manufacturing towards high value, specialised production and with job creation clearly frames policy directions in each of these areas. However, specific issues are prioritised in different ways depending on the dominance of the advanced manufacturing discourse and the geographic framing of manufacturing as an outersuburban or urban set of industries.

#### 4.1. Land Use

Cities and states are concerned about the supply and loss of industrial land, particularly when it pertains to growing advanced manufacturing industries. Further, specific land use concerns derive from how policy-makers conceptualise the geography of manufacturing. Australian policy considers manufacturing as an outersuburban activity while most of the U.S. cities focus on urban manufacturing.

Despite the advanced manufacturing discourse, Australian policy-makers by and large approach manufacturing as a traditional industry. Australian policy-makers assert that manufacturing industries want large, “hanger” spaces on low-cost land in outer areas with good road, rail, port and/or airport access (Brisbane, 2012; GSA, 2016b; GAA, 2011; Leichardt, 2013; NSW, 2012; Qld, 2016; RDA Melbourne, 2012; Sydney, 2013; VPA, 2014; Yarra, 2012). They largely ignore inner urban industrial lands because they are targeted for (or already have been rezoned for) housing, retail and “high value knowledge precincts” (GSA, 2012b; GAA, 2011; Yarra, 2012, p. 5). Similar to London’s “managed decline” (Ferm and Jones 2016), Queensland (QDSD, 2014) is actively working to relocate industrial uses from designated central city urban renewal areas. Although Sydney (2013, p. 17), Melbourne (2016) and Yarra (2012) in central Melbourne acknowledge that “some higher value manufacturing and other industrial uses may still require urban space”, the outer area emphasis dominates.

Australian policy therefore aims to update zoning codes to more clearly define industrial areas to guard against encroaching uses and create targeted industrial areas around ports and airports (GSA, 2012a, GSA, 2016a, QDSD, 2014; Qld, 2016; NSW, 2014; VPA, 2011, 2014; RDA Melbourne, 2012; Yarra, 2012). Many places concentrate on redeveloping ageing infrastructure and industrial parks into advanced manufacturing and specialised industry hubs. For example, South Australia (GSA, 2016b) is developing a food manufacturing park in North Adelaide. RDA Melbourne (2012) seeks to incorporate “high value added advanced manufacturing” in innovation precincts that contain higher education institutions and technology firms, while Melbourne (2016) promotes cluster investment that combines creative industry and advanced manufacturing firms. Parramatta (2011) in outer Sydney focuses on manufacturing related to IT industries and “eco-industrial precincts”. The City of Sydney (2013), whose jurisdiction covers the central business district, does propose developing new mixed use precincts with flexible land use regulations to support light industry uses. All the while, New South Wales State government integrated transport and land use strategies suggest that they are preparing to simultaneously rezone the last of the city’s inner urban industrial land for new high rise development along rail corridors (Gibson *et al.* 2017).

While some U.S. policy shares the concerns over larger industrial zones in outer areas (CMAP, 2014; Chicago, 2013b; Nashville, 2013, 2015), the focus tends towards addressing challenges associated with urban land. As in Australia, U.S. cities recognise that a large amount of urban industrial land has been rezoned and that conversions are poorly monitored, creating a barrier for entry by new firms. However, unlike Australia, many places view this situation as a challenge that hinders their ability to attract and retain manufacturing (ABAG, 2013; BPDA, 2017; Boston, 2017; Chicago, 2013b; NYCEDC, 2013; New York, 2014; Portland, 2013, 2014, 2015; SF Mayor, 2013; SFOEWD, 2016; SFMade, 2016). All of the U.S. cities except Nashville acknowledge that existing industrial zoning, already in short supply, does not provide sufficient protection from competing uses.<sup>4</sup> Successful and long established programmes like Portland’s Industrial Sanctuaries and Chicago’s Planned Manufacturing Districts and Industrial Corridors face unprecedented pressures on remaining manufacturers leading both cities to focus on bolstering protection in established industrial areas (Chicago, 2013a, 2013b; Portland, 2014, 2015). New York (NYCEDC, 2015) and San Francisco (SFOEWD, n.d.; SFPD, 2014) similarly prioritise the protection of urban industrial lands by drafting new regulations to limit competing uses.

Most U.S. cities seek to go beyond updating their zoning codes to protect industry. They also aim to balance competing uses and, they argue, respond to the needs of contemporary urban

manufacturers (Boston, 2017; Chicago, 2013b; Portland, 2013, 2015; New York, 2014; SF Mayor, 2013; SFOEWD, 2014). New proposals strive to accommodate a mix of uses that blends manufacturing with residential, ICT and commercial creative industries. They seek to address challenges around increasing density and parking requirements, while maintaining appropriate industrial infrastructure and addressing noise, odour and traffic issues.

As part of the Mayor's 5-point Plan for Manufacturing, San Francisco limits conversion in Production, Distribution and Repair zones (e.g. industrial) and has adopted more flexible parameters. This includes forbidding office development unless one-third of the project is dedicated to light industry and incentivising new projects that blend manufacturing with creative industry space on public land. The plan also requires new development in PDR zones to transfer a portion of the space to an industrial real estate non-profit organisation, PlaceMade (SFPD, 2014; SFOEWD, n.d.).

Following San Francisco's lead, New York (2014) proposes new "industry employment districts" and "creative economy districts" that aim to protect industry while increasing overall density by allowing commercial office additions on existing industrial spaces. Additionally, the City aims to overhaul its mixed use zoning, which currently allows but does *not* require a mix of uses (resulting in primarily high-end residential development). New mixed use zoning would require residential development to incorporate commercial and compatible industrial space. Similarly, Portland (2015) authorises a ground floor industrial bonus to incentivise the inclusion of manufacturing space in redevelopment projects in the City's South East while allowing higher density mixed use development near transit. The plan also introduces design standards intended to minimise conflicts between mixed use and industrial operations. Citing Portland as a model, Boston's (BPDA, 2017) Flynn Marine Park plan proposes a "mixed industrial building type" that includes ground floor industrial space with office and R&D space above allowing the higher rent floors to subsidise the preservation and growth of industrial space. While these strategies may support "combinatorial" knowledge dynamics (Boschma *et al.* 2017; Strambach and Klement, 2012) across cohabiting firms from diverse sectors, the potential to preserve space for industrial use is nonetheless dependent on growing knowledge economy activity in the very same areas. This mirrors "post-industrial" approaches that contributed to pricing out manufacturing in the first place.

#### 4.2. Business Development

Business development programmes for manufacturing differ little between countries. Policy seeks to support established industries and new, small firms in four key ways: marketing, access to resources, business networks and business costs. Cities and states in both countries recognise a need to reduce taxes and regulations (CMAP, 2014; Chicago, 2013b; Portland, 2012; NSW, 2014; QDSD, 2014), but few are "unashamedly probusiness" and stress their low business costs (Nashville, 2017; QDSD, 2016, p. 16; GSA, 2016b).

Cities are more concerned with an outdated and inaccurate image of contemporary manufacturing. SFMade (2016) claims manufacturing faces a "PR problem" and Chicago sees the need for a "better perception of manufacturing among students, prospective employees, and parents" (Chicago, 2013, p. 4; WBC, 2012). New South Wales and Queensland fear people view "manufacturing as an old-fashioned industry with decreasing relevance to the State's future" (NSW, 2012, p. 14; QDSD, 2016). In response, governments are developing marketing campaigns, "innovation awards" and leader forums to sell manufacturing as a cutting-edge, knowledge-based industry (NSW, 2012, 2014; QDSD, 2016). San Francisco seeks to capitalise on its maker economy "to brand manufacturing careers in a newly attractive way...making craft 'cool' again" (SFOEWD, 2016, p. 3). Nashville (2015), in conjunction with the Arts Council, aims to provide marketing assistance to artisan manufacturers and New York EDC's (n.d.) "Made in NY: Fashion" campaign seeks to raise awareness of locally made clothing. In Sydney, creative industries proponents have turned to the maker movement more fully than manufacturing advocates – though with scant consultation of

the makers themselves, resulting in poor understanding of what concrete policy settings are needed (Budge 2018).

Another key concern in the “transition to high-value added manufacturing” is the ability of small and medium-sized enterprises to access technology, market and finance information, and the resources to support their growth (GSA, 2012b, p. 7). Cities and states provide or propose programmes like Queensland’s Boosting Business Productivity Program, which offers workshops and forums for business development and management skills for manufacturers (QDSD, 2016). South Australia (GSA, 2012) has initiated a range of programmes to increase awareness and understanding of new technologies in rapidly changing industries (e.g. nano and biotechnology). They and others focus on developing collaborative partnerships and leadership networks among manufacturers, government and other entities to identify opportunities and resources (Chicago, 2013b). Alongside this, policy-makers offer technology adoption and commercialisation incentive grants and tax credits (GSA, 2012; NYCEDC, 2015; QDSD, 2016; NSW, 2012, 2014).

Some aspire to go further and develop manufacturing technology centres or maker spaces to enhance access to 3D printers, advanced materials and robotics (GSA, 2016; QDSD, 2016). New York Economic Development’s (NYCEDC, 2015) Futureworks provides access to a “network of advanced manufacturing resources” including city resources, contract manufacturers and prototyping facilities and shared work and incubator spaces for “advanced manufacturing entrepreneurs”. In conjunction, the agency’s targeted fashion and food cluster programmes provide entrepreneurial and space support. San Francisco seeks to support highly interdependent “low volume advanced manufacturing” through targeted business services and the development of localised contract manufacturing services, which smaller firms depend upon (SFOEWD, 2016; SFMade, 2016, p. 4). However, there is surprisingly little concrete emphasis on research and development links between industry and universities. Numerous Australian state-level manufacturing policy documents highlight the need for university-based research into advanced manufacturing technologies and showcase examples of university research (GSA, 2012b; NSW, 2012; QDSD, 2016), but rarely do they articulate concrete policy.

#### 4.3. Workforce

Many places aim to take a “demand-driven approach” to enhance productivity and grow an advanced manufacturing workforce in occupations such as machining, 3D printing, general fabrication, quality assurance, woodworking and software coding (QDSD, 2016; SFOEWD, 2016). RDA Sydney (2013, p. 11) seeks “hybrid skills in avionics/mechanical and radio remote control, 3D printing, and advanced composite technical skills”. Additionally, both QDSD (2016, p. 13) and New South Wales (2012) seek to promote higher education degrees through a “Masters in Manufacturing Innovation” and by “fast-tracking the digital technologies curriculum...[to] underpin the future growth of the advanced manufacturing sector”.

Chicago points towards the need for skilled workforce training to enable the restructuring of established industries like fabricated metals and food manufacturing (Chicago, 2013b), its “freight-manufacturing nexus” (Chicago, 2014) and advanced manufacturing (WBC, 2012). Similarly, in Adelaide, one of Australia’s traditional manufacturing areas, the South Australian Government (GSA, 2012b, 2016) and RDA Adelaide (2016) stress the need to reskill their ageing automotive manufacturing workforce while appealing to younger workers.

While Australian policy recognises workforce concerns as a route towards growing advanced manufacturing jobs, most places do not possess substantive workforce policy targeting manufacturing. Policy-makers call for programme review to identify manufacturing training and skills gaps and some seek to develop advanced manufacturing workforce strategies (GSA, 2012b; QDSD, 2016; NSW, 2012). U.S. policy similarly seeks to coordinate existing workforce programmes and community college curriculums to assist manufacturers (Chicago, 2014; SFOEWD, n.d.). New York (2013) aims to develop “industry-focused training partnerships” to address

a labour supply and demand mismatch and establish career centres in Industrial Business Zones. San Francisco (SFMade, 2016, p. 6) seeks to create “intentional training pathways” through “industry-driven, sector-based regional training partnerships” and expand apprenticeship opportunities in both legacy and advanced manufacturing sectors.

## 5. Conclusion: Urban Manufacturing Policy and the Post-Industrial Challenge

Urban policy that bears on manufacturing continues to stem from outmoded “post-industrial” solutions. The singular narratives around advanced manufacturing and the knowledge economy close off more complex strategies and economic development opportunities. This biases industries perceived as “high tech” over “low-tech” or “high touch”, even though both comprise urban economies (Friedman and Byron 2012; Hansen and Winther 2015). Worse, while such narratives should impact industry targets and directives, we find that policy strategies, particularly in Australia, tend to follow conventional approaches, particularly around land use, falsely assuming that manufacturing is comprised essentially of large firms seeking new greenfield sites in outersuburban locations.

By integrating manufacturing within the broader knowledge economy discourse, policy-makers aim to counter the “replacement” narratives at play for decades. Reframing manufacturing in this way may serve as a savvy rebranding exercise, but it fails to address the deeper challenge of reshaping the narrative trajectory of the post-industrial itself. Planners and other urban policy-makers have tended to view industrial uses as incompatible with urban mixed use settings (Grant, 2002). They have been conditioned by years of thinking about urban space under amenities agendas targeted towards the creative class and the neoliberal drive to extract maximum exchange value from urban real estate (Wolifson and Drozdowski 2017) while promoting edge developments around airports and enterprise zones (McNeill 2014). This contributes to the conventional view that manufacturing is primarily outersuburban, even as directives around high-tech, advanced manufacturing dominate the policy discourse. Moreover, simplistic depictions of central city manufacturing’s decline are used to justify other ends, such as conversion of industrial land to higher-dollar residential developments. Ultimately, this results in lost opportunities for economic and community development because it excludes legacy industries and potential synergies with emerging craft-based forms of manufacturing (Mistry and Byron 2011; Wolf-Powers *et al.* 2017).

Some manufacturing certainly requires large greenfield spaces with good transportation access on the periphery, but this is far from universal. Many existing manufacturers, and new activities at the interface between manufacturing and creative industries, require a mix of older buildings with flexible floorpspace and dense networks of tacit knowledge and inter-firm relationships more typically found in inner-ring industrial lands (Fox Miller 2017; Hatuka *et al.* 2017). These space needs remain a key oversight of urban manufacturing policy to date. Similarly, the reliance on generic business development and workforce strategies do not account for the spatial diversity, nor the distinct needs of very different types of urban manufacturing industries (Beer 2018). Consequently, Australian cities in particular may be better off not only reconsidering the space needs of urban manufacturing, but also tempering the advanced manufacturing rhetoric and instead exploring the “smart specialisation” strategies of European Union countries (Foray 2014; Morgan 2017). Echoing the economic geography literature on “combinatorial” knowledge, technologies and institutions (Boschma *et al.* 2017; Strambach and Klement, 2012), this approach in theory views innovation and knowledge more holistically, and calls for focused governmental intervention around new specialisations or niches that stem from local assets.

While virtually all cities in this study employ the knowledge economy rhetoric around manufacturing, some U.S. cities simultaneously seek to promote their craft and maker economies and, occasionally, traditional manufacturers. U.S. cities are experimenting with new zoning strategies that seek to balance urban manufacturing with the legacy of post-industrial planning

geared towards ICT, tourism and mixed-use development. However, the reality is that these policies are a late attempt to rectify years of industrial displacement and continue to rely on the continued growth of knowledge economy industries.

We do not wish to denigrate such efforts, but to challenge policy-makers to push beyond limited post-industrial visions and pursue strategies that directly support urban manufacturing in the face of competing land uses and knowledge industry aspirations. A restructuring *urban* manufacturing economy necessitates a rethink of economic development policy, workforce training and the overreliance on property and consumption-led development strategies. It would need concentrated attention to the major dynamics discussed at the outset.

This also means then, that we need to develop new avenues of research around urban manufacturing. An immediate need is to go beyond the scope of this study and conduct an evaluation of actual policy implementation (c.f. Budge 2018). In particular, research that tracks the outcomes of the mixed-use zoning strategies described here is essential to ensure cities are adequately adapting to new industrial land use needs and responding to the development pressures that manufacturing industries face (Greater Sydney Commission 2018). We also need to develop a deeper understanding of the place-specific industry relations and networks of production among urban manufacturers. Here, detailed place-focused research can identify the survival strategies that small firms employ in high cost real estate markets and the actual contract, production, skills and knowledge exchange relationships that exist between manufacturers and other industries in a metropolitan area. Such research can provide a foundation for policy that better responds to the challenges inherent in a new urban manufacturing economy.

## Notes

1. Although significant, we do not address the national policy context in this study. Both countries emphasise investment around research and development and upskilling for advanced manufacturing and this likely in part helps to set the tone of state and local policy documents. In fact, although Federal policy discussion in the U.S. have turned towards Donald Trump's emphasis on tariffs and trade deals for traditional manufacturing, Obama era "Innovation Institutes" are still in place.
2. Only the Inner Melbourne Action Plan (2016) recognises that, alongside creative industries, "urban manufacturing... is an important source of employment and competitive strength for Victoria" and Yarra (2012, p. 9) in central Melbourne predicts manufacturing will "transition to smaller scale operations which can operate within a high density environment". Neither, however, detail policy to support small urban manufacturing.
3. While San Francisco Mayor's Office and Economic Development show the strongest language advocating for the benefits of manufacturing, the City Plan (2014) makes no reference to manufacturing.
4. Industrial zoned land ranges from just 3.6 square miles in Boston (Boston, 2016) and less than two square miles (1,265 acres) in San Francisco (SFMade, 2016) to 40 square miles in New York (New York, 2014). However, even in New York, actual "industrial and manufacturing" land use accounts for just 21% of the uses in the zoning designation (New York, 2014).

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## Appendix 1. Referenced Policy Documents

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ABAG, 2013	Association of Bay Area Governments. (2013). State of the region.
Adelaide, 2016	City of Adelaide. (2016). City of Adelaide 2016–2020 Strategic Plan.
Boston, 2016	City of Boston. (2016). Small business plan.
Boston, 2017	City of Boston. (2017). Imagine Boston 2030.
BPDA, 2017	Boston Planning and Development Agency. (2017). Raymond Flynn Marine Park master plan update.
Brisbane, 2012	Brisbane City Council. (2012). Brisbane economic development plan.
BRA, 2012	Boston Redevelopment Authority. (2012). Manufacturing industry.
Chicago, 2013a	City of Chicago. (2013a). Chicago sustainable industries: A business plan for manufacturing.
Chicago, 2013b	City of Chicago. (2013b). PMD modernization report.
Chicago, 2014	City of Chicago. (2014). Green healthy neighborhoods.
CMAF, 2014	Chicago Metropolitan Agency for Planning. (2014). Update. Go to 2040: comprehensive regional plan.
GSA, 2012a	Government of South Australia. (2012a). Housing and employment land and supply program.
GSA, 2012b	Government of South Australia. (2012b). Manufacturing works: a strategy for driving high-value manufacturing in South Australia.
GSA, 2016a	Government of South Australia. (2016a). Adelaide 30 year plan.
GSA, 2016b	Government of South Australia. (2016b). Look North: North Adelaide economic plan.
GAA, 2011	Growth Area Authority. (2011). Planning for employment and industry Melbourne's growth areas.
Leichardt, 2013	Leichhardt City Council. (2013). Leichhardt Employment and economic development strategy, 2013–2023.
Liverpool, 2013	Liverpool City Council. (2013). Liverpool economic development strategy, 2013–2023.
Melbourne, 2016	City of Melbourne. (2016). Inner Melbourne action plan, 2016–2026.
Nashville, 2013	Metro Nashville. (2013). Economic development background report. a background report submitted to Nashvillenext.
Nashville, 2015	Metro Nashville. (2015). Nashvillenext: A general plan for Nashville & Davidson County.
Nashville, 2017	Nashville Area Chamber of Commerce. (2017). Regional economic development guide.
New York, 2014	New York City Council. (2014). Engines of opportunity: reinvigorating New York City's manufacturing zones for the 21st century.
New York, 2015	City of New York. (2015). One New York: The plan for a strong and just city.
NSW, 2012	New South Wales Government. (2012). New South Wales manufacturing industry action plan.
NSW, 2014	New South Wales Government. (2014). A plan for growing Sydney.
NYCEDC, 2013	New York City Economic Development Corporation. (2013). NYCrafted.
NYCEDC, 2015	New York City Economic Development Corporation. (2015). Industrial action plan.
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Parramatta, 2011	Parramatta City Council. (2011). Parramatta economic development strategy, 2011–16.
Portland, 2012	City of Portland. (2012). Portland plan.
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Portland, 2014	City of Portland. (2014). SE Quadrant Plan: industrial sanctuary review.
Portland, 2015	City of Portland. (2015). Central City 2035 SE Quadrant Plan.
Portland, 2016	City of Portland. (2016). 2035 comprehensive plan.
QDSD, 2014	Queensland Department of State Development. (2014). Governing for growth: economic strategy and action plan.
QDSD, 2016	Queensland Department of State Development. (2016). Queensland advanced manufacturing: 10-year roadmap and action plan.
Qld, 2016	Queensland Government. (2016). Southeast Queensland regional draft plan.
RDA Adelaide, 2016	Regional Development Australia Adelaide. (2016). RDA Adelaide metro inc. regional plan 2016–19.
RDA Brisbane, 2013	Regional Development Australia Brisbane. (2013). Regional roadmap, 2013–16.
RDA Melbourne, 2012	Regional Development Australia Melbourne. (2012). Making a great region even better: regional plan for Melbourne's East.
RDA Sydney, 2013	Regional Development Australia Sydney. (2013). Regional plan for Sydney.
SF Mayor, 2013	San Francisco Mayors Office. (2013). 17-point jobs plan.
SFPD, 2014	San Francisco Planning Department. (2014). Central SoMa draft policy PDR. November.
SFOEWD, 2014	San Francisco Office of Economic and Workforce Development. (2014). San Francisco economic strategy-2014 update.
SFOEWD, 2016	San Francisco Office of Economic and Workforce Development. (2016). Make to manufacture: Advanced manufacturing playbook.
SFOEWD, n.d.	San Francisco Office of Economic and Workforce Development. (n.d.). Mayor Lee's 5-point plan for manufacturing. <a href="http://oewd.org/manufacturing">http://oewd.org/manufacturing</a>
SF Made, 2016	SF Made. (2016). Bay Area state of urban manufacturing.
Sydney, 2013	City of Sydney. (2013). Employment lands study.
VPA, 2014	Victorian Planning Authority. (2014). Plan Melbourne.
WBC, 2012	World business Chicago. (2012). Plan for economic growth and jobs.
Yarra, 2012	Yarra City Council. (2012). Yarra business and industrial land strategy.

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