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(Un)making space for manufacturing in the city: the double edge of pro-makers urban policies in Brussels

1. Introduction

The last ten years have seen a thorough and intense process of re-designing of the urban landscape. After a prolonged period during which the most industrialised cities were shifting from manufacturing to tertiary sectors¹ and residential activities, a reversal of this trend was made possible by the spreading of “clean” technologies that allowed to start less impactful firms based on small scale technologies (Clark, 2014). The Industry 4.0 paradigm applied to the urban landscape (Busch et al, 2021) made possible the “intersection” of a high value added craftsmanship with high-tech activities (by means, for instance, of 3D printing technologies). These processes were reinforced by the availability of “cheap” land caused by the economic crisis (Anderson, 2012).

As a result, a new wave of "Schumpeterian" entrepreneurs (the so-called makers, Dougherty, 2012) supported the relocation in metropolitan areas of manufacturing activities starting from US and Australia (e.g., Lester et al, 2013; Budge, 2019). Makers are entrepreneurs that integrate small-scale cutting-edge design with environmentally friendly technologies (Anderson, 2012). For these reasons they thrive in urban contexts and notably in city centres, while in return their development enhances the health of the overall urban economies (Christopherson et al., 2014; Clark, 2014). These processes are now well under way, as they diffused all over the most important cities around the world (Ferm and Jones, 2017; Doussard et al., 2018; Schrock et al., 2019; Marotta, 2020; Busch et al., 2021; Grodach and Gibson, 2018).

The urban-based nature of these new ventures made them an ideal target for place-based policies (e.g., Wolf-Powers et al. 2017), such as rezoning of mono-functional areas towards mixed-use ones. Mixed-uses zoning supports a balanced and sustainable cohabitation of manufacture and housing (Grant, 2002) also mixed with other functions, e.g., recreation, nature development and water management (Louw et al. 2006, Nabil et al. 2015); at the same time, it tends to frame manufacturing according to a post-industrial “high-tech” and smart narrative based on the success of the maker movement (Schrock and Wolf-Powers, 2019).

¹ This trend can be traced across several geographical contexts: industrialised European and American cities, such as London (Ferm and Jones, 2016), New York (Curran, 2010), West German metropolitan areas (Gornig and Goebel, 2018), and more recently Asian metropolitan areas (Cheng, 2015; Li et al, 2018).

This latter aspect, however, could be problematic as it may overlook the role and the potentialities of low-tech and high-touch manufacturing still located within the cities, thus diverting the attention from spatial issues concerning industrial land use, real estate pressure, and competition with other urban functions (Grodach and Martin, 2021). Indeed, as important as makers are, traditional manufacturing activities still provide consistent shares of job posts for low-skilled workers (Howland, 2010; Lowe et al., 2016). These traditional sectors continue to be the main bulk of urban industrial structure, providing both the material infrastructures and the providential services to a wide range of households with different income levels (Heslop et al., 2019; ref.). Therefore, according to a foundational economy approach (Bentham et al., 2013), traditional urban manufacturing activities are still fundamental drivers of regional growth.

From the tension between these two possibly contrasting development processes, two trade-offs emerge. A first one relates to the cohabitation of urban makers with traditional manufacturing industries, whose demand for resources and competences could compete away the benefits from their implementation (Shrock et al., 2019). The second one refers to the tension between the preservation, or the relocation, of different forms of manufacturing and the increasingly hyper-competitive land markets associated with the growing housing demand in central areas (Grodach and Gibson, 2019) and the associated pressures of the real estate sector (Schrock and Wolf-Powers, 2019). Previous findings from different countries (mainly in North America, the UK and Australia) have shown the risk that, despite its objectives, mixed-use re-zoning would price out many manufacturers and remove suitable buildings for small-scale production (Curran, 2010; Ferm and Jones, 2017; Grodach and Martin, 2020), while stressing the importance of the dynamic spatial relationships between local communities and institutions in developing place-based strategies aimed at making economic development more equal (Lowe and Vinodrai, 2020). Despite these contributions, some related issues still need to be further explored. First, the actual capability of mixed-use zoning to attract and favour the settlement of “hi-tech” urban makers is still under question (Lester et al., 2015). Second, a more comprehensive definition of urban manufacturing industries could support researchers and planners in differentiating the associated location patterns (Wolf-Powers et al., 2017). Third, case-studies should deepen the role of traditional manufacturing in contributing to the integration of socially and economically marginalized groups (Lowe and Vinodrai, 2020). Fourth, recent literature called for a more detailed analysis of the spatial structure and the socio-economic characteristics of the areas targeted by these urban policies (Grodach and Martin, 2021).

This paper will address these trade-offs by questioning the effectiveness of public-led policies in “making space” for either the reintroduction or the attraction of manufacturing activities in urban areas, and by identifying the multidimensional tensions and conflicts emerging between

the narratives and discourses with which the local stakeholders purport the effective implementation of development programs and urban policies.

The underlying research questions are thus the following ones: is it possible to attract advanced manufacturers while at the same time preserving traditional productions and promoting an inclusive economy based on local needs? How can productive activities merge with the other urban functions subject to a set of spatial (such as, land availability, buildings features and infrastructure accessibility) and socio-economic constraints? How can these issues be addressed by means of planning and design policies?

To answer these questions, we refer to the Brussels case, locating it within the process of deindustrialization cum tertiarisation. In particular, Brussels is a very relevant case as it is a laboratory for both pro-makers urban policies (Hill et al., 2020) and regeneration projects targeting de-industrialized areas thanks to the presence of a wide set of agencies involved in the implementation of urban policies (Carlier et al., 2021). As such, Brussels is an illustrative case-study of how urban policies can cope with the varied nature of urban manufacturing processes: the area of the Brussels Canal, close to the city centre, shows a peculiar variety of manufacturing ventures, industrial sectors and innovative activities that have been targeted by several different types of planning policies.

Our analysis is based on a truly interdisciplinary approach combining quantitative and qualitative methodologies that, to the best of our knowledge, has not been used before. Based on the empirical results, we contribute to the literature with the following points. First, we shed new light on the inconsistencies of urban policies in supporting or protecting manufacturing, by showing their differentiated impact according to the type of productive activities. We observe that policy makers and spatial planners should take into account the different types of agglomeration patterns of urban manufacturing. This indicates that, as a stand-alone policy, mixed-use zoning is not able to promote social inclusion, upward social mobility of low-skilled workers, and coexistence between them and the suburban middle class, and thus that a one-size-fits-all approach to urban manufacturing is not a valid option. Second, we show the intrinsic ambiguity of urban policies aimed at favouring the resilience of manufacturing micro-clusters. If such policies aim at favouring the preservation of traditional manufacturing industries, they should be tightly integrated within the urban regeneration projects, such as, for instance, bottom-up initiatives led by non-profit organisations. Third, we highlight the limitations of planning schemes aimed at the revitalization of deprived urban neighbourhoods through the development of new manufacturing ventures. As such, ventures usually require task and skill contents that are not compatible with the characteristics of the existing workforce, their

implementation could jeopardise the social sustainability of the interested areas and crowd out more fragile households as posited by the foundational economy approach.

From these insights we derive a set of practical recommendations to minimise the side-effects of pro-makers policies: the development of pilot projects taking into account the goal of job creation and socio-economic development for the inhabitants of the neighbourhood; the promotion of co-creation initiatives based on action-research approaches; the use of micro-zoning characterised by small scale changes of land use. Our results can thus shed light on some relevant questions for both academic scholars and urban planning practitioners. In particular, we test how and to what extent mixed-use rezoning can favour the settlement of “hi-tech” urban makers. Moreover, we provide a sort of surgical approach to assess how different manufacturing activities (and the related externalities) are able to negotiate their location patterns with the other local stakeholders. Finally, we contribute to the understanding of how traditional manufacturing can contribute to the integration of socially and economically marginalized groups through the recognition and reinforcement of common experiences.

The paper is structured as follows. The next section sets up the theoretical framework. The third one presents the research design. The fourth one describes the urban policies for urban manufacturing in Brussels. The fifth one provides evidence on three selected areas. The final Section discusses and concludes providing policy recommendations.

2. Literature review

2.1 Manufacturing displacement and related urban policies

The manufacturing displacement outside the city has its roots in the great socio-economic transformations that from the 1970s onward generated deep changes in productions, space uses and populations.

Although deindustrialization and manufacturing displacement were not new, different factors concurred in the shift from production-based to knowledge-based economies, and thus to the decline of the industrial city and the contemporary shift towards the informational city (Castells, 1993). Starting from the 1970s, manufacturing activities, historically located in traditional multi-storey buildings along rail spurs and city docks, relocated towards the suburbs, looking for expanding the productive activities on larger and cheaper lots and for reorganising productive spaces in more efficient one-storey buildings (Fitzgerald and Leigh, 2002). In this phase, the spread of mass motorization, more efficient freight transport systems, and the construction of major road networks outside the city enhanced suburbanization of

manufacturing activities by reducing the costs of goods transport and facilitating the daily commute of workers (Knight, 1999; Leigh and Hoelzel, 2012).

Starting from the mid-Nineties, production relocations reached the global scale, mainly from Western European countries to either Asia or Eastern Europe with a strong impact on regional economic systems in terms of job losses (Györfi and Oren, 2006; Johansson and Olhager, 2018). In parallel, the broadening of informatics and communication networks boosted the progressive uncoupling of production sites from related knowledge and service activities, mainly located in the city centres (Hendriks, 1999; Howland, 2010). Scholars questioned whether such progressive deindustrialisation and tertiarization of metropolitan areas actually gave way to a new “spatial order” around a post-modernist urban landscape. They underlined the interplay of pre-existing dynamics (e.g., the mobility of capital, real estate market forces) and emerging new ones (e.g., informatics and globalization) (Beauregard and Haila, 1997; Marcuse and Van Kempen, 2000). In both cases, at the turn of the millenium, the image of the city rapidly shifted from a fordist place of production towards a post-fordist information and communication infrastructure for knowledge intensive activities (Hendriks, 1999).

Such changes had structural effects on urban policies, on their theoretical frameworks, narratives and tools grounded on the interpretation of dismissed industrial areas as spatial reserves. Such land availability made room for a thorough redesign of these unused spaces usually well located in the city centres. In this respect, two main patterns of manufacturing replacement through planning have been put forward, and are thus recognizable, with different outcomes and consequences.

On the one hand the redesign process has been focused on providing public equipment and affordable housing that were missing in districts previously exclusively occupied by manufacturing activities (Loures, 2015). During the 1990s, in Europe and the US, some of those substitutions took the shape of urban parks and playgrounds, new social facilities and affordable housing (Robiglio, 2017), regional parks hosting cultural amenities and devoted to ecological remediation (Brüggemeier, 1994). As highlighted by some scholars, this shift fostered an increase of the economic value and social welfare of the surrounding areas (Kuo and Sullivan, 2001; Wolch et al., 2014), but at the expense of new businesses and job quality (Leigh and Hoelzel, 2012).

On the other hand, a second pattern stressed the replacement strategies around tertiary services and housing. In some cases, by leveraging on public-private partnerships, local authorities favoured real estate development and redesigned former production sites in order to spark the conversion of industrial land towards other uses such as business and service centres, R&D and hi-tech facilities (Bonello et al., 2020; Leigh and Hoelzel, 2012). In global cities, former

industrial sites were redesigned to develop urban amenities suited to the lifestyles of a world class of talented, highly skilled and creative people to be attracted and retained (Knight, 1999; Florida, 2002) in order to boost the knowledge-base of urban economies in the global competition (Sassen, 1991). The desirability of these processes, however, was not unanimously supported (Porter and Shaw, 2009). The restriction of public action and policy-making capacity in favour of private initiatives, following a sort of *laissez-faire* urbanism, limited service and public spaces provision and inhibited the capability to pursue broader community goals (Bianchetti et al., 2015). Another typical criticism of this approach is that it stimulated the phenomenon of gentrification with the consequent displacement of local residents, retail and manufacturing activities (Lester et al., 2013; Smith, 1996).

More importantly for our study, scholars underline that the implementation of all these strategies speeded up industrial displacement well beyond the actual shrinkage of the manufacturing sector at the cost of further lowering the degree of economic variety, innovativeness and resilience (Ferm and Jones, 2017). Some authors even argued that the decline of manufacturing itself was partially caused by a lack of appropriate urban planning (Curran, 2010), and that policies aimed at maximizing land value were an overlooked feature of manufacturing decline in urban areas (Grodach and Gibson, 2019; Grodach and Martin, 2021). Related case studies (in the US and Australia) have shown, in this regard, that viable industrial firms have been pushed outside urban areas from real estate pressures (Curran, 2010; Grodach and Martin, 2021). Such pressures were favoured by a well-established – yet simplistic – policy narrative, according to which the decline of manufacturing industries was inevitable and industrial land use was outmoded in a post-industrial knowledge-based economy.

Manufacturing displacement has also been favoured by a certain rigidity in the classic zoning categories associated with traditional urban planning, according to which urban renewal has followed normative procedures postulating a clear separation between industrial areas and human settlements to preserve the healthiness of places and the safety of their inhabitants. Moreover, the transformation of globalized economies and the rise of new narratives in urban discourses – such as sustainability, smartness and resilience – made the drawbacks of monofunctional zoning approach more evident (Ganong and Shoag, 2017). The criticisms to such rigidity gave room to the distrust of planning and design approaches (Albrechts, 2004), as they could create inefficiencies in adapting land use to the changing market conditions (Chapple, 2014). However, a market-oriented approach may be detrimental as well, if it overlooks a comprehensive approach that takes into account the overall needs of the local economy (Wolf-Powers, 2005).

2.2 Maker movement and mixed-use zoning

In the last decade, a growing interest in the relocation of urban manufacturing in the cities emerged. Such rethinking mainly originates from the maker movement, which refers to small-scale producers integrating design with production of highly customized goods (Dougherty, 2012). Makers typically exploit new production methods based on digital technologies that allow the production of small volumes of output, without the need to achieve economies of scale (Clark, 2014). They thus make higher location costs affordable thanks to the higher added value of the produced goods (Shrock and Wolf-Powers, 2019). Their activity fits nicely with the notion of “distributed manufacturing” (Srai et al., 2017), or “digital urban manufacturing” (Busch et al, 2021), which relies on skilled labour availability, proximity to consumers and closeness to knowledge-intensive business services (Rabari and Storper, 2015), that allow for the recombination of a wide array of knowledge sources (Antonietti and Gambarotto, 2018). Distributed manufacturing is therefore the main target of current studies and policy initiatives that have put manufacturing back on the urban agenda: small place-based manufacturers are viewed as an opportunity to reintroduce an industrial base in urban clusters, hosting different urban functions in the same neighbourhood (Christopherson et al., 2014; Budge 2019; Bonello et al., 2020).

The hype on the makers movement is heavily based on the technology-based capacity to produce highly customised products with a relatively small environmental impact due especially to the possibility of additive manufacturing offered by the 3D printing systems.

The maker movement (Anderson, 2012) constitutes a sort of natural focus for urban planners and policy makers, because their competitiveness substantially relies on urban economies based on density, economic variety, geographical proximity, skilled labour pools, and sophisticated, high-income consumers expressing a customized and fragmented demand (Friedman and Byron, 2012). This new form of urban manufacturing is also more knowledge-intensive and less space intensive than the traditional one, fitting well to higher and more sustainable high-quality standards of life in the city (Van Winden et al. 2010; Wolf-Powers et al. 2017).

This new narrative has led to the call for a change of direction of urban policies (Shrock and Wolf-Powers, 2019) and on a more responsive urban planning capable of supporting regeneration projects and policies for dismissed industrial areas (Leigh and Hoelzel, 2012; Loures, 2015). This tendency is also consistent with a general resurgence of the role of manufacturing advocated by the policy makers in the US and Europe, and with the growing concern that service-dependent cities lack economic resilience (Clark, 2014).

In many cities innovative practices in urban planning have thus been adopted, with the primary aim of accommodating new forms of interactions between evolving forms of manufacturing and

hyper-competitive markets for urban land (Cities of Making, 2018). The typical tools to take this transformation into account are mixed-use redevelopment plans, which attempt to co-locate manufacturing and housing, or other activities (Grodach and Gibson, 2019).

Mixed-use as a planning concept has been used to overcome criticalities coming from the monofunctional zoning approach (Rodenburg and Nijkamp 2004, Louw and Bruinsma 2006), such as the low quality of everyday life, the lack of services for the inhabitants, the risk of unsafe urban voids, the difficulty of land use conversion when needed (Hoppenbrouwer and Louw, 2005). Three conceptual levels can be highlighted when examining the objective and strategies of mixed-use advocates (Grant 2002): (i) increasing the intensity of land uses; (ii) stimulating the diversity of uses within the urban fabric by encouraging compatible mix; (iii) bringing different categories of use together while overcoming regulatory barriers. This has led to various attempts in urban planning and design to shape mixed-use patterns and explore new spatialities towards a more resilient environment based on the variety and complexity of urban context (Pacchi, 2018). Such attempts are grounded on four features of the mixed-use concept (Hoppenbrouwer & Louw 2005): horizontal and vertical distribution, shared premises, and time dimension.

Mixed-use rezoning has then been successfully matched with the development of the maker movement that eroded the logic behind traditional zoning requirements (Scott, 2006). In particular, many planners supported a stronger integration of manufacturing activities into the urban fabric to provide local communities with a better understanding of the functioning of local economies (Cotter, 2012; Urban Design Group, 2014).

The actual capability of mixed-use policies ‘residential housing/manufacturing’ to “re-industrialise” urban economy is, however, questioned (Ferm and Jones, 2017). Many scholars criticized mixed-use zoning for the risk of “pricing out many manufactures and cultural producers” and “removing suitable buildings for small-scale production” (Grodach, 2017, 89), showing that in North American, Canadian and Australian cities industrial activities have been actually threatened by mixed-use rezoning aiming at introducing residential housing (Ferm and Jones; 2017; Curran, 2010; Grodach and Gibson, 2019; De Boeck et al., 2020, Moos et al. 2018).

2.3 Other forms of urban manufacturing and the foundational economy perspective

These criticisms point to the need to fully understand the nature of urban manufacturing and recognize the different locations, social structures, and types of economies underpinning the role of productive activities in the sustainable development of urban economies. Moreover, it has been stressed that urban manufacturing may contribute to the development of those

communities that are at risk of being left behind (Lowe and Vinodrai, 2020). Accordingly, it is necessary to distinguish the different types of urban manufacturing from a socio-economic perspective.

Indeed, the production landscape that characterises many Western cities (Schrock et al., 2019; Grodach and Gibson, 2019), including Brussels (De Boeck et al., 2019), is still mainly based on traditional production processes, also named as “high-touch manufacturing” (Grodach and Martin, 2021), that make these cities renowned for their specialisation in the local production of specific types of goods (e.g., Fox Miller, 2017). Therefore, it would be more appropriate to refer to them as being characterised by the presence of sectors belonging to the so-called foundational economy (FE) (Bentham et al, 2013), which acknowledges that the main bulk of the industrial structure is made by low-tech traditional firms (Engelen et al, 2017), with a strong local/regional drive to address social polarization (Hansen 2021), economic inequality while addressing environmental issues (Sayer, 2019).

FE tries to answer the question posed by the failure of hi-tech mission-oriented policies to address the needs of the vast majority of people. In this regard FE seems to be better equipped to deal with the problems of inequality and inclusiveness, as it argues that industrial strategies for economic development should be focused on social standards and local accountability of economic actors, together with developing competitiveness (Froud et al, 2018). To do this, a different and more systemic notion of innovation is called forth, together with a focus on more traditional and wide-ranging sectors (material infrastructure and providential services) supplying the basic requirements for citizens with wide ranging income levels and locations (Heslop et al, 2019). From this point of view, we see Brussels’ Cureghem district as a good example of renovation policies within a traditional structure that can be understood within this framework (e.g., De Boeck et al, 2019; De Boeck et al, 2020; Orban et al., 2021).

The most important implication of this perspective is thus to reorient and reassert the role of public policies. This should start from recognizing the limits of competition to advocating the commitment of private business to public goals, especially with projects of local development (e.g., Estela, 2019; Green, 2019).

Therefore, the role of manufacturing industries in urban areas is more complex and nuanced than the one associated with distributed manufacturing (Hansen and Winther, 2014; 2015). One can identify two further categories: “local manufacturing” and “inclusive manufacturing”. Local manufacturing leverages on geographical proximity to customize its products and take advantage of the presence of evolved consumers to anticipate the qualitative features of future demand. Differently from distributed manufacturing, local manufacturers rely on labour-intensive processes and are more likely to adopt incrementally innovative products and

processes than disruptive ones (Hansen and Winther, 2014, 2015). They typically include low-tech crafters producing traditional goods (so-called cultural manufacturers) and food and beverage industries (Schrock et al., 2019). These industries mostly benefit from economies of specialization, i.e., the spatial concentration of firms operating in the same industry (Marrocu et al., 2013), and from inter-industrial linkages between related sectors (so-called “related variety”) taking advantage of the co-location of economic agents endowed with complementary skills and technologies (Frenken et al., 2007). The urban location allows local manufacturers to enjoy such economies by accessing dense business networks and labour market pooling (Buciuni and Finotto, 2016).

Inclusive manufacturing refers instead to productions based on manual tasks, such as repairing industries, based on cohesive and thick groups of individuals within the urban workforce, such as low-skilled workers and first-generation immigrants (Pratschke and Morlicchio, 2012). These workers share tacit knowledge and are less prone to move to other districts or to easily shift to other industries and professions (Lowe and Wolf-Powers, 2018). By providing employment opportunities to this tier of the workforce, inclusive manufacturing can contribute to the social resilience of urban areas thus mitigating the socio-spatial conflicts caused by poor social cohesion (Cassiers and Kesteloot, 2012). Notably, these industries can be capable of transforming poor jobs into “stepping-stones” for potential career paths, even outside of the industry itself, and into positive long-term socioeconomic outcomes for low-skilled workers living in the cities (Lowe and Freyer, 2015; Lowe et al., 2016). In terms of underpinning agglomeration economies, inclusive manufacturing is similar to local manufacturing, basically relying on industrial specialization and industrial relatedness at a small-scale level (Frenken et al., 2007).

All in all, the above review indicates that urban manufacturing appears more multifaceted than usually advocated by the dominant literature on urban makers. The agglomeration path and the spatial needs of distributed manufacturing have not been comprehensively investigated yet by the existing studies, nor such studies adequately took into account the detailed spatial structure and the socio-economic characteristics of the areas targeted by pro-makers urban policies. This gap seems to stem from the fact that the current evidence on the role of mixed-use rezoning in sustaining urban manufacturing is still ambiguous. Moreover, the FE approach calls for a thorough consideration of the other forms of urban manufacturing, namely traditional and inclusive manufacturing in sustaining social and economic cohesion of the interested areas. Finally, most of the reviewed literature adopts a sole lens of analysis from the disciplinary standpoint, while it only relied on either qualitative or quantitative methodologies (more frequently the former) when investigating the characteristics of urban manufacturing and the

validity of pro-makers urban policies. The use of a multidisciplinary approach, meshing different perspectives, such as sociology, urban planning and economics, is still missing despite its worthiness. Urban policies targeted to re-integrating manufacturing in the cities need thus to be explored from a multidisciplinary perspective and with regard to the twofold capability of mixed-use zoning to attract distributed manufacturers and to deal with the socio-spatial structure of the prevailing industrial structure (De Boeck et al, 2020).

3. Research design: case study and methodology

The choice of Brussels is motivated by the peculiar combination of different factors. Brussels is a city with a considerable industrial heritage, resulting from the historical relationship between manufacturing activities and the development of the Canal infrastructure in the Senne valley (Nakhlé and Raynaud, 2014). The deindustrialization process, experienced in Brussels between the 1970s and the 2000s, had a strong impact on urban spaces, and on a wide set of interrelated domains: economic, political, social and environmental (Corjin and Vermeulen, 2013). According to the general trends described in the literature review, deindustrialization in Brussels was mainly characterised by the progressive suburbanization of productive activities, and by the contemporary shift of urban economy towards tertiary, business and administrative activities hauled by the settlement of EU institutions. Up until the 2010s in Brussels, urban and planning policies supported the tertiarization of central districts with the goal of making Brussels a hub and a port of entry for international political and financial trade, but largely neglected vacant industrial land and rising socio-economic polarisation between former working-class and central neighbourhoods. The lack of comprehensive policies to transition to a post-Fordist economy thus deepened the historic spatial divide between downtown Brussels and the industrial Canal quarters, leading to a peculiar condition of post-Fordist polarization projected onto a Fordist spatial canvas (Kesteloot, 2000). Similarly, to other European and North American contexts recent urban development policies try to reverse these trends by leveraging on an emergent policy narrative concerning the “productive city” (BMA, 2018; Cities of Making, 2018; Hill, 2020). The core of this narrative is a new perspective on urban manufacturing aiming at a balanced coexistence between productive activities and other urban functions leveraging on industry 4.0, on maker movement and on mixed-uses projects as a tool to redevelop former industrial land. Consequently, Brussels urban-sized regional governance has been redesigned to integrate a wide set of public agencies for the operation of innovative planning policies aimed at favouring the relocation of productive activities in the city centre. These policies mainly target the deindustrialized areas and deprived neighbourhoods along the Canal, namely the neighbourhood of Cureghem. Here we find both local and inclusive manufacturing activities

that survived deindustrialization and still provide a consistent share of jobs for the low-skilled tier of the population, but at the same time they are threatened by an upmarket residential conversion driven by the pursuit of increasing rents in the city region. Therefore, a diversified set of urban policies has recently targeted Cureghem with the aim of preserving part of the manufacturing heritage of the district and facilitating the re-shoring of small-scale manufacturing activities into the urban fabric

In Cureghem we look at three examples of distributed, local, and inclusive manufacturing and at how their permanence or attraction in the urban context is supported (or not) by tailored urban policies. We therefore describe urban manufacturing in the Brussels Capital Region and analyse the implementation of its urban regeneration programs and schemes in three productive areas in the Cureghem neighbourhood: 1) Heyvaert street, along which an international hub for car trade and repairing is situated (inclusive manufacturing), 2) the Biestebroecq basin, in the southern part of Cureghem, which is interested by experimental projects privileging distributed manufacturing, 3) the Abattoirs d'Anderlecht, one of the last slaughterhouses in urban context of Europe (local manufacturing). These three examples are representative of the different visions of the role of manufacturing in the city and the urban policies aimed at promoting it. Moreover, all these cases are characterized by social and spatial tensions that raise some concerns about how manufacturing and housing can coexist in a sustainable way.

Our empirical analysis adopts a mixed methodology. Qualitative analysis is based on 19 unstructured interviews, conducted with a plurality of stakeholders between January and March 2018. These stakeholders can be defined as “meso-level actors” placed as they are in an intermediate position to bridge the gap between regional planners and policy makers, on the one hand, and the workers and inhabitants, on the other hand (Table A.1 in the Appendix A.2). More in particular, we interviewed 7 designers and project managers (who are involved in the implementation of regional plans and projects for Cureghem), 5 manufacturing-related entrepreneurs (whose activity is significantly affected by the ongoing transformation), 4 representatives from local associations (taking care of the social changes brought about by these transformations), 3 local experts (expressing a knowledgeable opinion on the neighbourhood).

The interview protocol focused on the history of the organization of the interviewees, on the relevant urban and socio-economic issues of the selected areas. A specific section of the interview dealt with economic and social networks and their geography. The respondents were also asked to characterize their vision on the ongoing urban transformation projects and their expectations on future ones. The members of the research team independently examined the transcriptions and jointly analysed the specific (re)development and renovation projects involving the selected areas.

The quantitative analysis relied on the following data: 1) statistics on economic activities in both the Brussels region and the single municipalities; 2) a unique set of the administrative data on size and ownership of every single commercial space located in Cureghem, obtained by merging topographical data (realized by means of Brussels UrbIS®© - Distribution & Copyright CIRB) with business location (Amadeus-Bureau Van Dijk); 3) firms' balance sheets retrieved from Amadeus-Bureau Van Dijk, referred to the period 2009-2015. The first two datasets provide descriptive evidence on the industrial composition in terms of employees, number of establishments and used space. The third dataset, integrated with the addresses extracted from the second one, was used for a twofold econometric analysis.

The first empirical analysis is a test for the agglomeration economies underpinning urban manufacturing in the Canal area (see Section 4). Through a log-linear regression (Pooled OLS estimator), we analysed the performance of urban manufacturing industries during the period of interest and the agglomeration forces sustaining them. More formally, we estimated the following equation [1]:

$$\ln \left(\frac{Turn_{it}}{Empl_{it}} \right) = \beta_0 + \beta_1(Man_type_i) + \beta_2(aggl_ec_{it} * Man_type_i) + \beta_3(z_{it}) + \beta_4(w_i) + \varepsilon$$

[1]

where the dependent variable is the ratio between firm turnover and the number of employees (in natural log), used as a proxy of average productivity. The main covariates (*Man_type*) are three industrial dummies associated with the corresponding categories of urban manufacturing: local, inclusive² and distributed. Such dummies are also interacted with three indicators of industrial agglomeration (*aggl_ec*) in the Brussels Region: i) location quotient used as a proxy of industrial specialization (so-called MAR externalities) (e.g. Glaeser et al., 1992; Melo et al., 2009), ii) entropy-based related variety, used as a proxy of industrial diversification across similar sectors (e.g., Frenken et al., 2007), and iii) entropy-based unrelated variety, used as a proxy of pure industrial diversification (so-called Jacobs externalities) (e.g., Jacobs, 1969; Henderson et al., 1995)³. Time-variant control variables (*z_{it}*) include the book value of fixed assets (in natural log), year dummies, the rate of growth of regional GDP (in natural log). Time-invariant control variables (*w_i*) include 19 spatial dummies, one for each municipality of the

² A limitation of the econometric analysis, with regard to this category, is that inclusive manufacturers (such as car repairers) may be unregistered or informal and thus they do not appear in the Amadeus dataset, which is based on firms' balance sheets.

³ The formulas of these indicators, as well as the definition of MAR and Jacobs externalities, are reported in the Appendix A.1.

Brussels region. To take account of the foundational perspective, and assess the contribution of manufacturing to the urban employment we also replicated equation [1] with the number of employees as dependent variable:

$$\ln(Empl_{it}) = \beta_0 + \beta_1(Man_type_i) + \beta_2(aggl_ec_{it} \times Man_type_i) + \beta_3(z_{it}) + \beta_4(w_i) + \varepsilon$$

[1']

In the second empirical analysis (see Section 5) we use the same estimator, in linear form⁴, to assess the correlation between the localization of manufacturing firms in the selected productive areas⁵ and their profitability to check whether these firms may have benefited from the pro-makers urban policies implemented in the Brussels area. To do this we estimated the following regression:

$$Prof_{it} = \beta_0 + \beta_1(Sel_area_i) + \beta_2(Sel_area_i * Urb_pol_t) + \beta_3(aggl_ec_{it}) + \beta_4(z_{it}) + \varepsilon$$

[2]

In this case the dependent variable is firm's operating profit, whereas the main covariates are the location (*Sel_area*) and the period of implementation of pro-makers urban policies (*Urb_pol*). Other control variables (*z_{it}*) are the same as equation [1]. Such regression is run for the overall sample and for the subsample of manufacturing firms to make industrial differences emerge. If the urban policy cannot be referred to a specific period, we selected the area interested by such policies and run a regression similar to [2], using the manufacturing sector as the main covariate:

$$Prof_{it} = \beta_0 + \beta_1(Man_type_i) + \beta_3(aggl_ec_{it}) + \beta_4(z_{it}) + \varepsilon$$

[3]

Again, in line with the foundational approach, we replicated the estimates of equation [2] and [3] with employment as dependent variable, as done for equation [1] and [1'].

4. Urban policies and manufacturing activities in the Brussels Region

4.1 Brussels Capital Region: at the interplay of deindustrialization and tertiarization of the urban space.

⁴ In this analysis we do not use the log-linear form because if profits are negative (i.e., in the case of a loss) they cannot be log-transformed.

⁵For the Abattoir site, this analysis was unfeasible because the entire area is owned by a single firm.

The Brussels Capital Region is a compact and densely populated city (1,2 million inhabitants), divided into 19 municipalities. Administratively Brussels is an autonomous city-region, settled in 1989 following the process of regional federalization of Belgium, while geographically it is included within the territory of the Flanders region. Despite being mostly known as one of Europe's political and administrative capitals, Brussels holds an important industrial legacy developed along the Canal, which, since the nineteenth century, served as a main infrastructure, to connect the city to the port of Antwerp on the north-east and to the Charleroi industrial basin in the south-west (Corijn and Vermeulen, 2013).

The industrial development of the city flourished over the twentieth century, and knew its heyday after the second WW, during the so-called “glorious Sixties”. In this period the development of a fordist based economy provided the basis for rising real wages, job opportunities and access to the credit system, while rising levels of education provided new possibilities for social upward mobility especially for the middle-class (Kesteloot and Meert, 2000). Economic well-being and job security fuelled mass consumption of goods, amongst which house and private car ownership were central elements (Mistiaen et al., 1995). Particularly, access to house property in the suburbs was sustained by the State through grants and cheap mortgage subsidies (Vandermotten, 2014). While since the mid-fifties the State gave impulse to a rapid development of the transport network around Brussels, in order to make it a main transport node in central Europe and to sustain the desire for private mobility and the supply of consumer goods (Hubert, 2008). All these elements triggered an intense dynamic of suburbanization of Belgian middle class, spatially expressed by a sprawl process in the Brussels metropolitan area and boosted by mass motorization⁶. Conversely, in the Canal zone, the Belgian middle class was replaced by guest workers through a series of migratory waves, as the area still offered job opportunities in industrial activities and affordable housing conditions (Corijn and Vermeulen, 2013).

According to different scholars the 1958 Expo must be considered the turning point in the reorientation of Brussels's economy towards the development of service-based, administrative, and tertiary functions, and furthermore in the subsequent production of Brussels built environment. The Expo, as an international platform to show the results of the post-war socio-economic recovery, was aimed at up-grading Brussel amongst European capitals ranks as an entry point for US firms into the emerging European communal market and a reference platform

⁶ Suburbanization (though changed under the socio-economic profile) continues today with a network of ca. 380,000 commuters per day. They live in the surrounding municipalities and regions and head to the city for education, services, and work. Given the federal nature of Belgium regional structure, suburbanisation implies consistent fiscal imbalances between Brussels Capital Region and its wider metropolitan area, since many of those who work and/or use services in Brussels pay taxes in the suburban municipalities where they live (Maesschalck et al., 2015; Vandermotten, 2014).

for international political and financial exchanges (Den Tandt 2004; Hubert, 2008; Romanczyk, 2012; Vandermotten, 2014). The tertiarization of Brussels urban landscape, as a result of explicit State policies, had a strong impact on central neighbourhoods through a modernist destruction-reconstruction approach affected by fragmentation and inefficient planning system, often leading to a sort of “urbanisme sauvage” (Groth and Corjin, 2005:516). Old central neighbourhoods, former industrial areas and working-class neighbourhoods were razed and rebuilt to make place for transport infrastructure, European institutions, office buildings and new business districts⁷ (Dessouroux, 2010). Since 1968 inhabitants and associations have strongly opposed what they labelled the *brusselization* of the historical central neighbourhoods, since it lacked any concern for aesthetics, protection of building heritage⁸ or consultation with residents while conversely it was too prone to real estate operators (Lagrou, 2000; Romanczyk, 2012). As a consequence, *brusselization* triggered the rising of land prices and thus limited access to rents and housing market for locals. Those who could not afford to join the suburbs nor to stay in the central neighbourhoods remained “stuck in the city” and progressively concentrated in the outdated housing stock of western neighbourhoods along the Canal (Mistiaen et al, 1995; Kesteloot and Meert, 2000; Kesteloot and Loopmans, 2009).

Starting from the early 1970s deindustrialization particularly hit the Canal area where production location became less desirable and less profitable. While some manufacturing industries permanently closed, others relocated in near-by regions where bigger and cheaper areas were available for further plant development and were better connected to newer transport infrastructure such as highways, coast ports and freight airports like Zaventem (Corjin and Vermeulen, 2013).

In the Canal area the shrinking of manufacturing activities reduced even more the job prospects of those who could not rely on high education levels nor specialised skills to improve their employability.

These long-run dynamics strengthened social polarisation and socio-spatial inequalities between the city and its wider suburban area (Kesteloot, 2014; Maesschalck et al., 2015) as well as between the central neighbourhoods and the so-called “poor crescent” which encompasses the Canal area (Kesteloot and Meert, 2000). Still nowadays, Canal neighbourhoods are the most densely populated, with high percentages of low-income households and unemployment rates,

⁷ We refer here, for example, to the clearing of old neighbourhoods to allow a massive development of office buildings in the so-called Central Business District which encompasses the Leopold quarter (European quarter), the Brussels Park and the North-South junction area. Another example is the so-called “Manhattan project”, or the Brussels World Trade Center: built in the late 1960es in the Northern quarter it rapidly failed in the early 1970es (Dessouroux, 2010).

⁸ It’s the case of the Maison du Peuple, exemplary of art nouveau architecture, demolished in 1965 and replaced with a skyscraper.

compared to the average of the city-region (IBSA, 2020). Furthermore, as they are a gateway to the city for migrants and newcomers, these neighbourhoods express an increasing demand for public facilities and social policies.

At the end of this process manufacturing accounted for around 3% of the urban economy, having lost 30,000 jobs from 1991 to 2006, mainly in low qualified positions (Vandermotten et al., 2009). Currently, however, despite four decades of decline together with the ongoing relocation of manufacturing activities outside of the city, there are still three persisting areas of industrial specialization within the city, such as food industries, constructions, and automotive. In 2015 the automotive industry employed more than 2,500 workers, following a net employment growth (+14%) between 2007 and 2015. In the same year, the food and beverage industries employed 3,500 workers, mainly concentrated in the municipality of Anderlecht (which includes the Canal basin), after having increased their relative competitiveness between 2007 and 2015. Overall, these figures do not support the idea that a diversified manufacturing industry in the region is flourishing, but they are rather consistent with a persisting specialization in some traditional sectors. These trends are also accompanied by small-scale positive dynamics of medium-technology sectors. In particular, under the threshold of 200 workers, one can find a bundle of activities that grew faster in the Brussels region than in the rest of the country, such as metal products, electrical equipment and machinery, aircrafts.

4.2 Planning policies and urban projects for urban manufacturing

In Brussels the recent debate, both on the post-industrial city and the rethinking on mixed-use rezoning, was carried out firstly by academic researchers, citizens' associations and professionals' networks. These collective reflections gained the public attention when they converged in the exhibition "Atelier Bruxelles-A Good City has Industry" (2016), and in the Brussels editions of Rotterdam Architecture Biennale "IABR-2018+2020 The missing Link, exploring new spatial models of production-consumption for a more resilient and sustainable transition of the urban ecosystem". Further applied research continued with EU funded research projects focusing on manufacturing reshoring in Brussels and other European cities. This debate has been producing new design practices, while informing public action and policies (Verbakel and De Bruyn 2014, Fioretti et al. 2020) that are renovating Brussels' long history of urban regeneration actions at different scales and for different types of urban fabric. Most importantly, this debate progressively created the conditions for politicians' support, which is viewed as "an essential requirement to allow effective progress towards the development of tools on an operational level and the realisation of real projects" (BMA, 2018: 4).

This increasing attention towards the rehabilitation of dismissed areas put the Canal basin at the centre of administrators' and planners' narratives, as a revived backbone of urban and regional development. The first outcome of this public debate, indeed, consisted in an international consultation concerning the Canal areas promoted in 2012. The first interim report called "Plan Canal" (PC) is an exploratory masterplan delivered in 2013 and subsequently adopted in 2014. During the preliminary survey of the PC, a large reservoir of grey-field abandoned sites emerged. As it was mainly publicly owned, the presence of this reservoir enabled regional agencies to gain a leading role in urban development, and to implement new pilot projects considering urban manufacturing reintroduction or strengthening.

The most interesting one was the new mixed-use zone called ZEMU (*Zone d'Entreprises en Milieu Urbain* – Enterprise Zone in Urban Context) (see Figure 1 and Table A.2 in the Appendix). It was inserted in the Land Use Plan (PRAS) adopted in 2013, which allowed a shift in land use regulations in pre-identified industrial areas to promote the coexistence between economic activities and housing.

In addition to the ZEMU, other urban schemes and programs, oriented towards different objectives and scales of intervention, have been redirected or reformulated to include manufacturing and production in the regeneration of urban spaces.

Among them, there is the CDQD (*Contrat de Quartier Durable* – Sustainable Neighbourhood Contract), a formal contract between the Region and the Municipalities, formerly instituted in 1993. CDQDs are municipal scale tools, with a limited time span (5 and 7 years), grounded on a project-by-project approach with a specific focus on public equipment provision, public spaces enhancement, socio-professional inclusion, and social housing. Recently, CDQDs also encompassed the development of economic activities, potentially recognizing the role of manufacturing within the city context to promote inclusion processes (Berger 2019). Moreover, they aim at including inhabitants and local associations in the decision-making processes and the project's follow-up.

Since 2016, CDQDs have been inserted within the ZRU (*Zone de Rénovation Urbaine* – Urban Renovation Zone) that is a regional level planning area, whose aim is to enhance socio-economic inclusion, the development of the local economy as well as a general improvement of deprived neighbourhoods. The ZRU perimeter embraces a large intervention area defined by three socio-economic indicators: unemployment rates, income, demographic density. It embeds and coordinates not only CDQDs but also another municipal-level tool: the CRU (*Contrats de Rénovation Urbaine* – Urban Renovation Contract).

Moreover, within the areas identified by the PC, the Abattoir area benefited from extensive and coordinated use of ERDF (European Regional Development Fund) as leverage for a

manufacturing-oriented urban transformation. These funds, usually committed to strengthening social and economic cohesion, have been specifically and innovatively used in the frame of a regionally integrated planning approach for the renovation of urban voids.

< Insert Figure 1 here >

< Manufacturing-related policies and planning tools along the Canal in Brussels. >

Sources: Brussels UrbIS®© - Distribution & Copyright CIRB

Even if these policies included urban manufacturing as a pivotal element of their narratives on urban development, not all manufacturing activities may fulfil the scenario these narratives convey, due to the heterogeneity of such activities. This idea is supported by the results of the econometric analysis on the profile of the manufacturing industry in the Canal area and the associated agglomeration externalities (Table A.3 in the Appendix A.2).

According to the estimates, the performance of manufacturing industries during the period of interest was quite heterogeneous as well as the underpinning agglomeration forces. Inclusive manufacturing and local manufacturing do not stimulate labour productivity (see equation [1]). Their log-linear coefficients (see column one of Table A.3), in fact, are both negative and significant (-0.194 and -1.738, respectively), unless they interact with specific agglomeration forces. Industrial specialization (MAR externalities) has a positive effect on average productivity if referred to inclusive manufacturing, as shown by the positive coefficient (+0.378, which means that a one-standard deviation increase of the specialization coefficient contributes to a 37.8% growth of average productivity) attached to the interaction term. Local manufacturing positively correlates with related variety (column two of Table A.3), which requires the co-location of similar (but not the same) industries.

These results are in line with our expectations: inclusive and local manufacturing would not benefit from urban location, but they take advantage from agglomeration if other similar firms concentrate in the area. On the contrary, distributed manufacturing (column 3 of Table A.3) enjoys a comparative advantage from urban location (+49.7%), but it is penalized by industrial specialization (the coefficient of the interaction term is equal to -0.260).

However, when considering the number of employees as the dependent variable (Table A.4 in the Appendix A.2), the results are the opposite. Inclusive and local manufacturing stimulate employment (coefficients are respectively equal to +0.107 and + 1.635), whereas distributive manufacturing negatively correlates with the number of employees (-0.706).

This second result basically confirms the foundational economy approach as it emphasizes the role of more traditional industries in guaranteeing a strong occupational base in all spatial contexts, including cities.

5. Urban manufacturing and cohabitation conflicts in Cureghem

The contrast, or even the conflict, in the transition between the existing manufacturing industries and the idea of manufacturing associated with the urban policies narratives clearly emerges when looking at their implementation in Cureghem.

Cureghem neighbourhood is a specific portion of the Canal area, amidst the municipalities of Anderlecht and Molenbeek, whose industry footprint is still relevant in the urban fabric of the area as it is related to the historical development of the Canal as the main infrastructure for productive activities (Nakhlé and Raynaud, 2014). Because of deindustrialization and Belgian middle-class suburbanization, here land and housing prices are quite low. This favoured the settlement of foreign communities, notably from North Africa, Sub-Saharan regions, Southern and Eastern Europe. These communities often live in precarious dwellings and in deprived conditions, also suffering the lack of public spaces and facilities. Nonetheless, the neighbourhood is a point of reference for them, since it works as a gateway to the city in terms of work, (temporary) accommodation, services, and information, provided by community networks (Chabrol and Rozenholc, 2015). Moreover, the low prices of land and houses allowed the neighbourhood to work as a kind of inclusive enclave where immigrant communities have been able to develop ethnic entrepreneurship and access land property (Mistiaen et al., 1995; Kesteloot and Meert, 2000).

Given the progressive industrial decline and the low political impact of immigrants' communities, the neighbourhood has long been neglected by urban policies. Only in the mid-1990s, local administration switched from a "demolition" approach, (to make room for a new motorway and a group of housing and office towers) to a "revitalization" approach (leveraging on new tools available at the regional level, such as the CDQD). This switch did not have an immediate tangible impact in the neighbourhood due to both a lack of interest of local political executives, and an administrative inertia in CDQD implementation (Sacco, 2015). Later, the entitlement to vote in local election and changes in the criteria to obtain Belgian nationality for immigrants and foreigners, along with the emergence of new political subjects (the Green Party), triggered local and regional executives' commitment towards the revitalization of Cureghem and its repositioning at the centre of the political agenda (Sacco, 2015). Paradoxically, the long-term neglect of local and regional administration protected former

productive spaces from land speculation and further eviction of manufacturing activities up until the 2010s. This provided the land reserve on which current policies and planning tools could leverage towards a more balanced urban development.

Today, Cureghem is at the centre of such regional and city policies on urban development. Thus, the need to better understand the factors which sustain (or not) localization patterns of manufacturing activities and the implementation of specific planning policies fostering them is more evident (Orban et al., 2021)⁹. In the following paragraphs we will look at three exemplary cases: the enhancement of mixed functions in the Biestebroek basin through the use of the ZEMU, the renovation of spaces for meat production in the Abattoir plain through the use of ERDF funds, and the specialized production of car trade and repairing in Heyvaert street following the implementation of CDQD (see Figure 2).

< Figure 2 – insert here >

< Localization of the three selected areas and spatialization of manufacturing industries and selected planning policies in Cureghem neighbourhood. Note: The map highlights the second-hand car related activities in Heyvaert area, the food manufacturing industries around Abattoir, and the variety of the economic activities in Biestebroek.>

Sources: topographical data (Realised by means of Brussels UrbIS®© - Distribution & Copyright CIRB); business location (Amadeus-Bureau Van Dijk); fieldwork survey by the authors (2018-2019).

5.1 Cohabitation of housing and manufacture in Biestebroek: between experimental urban policies and eviction of production from the city

Despite the process of deindustrialization that has occurred in Brussels since the 1980s until recently, the area of Biestebroek maintains a relevant industrial profile that joins together traditional industrial productions with innovative start-ups.

Two main built environments juxtapose in its urbanscape: on the one side, the industrial blocks made up of large warehouses and wide open spaces for logistics or reused historical manufacturing building for service economies that are profiting from large land parcels availability; on the other side, the traditional low-density urban fabric characterized by residential blocks and terraced houses, interspersed with council estates and residential towers

⁹ Orban et al. (2021) distinguish between “old” industries as to those settled before 2000, and to “new” ones as to those settled after 2000. According to the authors the location patterns of these last ones have been strongly influenced by subsidies and favourable settlement conditions provided by the latest regional policies aimed at attracting to the Canal area new and innovative SME. Conversely “old” industries, already settled in the area, strive to remain in the area because they cannot access the same favourable conditions as they tend to be more space-consuming and to have a lower degree of innovativeness.

for low-income families. It is a very fragmented and variegated urban landscape, interspersed with dismissed areas and unused public spaces, that accommodates highly diversified economic activities. The industrial profile of the area shows the presence of both traditional low-tech space-intensive industries (4.2% of the enterprises and 16.8% of the used land) and medium-technology industries potentially falling in the category of distributed manufacturing industries (3.5% and 2.9%). The area is also characterized by the presence of tertiary industries, including knowledge-intensive business services (6.9% and 7.6%), along with logistics (15.3% and 35.4%) and wholesale trade (2.1% and 8.4%). Such industrial structure supports the image of a mixed urban district (Carmona, 2015).

The main spatial features, which make Biestebroek a suitable and attractive place for manufacturing, are the high level of accessibility (due to its proximity to the main intermodal mobility nodes, such the railway international station of Brussel Midi and the main regional highways), its central position, and the availability of large land parcels. As recognised by a local entrepreneur specialized in the re-use of construction materials: “It is very nice to be located here for the activity we do because we are near to the city centre [...] we have a huge storage place 15 minutes from the station [...] we have good access to the highway”.

In 2013, in compliance with the PRAS, the designated use of Biestebroek areas has partly shifted from ZIU (Urban Industrial Zone) to ZEMU, as the Region chose it as a test area to redesign urban functions towards an innovative, more intensive, mixed-use of industrial land, based on a variety of activities, including new forms of city-friendly and space-efficient distributed manufacturing.

The innovativeness of ZEMU has been favourably welcomed also by traditional manufacturers, who view it not only as a tool that accommodates real estate interests, mainly focused on building new housing, but also as a tool that pays attention to the need to safeguard blue-collar jobs and enhance socio-economic inclusion. As argued by the CEO of a social enterprise operating in the packaging industry: “I think it is also in the public interest to have ZEMUs, to have jobs and not only housing. To a certain extent there are risks of cohabitation”. Moreover, since the firm employs disabled workers, he looks favourably to the positive externalities of a functional “mixité” since “our workers will be more integrated: there will be a lot of housing all around and there will be more public transport”.

At the same time, the attempt of ZEMU to translate a widespread narrative on urban mixité into planning regulation has been suffering from many drawbacks arisen during the implementation phase; “The Region has decided to develop the ZEMU, but they did not take into account the consequences, since they really hoped to create a functional mixité: production and housing” as underlined by one representative of the local associations and committees federation who

stressed the difficulty of steering real estate projects towards less profitable investments, such as manufacturing-related ones, in comparison to housing. From her point of view “there has been an advertising-effect that led private developers to buy large parcels in the area” in advance in respect to the program implementation. This has reinforced a market-led trend that made it very difficult for the Region “to impose on developers the creation of a functional mix and combine both housing and productive activity” that would be less profitable for them.

Another critique refers to the lack of space for logistics and storage activities needed by traditional manufacturing, usually space-intensive, that is at odds with the need for public spaces, amenities and services associated with housing. CEO of a social enterprise also highlights this aspect: “I think that what they may have lost sight of is that a productive activity requires space, not only to produce but also to store, we have 50 trucks per day coming and leaving”.

Even the urban designers involved in the ZEMU transformation recognize its limitations in terms of lots size and volumes: “It’s good to understand what is the size and scale of the problem”, as stated by an architect and planner working on Biestebroek area, “not only productive activities requiring more than 2000 sqm are considered nuisances and have to leave, but also everything that is between 500 and 2000 sqm has a tendency to disappear”. What remains are very little plots, unable to host productive activities. He explains that 500-2000 sqm is “the perfect dimension of terrain asked by developers to build condominium housing, which is fantastic for this area because they need upper-class investments but at the same time those are terrains for the industries that are being pushed out”. Moreover, even the smallest manufacturers could be penalized by the absence of spaces that are large enough to make their production processes efficient. As argued by a manager of a real estate company specialized in vacant premises: “It would be nice if there would be a building next to ours that is like a big production hall, that would be perfect, because we have lots of microbreweries that want to do something. More in general we have lots of small companies needing from 200 to 400 sqm”.

To handle these critical issues, the Region has put in place a series of public-funded projects and appointed a regional agency, CityDev, with the purpose to attract high-added-value companies and middle-income households to the Brussels-Capital Region. Since 2015, CityDev has been developing two pilot projects within a broader program called Citygate, in collaboration with the Housing Company of the Brussels-Capital Region (SLRB), taking place in a total surface area of more than 1,3 ha, and composed of Citygate I (housing, SME spaces, retail, equipment), Citygate II (housing and equipment). Through them, the agency tries to orient the real estate market dynamics towards the objectives put forward by ZEMU legislation, while starting a dialogue with simultaneously public and private projects of urban development. “With CityDev

we have the opportunity to test specific public-oriented projects, such as vertical mixité like workshops on the ground and first floors and the housing on the top ones etc.”, stated the CityDev CEO who has the following vision: “We don't really know how the way of living and the way of working is going to evolve, [...] but more and more it is about the integration, interaction, and complementarity of different functions and infrastructures that you need in the city”.

Within CityGate II, the most experimental project is StudioCitygate, one of the largest temporary occupations in Brussels, taking place during the long time needed by neighbourhood allotment transformations. He explains that “our projects are bigger and more complex, with more actors, that takes more time. What happens in the meantime? You have to manage empty buildings”.

Those temporary occupations have especially been promoted to attract emerging socio-cultural and co-working or productive ventures in the area. Those are sided by services and amenities more related to urban life such as a skateboard park, urban gardens, bars, and a terrace restaurant that are hosted into the buildings. Their permanence in the neighbourhood is not for granted, and they could be seen as temporary exploitation of abandoned areas, or a hip marketing strategy to disguise real estate development speculation (Ferrerri, 2015). Nonetheless, temporary uses keep the building from falling apart and being insecure, allowing economic variety to emerge and settle in the city, thus showing the potential of the area to host new kinds of manufacturing activities.

Although the implementation of ZEMU is very recent and it is thus difficult to fully evaluate its impact in terms of urban development and manufacturing enhancement, the econometric estimates of its potential effects on the profitability of manufacturing firms report positive evidence. Indeed, although the introduction of the ZEMU is associated with a systematic positive correlation with the profitability of all observed firms, such correlation is significant only for manufacturers. As shown in Table 1 (column 2) a generic firm that gets benefits from the introduction of ZEMU located in Biestebroek reported a non-significant variation of their profitability after the introduction of the ZEMU zoning in 2013. On the contrary, manufacturing firms located in the same area enjoyed a shift from negative significant profit growth after 2013, in comparison with the period before ZEMU and with non-manufacturing industries (third column of Table 1). Namely, manufacturing firms located in Biestebroek after 2013 enjoyed a profit increase of 4,260 €, on average, other things being equal, compared to a decrease of € 4,183 suffered before 2013. When looking at employment, the introduction of the ZEMU is associated with a reduction of the employment loss suffered by the average firm operating in the area, but the variation is only significant for manufacturers. Notably, when manufacturing firms

are considered (column six in Table 2), the correlation between Biestebroek area and the number of employees shifts from a negative and significant coefficient before 2013 (-45) to a null and non-significant one after 2013. It seems therefore that mixed-use policies undertaken by the Brussels Region are compatible with the development of manufacturing industries and with the preservation of their role in the urban area, at least in the short run. However, in the light of the stringency of ZEMU requirements and the aforementioned issues related to the ongoing projects, this potential compatibility is likely to be more and more partial in the long run, and limited, in particular, to “distributed” manufacturing. Not only is this “in itinere” expectation in line with the findings of a previous ex-ante evaluation (De Boeck et al., 2017), which suggested that small companies not rooted in the social and economic fabric might leave the area in the long run, but it also indicates that ZEMU characteristics may further limit the number of long-term surviving firms by posing substantial spatial and quality constraints to manufacturing activities.

Table 1 here

5.2 Abattoir: a resilient food-based ecosystem, traditional or innovative?

Abattoir is one of the last urban slaughterhouses in dense urban areas in Europe, where the production of meat keeps running from 1890. The site, of approximately 11 ha, is located at the core of Cureghem neighbourhood, on the riverside of the Canal and quite close to the city centre. Besides slaughtering, Abattoir also hosts a tanning firm and meat processing activities and is renowned in Brussels for its week-end open-air market. To cope with deindustrialization and afterwards to keep pace with urban renewal ongoing in the Canal area, the S.A. Abattoir, long-term lease tenant of the site since 1984, has profoundly renovated the site over the decades. In the mid-1980s, meat activities were compacted and rationally reorganised in the so-called “black box”: a blank façade building to meet AFSCA (Federal Agency for Alimentary Production Security) regulations in terms of hygiene and export seal (Senechal, 2015a). The rationalisation of meat production spaces inside the black box released big surfaces on the Abattoir plane, allowing new investments in Abattoir spaces focused on addition of other functions and renovation projects.

The promotion of Abattoir as multi-function space evolving around alimentary production is reinforced by the simultaneous presence on site of the weekly open-air market which lures approximately 100.000 visitors per week¹⁰. The market has also influenced, and is influenced in

¹⁰ The market takes place mostly open air, on the vast plain around the Grand Halle. The variety and availability of products is quite impressive since base ingredients and specialities from various, typical or

turn, by the retail structure in the close-by streets: on time and following different migratory waves ethnic or specialised shops settled in adjacent streets responding to the needs of new customers. This allowed the development of ethnic-based entrepreneurship (Kesteloot and Meert, 2000) thus providing social inclusion paths for many, since these commercial activities are often run by foreigner shop owners who may have started with a stall in the Abattoir market (C.Sénéchal, interview, february 2018)¹¹.

Starting from the 2010s, the Abattoir S.A. has leveraged on urban design resources to elaborate an incremental renewal strategy (ORG and Abattoir S.A., 2013), consequently this project capability allowed Abattoir S.A. to apply for regional and European funds.

The first project of Abattoir renovation plan is the FoodMet, funded by ERDF (2007-2013) and Brussels Region. FoodMet is meant to be a food hub where local and international customers can buy food specialities. In this vein, FoodMet plays a role in Abattoir marketing strategy: the label “Brussels belly”¹² attached to this project is aimed at valorising its long history of food production and therefore leveraging on the growing attention to food culture in urban contexts. Besides this, the importance of FoodMet consists of innovative elements integrated in the project such as the urban farm and the hydroponic plant on the rooftop. The urban farm, the greenhouses and the hydroponic plant are rented to and managed by a firm specialised in the implementation of circular economy projects in the real estate sector.

The good result of FoodMet project and the elaboration of a masterplan in 2008 provided a reliable base to apply for a second ERDF (2014-2020) for the development of Manufacture project: a vertical and compact building where meat production will be further rationalized, and other possible activities will find space to meet economic and social transformation in the area. As confirmed by Abattoir project manager, Manufacture is intended to be a “building that foresees the possibility to keep meat production as a core activity, while allowing further development projects to be ready and flexible towards new functions”. This is conveyed by the name itself which explicitly recalls the overarching narrative on urban manufacturing and according to him “the idea is preserving manufacturing activities in the Abattoir site and the city centre, to valorise it”, notably “keeping this knowledge of creating things by hands, in this case

traditional cuisine, ranging from Maghreb, eastern Europe, to the most exotic products and preparations from sub-Saharan Africa and south Asia, can be easily found. The market attracts both residents from Cureghem and immigrant communities from all over Brussels. The relevant benefits are twofold: goods on sale are quite cheap compared to the city average, thus allowing the local community(ies), to afford their daily needs, while the variety of alimentary goods on sale meet the tastes of a multicultural community with different traditions and alimentary habits.

¹¹ We briefly refer here to the role of Abattoir market in contributing to the inclusiveness potential of the commercial activities taking place on the site and their trickle-down effects on the surrounding neighbourhood. Nonetheless it will not be fully addressed in the following paragraphs since it concerns commercial activities on the site more than productive ones.

¹² The “Brussels belly” (“ventre de Bruxelles”) recalls the famous novel by E. Zola (1873).

slaughter and meat cutting”. The underlying logic of preserving meat production and related activities also relies on the eco-systemic potential of the food industry in urban areas (local manufacturing).

The presence of Abattoir significantly marked the history of the local economy, as until recently the neighbourhood was commonly known as the “meat neighbourhood” (Sénéchal, 2015a). Although the displacement of the meat industry in the suburbs reduced the number of meat operators, Abattoir remains a reference point in the Anderlecht meat industry because of the persisting concentration of firms specialized in related activities such as meat cutting, butchery, entrails processing and tanning. The social evolution of the neighbourhood and the city towards multiculturalism also had an impact on meat activities: the small-medium size of Abattoir eased the implementation of service provision by including specialized niche productions dedicated to different ethnic food cultures, such as halal. This suggests that meat production downsizing has been partly counterbalanced by the ability to intercept a more customized demand coming from the surrounding area.

Currently, Abattoir contributes to make the food industry one of the largest manufacturing sectors of Brussels, employing 3,048 workers in 2015 (0.49% of the regional workforce and 1.1% of Anderlecht workforce). The contribution of Abattoir refers in particular to meat processing and preservation activities. The two slaughtering companies, employing between 35 and 40 workers, and the 30 meat cutting companies, employing approximately 60 workers, constitute the core of this industry, which in Anderlecht occupies 125 workers out of a total of 310 in the Brussels Region.

Meat related activities provide job posts for specialized workers, especially blue collars, enhancing their social inclusion and providing them career opportunities. This marks a substantial difference with large meat industries placed outside the city, which create dead-end jobs for the unskilled tier of labour supply (Sénéchal, 2015b). In this sense, Abattoir plays a relevant role in the local labour market often nuanced with inclusive aspects as “there are workers living in the neighbourhood, and also seasonal workers that afterwards settle in Belgium”, as confirmed by the spokeswoman of Forum Abattoir. Otherwise, the possibility that Abattoir meat production will continue to provide local as well inclusive job possibilities in the years to come is threatened by the competition of large-scale distribution, by the loss of training schools and programmes for specialised workers in meat sector as well as by the generational turnover amongst meat company owners and workers (Sénéchal, 2015b)

In the case of FoodMet and Manufaktur projects, ERDF have been oriented towards territorial development through renovation of urban fabric and valorisation of local manufacturing. Thus, contributing to the main regional strategy to keep manufacturing in the city. ERDF allowed

Abattoir to resist deindustrialization and land speculation through an incremental strategy that keeps productive activities at the core, while being flexible and resilient towards possible future functions and spatial requirements.

Nonetheless, some tension will arise if one looks at the role of meat production in this strategy. Even if meat production remained a core activity at Abattoir, its spaces have been strongly reduced and its daily routine is hidden behind the blind walls of the black box, to the point that neighbourhoods often do not even perceive the slaughtering activities.

The aim to further reduce its spaces by arranging them in the Manufacture building amidst other possible functions seems to contrast with the narrative of keeping meat production at the centre. As hypothesized by the Abattoir project manager “We want to have slaughter lines, but maybe we won't have slaughter lines”. Therefore, the possibility that meat production will either end or change in the future – from a manufacturing activity towards more technologically integrated production, such as artificial meat – is already taken into account in the Manufacture project. Thus, it becomes a design matter. “Should we make a program that gives openness to integrate, at some point, food innovation in our building? Can we replace slaughterhouses with food innovation activities, or things like that?” he underlines.

The urban farm and the hydroponic plant on FoodMet rooftop are exemplary spatial outputs of the evolution towards a ‘smart’, ‘green’ and ‘circular’ food production and have been key features in the project funding (European Commission DG Regio, 2016). These experimental projects are consistent with the idea of keeping local food production on site and fit well into the narrative of an innovative and sustainable urban manufacture that valorises existing production spaces inside the city. At the same time the urban farm could provide inclusive as well as local jobs through the partnership with a non-profit association working in the frame of social economy and providing training and job placement to underprivileged categories of workers (disabled, people in professional reintegration, long-term unemployed). Conversely, one must consider that these activities are run by a firm with a large investment capacity, strongly committed to technological innovation and rentability, which could get into contrast with the socio-economic features of the neighbourhood (Bortolotti et al., 2017). Vegetables and fish production on Foodmet rooftop will hardly be marketed among the low-income neighbourhoods and will probably address more profitable foodservice markets inside or outside the city. Furthermore, being highly technological infrastructures, the urban farm and the aquaponic plant management will demand high-skilled workers who can hardly be found in the local labour market. This could be compensated through the collaboration with non-profit associations for the reinsertion of underprivileged or low skilled workers. However, this risks not contributing consistently to the local labour market nor to a long-lasting social inclusion of workers since

people involved in these work reintegration paths often do not land to a permanent position (Orban et al, 2021). Finally, being restricted access spaces, they will remain “invisible” and un-accessible to neighbourhoods. In this sense, these projects could be perceived as a “bulk element”, and potentially be rejected by locals as underlined by the spokeswoman of Forum Abattoir.

By leveraging on process innovation and functional flexibility of productive spaces, the narratives framing Manufacture an FoodMet projects risk to overwhelm meat production in the long run. These may have a negative impact on the Abattoir entrepreneurial ecosystem, which is mainly constituted of small-medium family firms run by local entrepreneurs, by dismissing them as space consuming and not profitable. At the same time the role that Abattoir could play in the local labour market has not been fully considered. Current narratives associated with innovation projects risk to overlook how and to what extent the integration of all the activities on site could support a more variegated and inclusive local labour market by providing training, specialised formation programmes, and career opportunities evolving around alimentary production.

5.3 A conflicting relationship between inclusive manufacturing and the improvement of dwelling conditions in Heyvaert street

Heyvaert street and the surrounding neighbourhood became a very specialized district connected to a transnational trade circuit of second-hand cars exported from Belgium to Sub-Saharan regions during the 1980s (Rosenfeld, 2013). The area is characterized by a substantial concentration of car-related activities: more than 20% of the establishments (115 out of 463) operating in this area belong to the trade and repairing of motor vehicles. Despite not being a proper manufacturing sector, car dealing and repairing activities have generated the typical benefits of inclusive manufacturing. As a car dealer remarks: “[our activity] is economically important because it offers job posts to workers that are usually low-skilled, providing the right matching between labour demand and supply”. This district can thus be considered an effective gateway to the local labour market, especially for incoming immigrants.

From a spatial perspective, these activities demand large amounts of land to park and stock second-hand cars waiting to be shipped towards Antwerp and exported to Africa as reflected by the land use distribution of the area: this industry occupies more than 77% of the area of interest, despite representing less than 23% of the enterprises operating in the district. Moreover, car dealing warehouses are intertwined with residential buildings, while their activities usually spill into adjacent streets, sidewalks, and waterfronts, without providing any direct benefit to the neighbourhood residents in terms of service provision. For these reasons,

despite their role in favouring social inclusion through the provision of employment opportunities, the presence of second-hand car dealing in the neighbourhood has exacerbated socio-spatial contrasts about the use of public and private space (Lenel, 2015). As stated by a university urban researcher, public choices should be concerned by those issues because “if you act as a public authority and a civil society to go forward to a sustainable city centre, cars don't have a place in the middle of a residential area. Even if it is providing jobs”. Such contrast is mostly evident in terms of environmental disamenities, such as noise, smog, oil patches, and safety as remarked by the architect in charge of the CDQD “Petite Seine” concerned by “the pressure that is too strong, by day or by night [...] and the truck drivers actually can't see what is happening on the streets and react accordingly, and that is quite dangerous for the inhabitants”. These disamenities also affect the perceived image of the district. As stated by the responsible of a local development project “The inhabitants hate it, because it's very dirty, you have a lot of noise, trucks are too big for the roads, and it is very scary for the kids”. This corroborates a stigma for the neighbourhood as “many inhabitants told us that Heyvaert is the ‘garbage of the city, the garbage of the world’: because you have the cars, you have the waste, you have the politicians not caring about the place”. By highlighting the polluting nature of this activity, this perception seems to acknowledge not only the negative externalities engendered by the car trade to the district but also the environmental issues arising from “dumping” polluting cars on the African market.

Since the 1990s Molenbeek and Anderlecht municipalities tried to cope with these issues through a regeneration program based on CDQDs and CRU¹³ promoting transition of functions and space redesign. The most recent CDQDs were the CDQD Compass (2013-2017) on the Anderlecht side, and the CDQD Petite Senne (2014-2018) on the Molenbeek side. The CDQD Petite Senne includes, for instance, the “Halle Libelco” project. Its objective is the transformation of a former car dealing plot with a covered hall into an open public square connecting two sides of a block, with social and affordable housing, commercial and craftsmanship activities, and day-care services on the ground floor, such as language, play and work laboratory. In this way the project seeks to accomplish the main institutional objective of CDQDs: to build welfare facilities, provide qualitative public housing stock, and renovate the existing public spaces in one of the poorest areas of the city. The CDQD Petite Senne also incorporated actions to enhance economic development. In particular, a part of the new spaces has been specifically designed to host fablabs and craftsmanship ateliers (PTArchitecten BVBA, 2017). In this way the CDQD tries to welcome distributed manufacturing, in an attempt to

¹³ The Heyvaert street area is divided between Anderlecht and Molenbeek municipalities. Both municipalities extensively used the CDQD tool since the mid-1990 (Sacco, 2010). The two municipalities are nowadays associated with the CRU Heyvaert Poincaré (2017-2024).

accommodate productive activities that are compatible with dwelling and the aim of reducing environmental disamenities in the public space. This perspective, however, is in contrast with the presence of inclusive manufacturing, on which the neighbourhood relies.

The econometric estimates of the benefits (or the penalties) accruing to inclusive firms¹⁴ located in CDQD areas (Romanczyk, 2015) confirm this qualitative evidence. Results show, indeed, that firms operating in this sector and located in a municipality interested by CDQD programs (Table 2) are penalized in terms of both profitability and employment levels. These levels are significantly lower than the ones of firms operating in the same areas but in other industries. Namely, inclusive manufacturers suffer an average profit shrinkage of 576 Euro (column one of Table 2) and an average employment reduction of 60 workers (column two of Table 2) compared to the rest of the sample. This negative correlation suggests CDQDs may crowd out inclusive manufacturers through the urban transformations (based on public facilities and welfare equipment) they promote. Although it is not possible to derive any causal link due to the presence of many confounding factors (such as rising local taxes, stricter limits to environmental permits), this evidence indicates that these programs may play a role in inducing inclusive manufacturers to look for alternative strategies in view of the increasing risk of going out of business with their traditional activities.

Table 2 here

These results are reinforced by the outcome of car dealers' interviews. According to them, in fact, it is reasonable to expect that the implementation of further CDQDs (or similar programs) in the area could stimulate the displacement of these firms out of it in the years to come. As a car dealer summarizes: "we're in the city centre of Brussels, where there are urban renewal plans and a problem of population growth, so it could happen that we may have to relocate it elsewhere since our activity is economically important". However, since most of the car dealers own the land where they operate, they may also decide to change their activity and enter the real estate sector to benefit from the increasing housing demand. In fact, as underlined by the representative of local associations and committee federation, "80% of car dealers are owners of the plots, and they want to keep them. Since they know that the neighbourhood is going to change, their idea is to switch their activity to real estate development to make profits". Furthermore, she adds that this attitude "creates tensions with public authorities' plans, as for example in the first moment Citydev foresaw the construction of affordable and social housing but faced car dealers' resistance to sell".

¹⁴ Following our definition of inclusive manufacturing, we included in this category food and beverage industries, and maintenance and repairing industries.

During the last 15 years, in fact, in trying to cope with poor housing stock conditions and housing precarity amongst deprived/low-income people, public stakeholders as the SRLB (Brussels Regional Society for Housing) and CityDev have been very active in the neighbourhood. Via the CDQDs they managed to realise some 180 social houses. To these we can add the 89 social houses (plus 80 acquisitive houses) connected to the CRU Heyvaert Poincaré, and more recently the 60 social houses (plus 69 acquisitive houses) of the Passer/Compas Project of CityDev (started 2019).

The project, within the Contrat de Quartier Lemmens in Heyvaert, starts a new type of collaboration between public housing agencies to promote social mixité and provide both middle- and low-income housing, even though they still do not provide a sufficient number of dwellings to match existing requests.¹⁵

Coming back to manufacturing displacement, the fieldwork evidence – combined with the worsening economic performance of the district during the 2010s (Rosenfeld and van Criekingen, 2015) – raises doubts also on the permanence of these socially inclusive manufacturing activities in the district. Even their status of “inclusiveness” seems to be endangered if negative external factors mesh with urban policies not supporting an economic development embedded in the history of the district.

Meanwhile some bottom-up actions – funded by regional innovation agencies – are trying to support a more endogenous local development by facilitating the transition of low-skilled workers to new jobs through pilot projects and experimental applied research.

One of them is WIM-Wood in Molenbeek, a publicly funded action-research project run in collaboration with the municipality and specifically targeted to workers employed in the local labour market. The project is an attempt to foster entrepreneurship in carpentry and wood-work activity through a learning-by-doing strategy. Therefore, WIM is proposing a viable alternative occupation to them. As stated by the responsible of the project: “A lot of people are interested in learning new skills. If we can just even give them a taste and a few skills, maybe the person is going to a school to learn more about carpentry”. In this vein, WIM project can contribute to develop the foundational component of the construction sector, which is acknowledged as vital for the production of urban and social reproduction infrastructure (De Boeck et al., 2019), as

¹⁵ CRU and CDQDs explicitly endorse the need to sustain social housing and/or acquisitive housing agreements to favour a balanced social mix and contrast possible eviction of the fragile population from the area. Nonetheless, according to the Monitoring de Quartier (www.monitoringdesquartiers.brussels) the share of social housing in the portion of neighbourhood we’re looking at, remains far below the regional average (Cureghem Rosée: 3,38%; Cureghem Bara: 2,11%; RCB average: 7,22% for the year 2019-last data available), while the municipalities of Anderlecht and Molenbeek rank amongst the first four municipalities of the city in terms of applications for social housing.

well as to be “inclusive” by supporting the transition to accessible jobs for the workers exiting the car dealing and repairing industry.

These innovative social practices can thus act as stepping-stones towards new job opportunities that could complement the ones offered by the other type of manufacturing (distributed manufacturing) actually promoted by CDQD. Moreover, these potential new jobs could provide an alternative career path, whereas car-related activities would lock the worker into dead-end positions. In fact, this sector widely relies on the informal labour market while it is not able to provide the workers with neither formal qualifications nor suitable lifelong learning paths.

As stated by a social geographer working at Brussels University: “it is completely unjust and unethical to concentrate those people that didn't have the opportunity to study in this filthy industry. It is an extremely patronizing attitude. While it would be important to advocate for jobs that can provide these low-skilled workers with the opportunity to climb the social ladder”.

6. Conclusions and takeaway for practice

Re-introducing manufacturing in partially dismissed metropolitan areas is a complex task that requires the departure from one-size-fits-all approaches. It requires instead a strategic convergence of different policies for the development of different types of manufacturing and, more in general, of highly diversified urban economies. From this perspective, this paper focuses on the renewed interest of urban designers and policymakers in bringing back manufacturing into the cities by leveraging on Industry 4.0 technologies to attract small-scale makers. On the other side it addresses the risk, underscored by the extant literature (Grodach and Gibson, 2019; Grodach and Martin, 2021), that such policies could fail to acknowledge the heterogeneity of urban manufacturing, overlooking the role of more traditional productions in enhancing social inclusion and increasing resilience of urban economies (Bentham et al., 2013). Our analysis addressed this issue by looking at the case of Brussels (notably the district of Cureghem), where manufacturing has gained a new centrality in urban policies, both spatially (i.e. the relocation of manufacturing activities within the city boundaries), and discursively (i.e. urban manufacturing as the object of political debates and planning narratives). For its strong support to the “maker narrative” through dedicated urban policies, Brussels represents an illustrative case of these trade-offs at neighbourhood level, providing both a confirmatory evidence of previous studies on this topic (e.g., Lester et al., 2013; Schrock and Wolf-Powers, 2010; Grodach and Martin, 2020) and a deeper understanding of their potential impact on socially and economically marginalized groups (Cassiers and Kesteloot, 2012)

The paper questioned, in particular, two main issues. First, the possibility to promote the cohabitation between advanced manufacturers and traditional production while supporting an inclusive economy based on local needs. Second, the effectiveness of planning and design policies, addressing productive activities mixed with other urban functions while taking into account land availability and socio-economic conflicts.

The multifaceted constraints emerging from the promotion of the cohabitation of different urban functions and social groups in the Cureghem area add a new body of knowledge to the ongoing debate. In particular, our findings support the results of earlier research (De Boeck et al. 2017) bringing the literature on urban manufacturing and the foundational economy into the debate on mixed-use policies in a twofold way. First, they confirm the need to reframe mixed-use rezoning with a more comprehensive approach. Second, they call for an integrated policy approach aimed at preserving the availability of an already fragmented industrial landscape by contrasting the shrinking process of manufacturing driven by the competition of other urban functions in land demand. The related insights allow us to provide policy recommendations and takeaways for both international and local practice.

6.1. Reframing mixed use in planning policies through pilot projects and micro-zoning

The extant literature from other countries (e.g., Shrock and Wolf-Powers, 2019) already highlighted that the focus on the “maker narrative” can rely on an ideal-type of innovative and environmentally friendly manufacturer. In the case of Brussels, we observed that such a narrative has also been adopted in the implementation of mixed-use zoning (ZEMU) generating conflicts and competition for space with more traditional manufacturing sectors that are still relevant for urban economies (such as inclusive and local manufacturing) and rely on different agglomeration forces. Mixed-use zoning failed to encompass not only the cohabitation of different urban functions, but also the combination of different productive activities providing jobs to different tiers of the neighbourhood labour force. From our multidisciplinary research it also emerged that the vagueness of the concept of mixed-use failed to address issues such as social inclusion, upward social mobility of low-skilled workers, and coexistence with the suburban middle class. This criticism is consistent with the literature stressing that the application of mixed-use re-zoning may lead to ambiguous outcomes (Rowley 1996; Hoppenbrouwer & Louw 2005; Moos et al., 2018).

As a policy recommendation, mixed-use policies should be accompanied by other supporting policies contrasting the potential displacement of socio-economic groups through place-based initiatives targeted to the preservation of traditional manufacturing with its constituent skills and tasks. Such policy should preliminarily rely on a granular understanding of the “possibilities and

limits for new forms of manufacturing innovation and production to take root in the urban environment taken into account” (Shrock et al., 2020, 48).

This does not mean, however, that mixed-use policies do not have merits. Although partially, they contrasted with the past planning practices of urban voids recovery exclusively based on tertiary and residential functions (Leigh and Hoelzel, 2012). This evidence confirms our quantitative analysis, showing that the performance of the manufacturing firms was comparatively higher in re-zoned areas (ZEMU) than in the rest of the analysed district.

The consequent take-away concerns the implementation of pilot projects, followed by a proper in-itinere and ex-post evaluation procedure, as a useful tool to locally test functional mixed-use policies. The objective is to fine-tune mixed-use place-based policies and codify specific spatial requirements of new productive activities in order to better integrate them in the existing context. Moreover, pilot projects are a valuable starting point for spatial planners and urban designers to “envision and make space” for heterogeneous manufacturing activities in transforming deindustrialized neighbourhoods.

A complementary practice could envisage micro-zoning policies based on small-scale changes of land use. It would gradually convert targeted monofunctional industrial land plots into mixed-use areas, while pursuing housing-production co-existence. Micro-zones could also accommodate a plurality of economic activities, including the foundational ones, while being less fuzzy in identifying the activities to attract and avoiding the risk of benefiting few real estate market investors.

6.2 Fostering an integrated policy approach to mitigate socio-economic constraints

A second aspect that emerged in this study is that urban policies originally conceived to improve the neighbourhood living environment throughout the provision of public equipment and amenities, as well as public services, have been recently re-oriented towards urban manufacturing. This approach can be problematic, as in some cases it could favour the eviction of inclusive manufacturing. Mixed-use zoning itself proves to be not sufficient to address the issues of social inclusion, of upward social mobility of low-skilled workers, and of their coexistence with the suburban middle class. This side effect recalls the socio-economic constraints of local schemes aimed at the revitalization of deprived neighbourhoods, through the development of new manufacturing ventures (Pratschke and Morlicchio, 2012; Lowe and Wolf-Powers, 2018). These policies stimulate small-scale entrepreneurship also in local manufacturing industries, but their implementation tends to privilege potentially ubiquitous firms not embedded in the area involved in the urban transformation projects (Shrock et al., 2019). As we have seen in the case of Abattoir, their main ambiguity lies in the potential clash

among these goals and in the risk of future substitution of local manufacturing activities with distributed ones and with tertiary services oriented towards designing and branding functions whose task and skill content is not compatible with the characteristics of the existing workforce. This may generate conflicts with the existing socio-economic conditions of the neighbourhood in the long run by endangering the existence of those foundational sectors characterised by a stronger territorial grip (Engelen et al., 2019). Therefore, in contexts where the low-skilled tier of the local workforce strongly relies on the presence of inclusive manufacturing, such schemes are not able to support the reallocation of these workers in the local labour market. Their implementation could penalize the social sustainability of the surrounding district, leading to unwanted patterns of eviction of both productive activities and more fragile inhabitants.

To address such constraints, while also promoting the cohabitation of different urban functions and social groups and mitigating the related conflicts and contradictions, a possible way-out could be the implementation of co-creation projects based on action-research, blending the top-down strategy with a bottom-up approach focused on local actors. The socially innovative initiatives of WIM project made apparent that sharing the local expertise and knowledge of researchers, local associations, and relevant stakeholders, can be an effective practice to start a step-by-step transformation process aimed at attracting distributed manufacturers while preserving local and inclusive productions.

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Table 1 – Effects of ZEMU on firm performance in Biestebroec (Pooled OLS estimator)

Area	Kanal	Kanal	Kanal	Kanal	Kanal	Kanal
Industries	All	Service	Manufacturin	All	Service	Manufacturin
Dep. Variable	Profits	Profits	Profits	Employees	Profits	Employees
Biestebroec k before ZEMU	-2399.961* (1344.142)	254.2138 (371.8902)	-4183.439** (2057.762)	-41.7472 (31.4037)	-162.709* (98.5578)	-45.4110*** (17.1468)
Biestebroec k after ZEMU	695.051 (544.159)	380.7733 (422.2776)	4259.763* (2269.786)	-46.3600 (52.4688)	-85.7469 (130.6743)	-0.3504 (30.0951)
Constant	-9778.466 (13018.72)		-81758.497 (71774.64)	2577.7134* (1359.5974)		-1206.0740*** (272.6644)
Control variables	Assets, Employees, regional GDP, industrial specialization (location quotient), industrial diversification (related and unrelated variety)		Assets, Employees, regional GDP, industrial specialization (location quotient), industrial diversification (related and unrelated variety)	Assets, regional GDP, industrial specialization (location quotient), industrial diversification (related and unrelated variety)		Assets, regional GDP, industrial specialization (location quotient), industrial diversification (related and unrelated variety)
Observations	30318		4841	30318		4841
Adjusted R^2	0.1566		0.1017	0.0555		0.2647

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The number of observations include 4,331 firms (of which 692 belonging to the manufacturing sector), on average, observed over 7 years (2009-2015). The variable “Biestebroec Before ZEMU” takes the value 1 if the firm is located in the Biestebroec area and observed before 2013 (i.e. the year in which ZEMU was first implemented) and zero otherwise, whereas “Biestebroec After ZEMU” takes the value 1 if the firm is located in the Biestebroec area and observed in 2013 or later, and zero otherwise. Manufacturing includes Nace codes between 10000 and 33999. Nace codes are drawn from the statistical classification of economic activities in the European Union, and are uniformly interpreted across all the Member States.

Table 2 – Effects of inclusive manufacturing on firm performance in CDQD areas (Pooled OLS estimator)

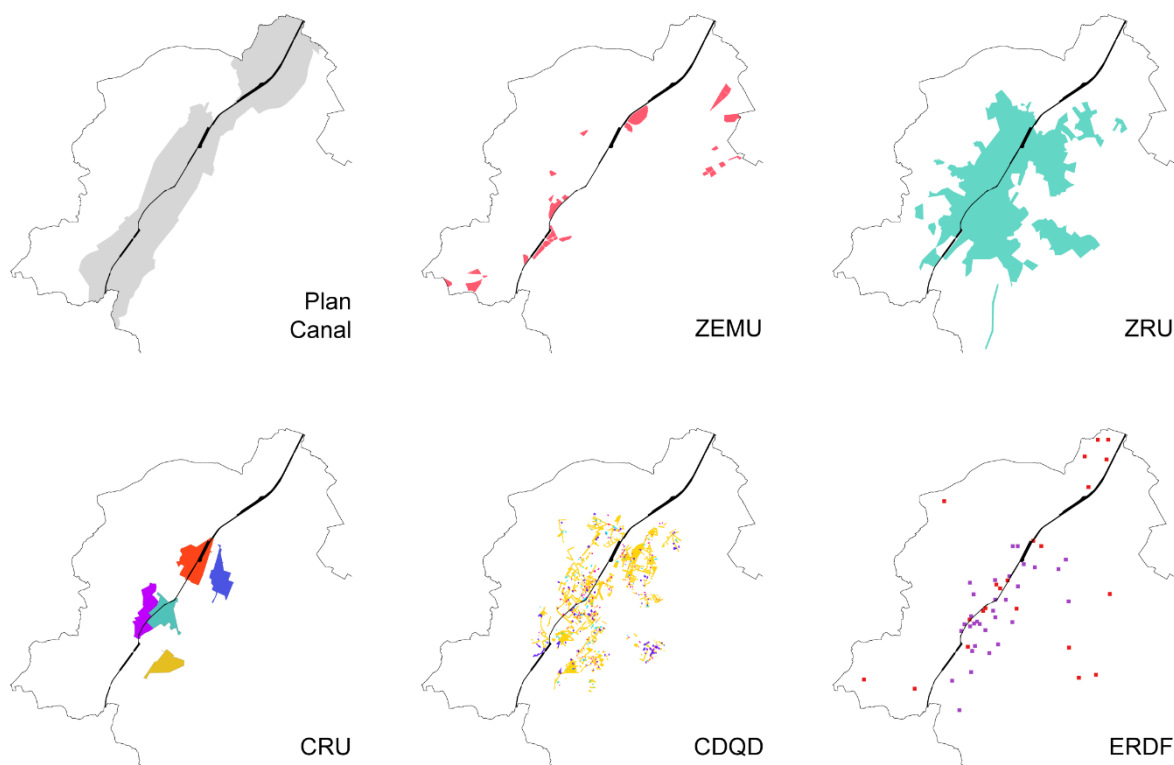
	(1)	(2)
Area	CDQD	CDQD
Industries	All	All
Dep. Variable	Profits	Employees
Inclusive manufacturing	-576.438^{***} (218.449)	-60.199^{***} (11.185)
Constant	-2461.069 (2456.041)	172.3507 (109.0786)
Control variables	Assets (log), Employees, regional GDP, industrial specialization (location quotient), industrial diversification (related and unrelated variety)	Assets (log), regional GDP, industrial specialization (location quotient), industrial diversification (related and unrelated variety)
Observations	54,292	54,292
Adjusted R^2	0.1404	0.1406

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The number of observations include 7,756 firms, on average, observed over 7 years (2009-2015). Inclusive manufacturing includes food and beverage industries (Nace codes included between 10000 and 11999), and repairing industries (Nace codes between 33000 and 33999, and Nace codes between 45200 and 45499).

Figure 1 - Manufacturing-related policies and planning tools along the Canal in Brussels.



Sources: Brussels UrbIS®© - Distribution & Copyright CIRB

Figure 2 - Localization of the three selected areas and spatialization of manufacturing industries and selected planning policies in Cureghem neighbourhood.



Note: The map highlights the second-hand car related activities in Heyvaert area, the food manufacturing industries around Abattoir, and the variety of the economic activities in Biestebroek.

Sources: topographical data (Realised by means of Brussels UrbIS®© - Distribution & Copyright CIRB); business location (Amadeus-Bureau Van Dijk); fieldwork survey by the authors (2018-2019).

Appendix A.1

Agglomeration economies: definitions and indicators

Local agglomeration economies are usually divided in three main categories: i) MAR externalities; ii) Jacobs externalities; iii) and relatedness externalities.

MAR externalities take the name from the names of the economists (Marshall, Arrow and Romer) who theorized that spillovers take place primarily within a single industry thanks to hereditary skills, growth of subsidiary trades, use of highly specialized machineries, and labour market pooling (e.g. Glaeser et al, 1992). Hence, MAR externalities (also known as ‘localization economies’) highlight the role of intra-industry economies in stimulating local development.

The presence of MAR externalities is commonly measured by a location quotient measuring the relative importance of the region for each sector compared to the rest of the country:

$$S_{i,j} = \frac{\frac{E_{i,j}}{E_j}}{\frac{E_i}{E}} \quad [1]$$

where $\frac{E_{i,j}}{E_j}$ is the share of employees (or added value) in sector i in the region j , $\frac{E_j}{E}$ is the share of total employees (or added value) in region j over the national total. If it is higher than 1 the concentration in industry i is higher than the average level in the country (or macro-region).

However, Jane Jacobs suggested that externalities can also arise from inter-industrial spillovers made possible by the process of recombination of a pre-existing variety of knowledge and artefacts. For this reason, they are commonly referred to as “urbanization economies”. The cross-fertilization emerging from such types of recombination would act as a catalyst of virtuous cycles of innovative ideas leading to new products and services (Jacobs, 1969).

As far as Jacobs’ externalities are concerned, a common indicator is given by the entropy of the workers employed in the local system of interest regarding the main

industrial sectors, as identified by 2-digit NACE¹⁶ industrial codes (e.g. Frenken et al., 2007). This proxy of Jacobs externalities (also known as “unrelated variety”) is calculated as follows:

$$UNRELVAR = \sum_{f=1}^F E_f \log \left(\frac{1}{E_f} \right) \quad [2]$$

where E_f is the employment share of macro-industry f in the local system of interest.

Finally, relatedness theorizes that knowledge spillovers within a local system occur among firms operating in different but related sectors. This notion is deemed to capture the likelihood that firms take full advantage from the similarity of the skills’ portfolio of the workers within the local labour market, and from the co-location of competent suppliers and customers endowed with complementary skills and technologies.

A typical measure of relatedness looks at concentration/dispersion of the employment in 5-digit NACE codes within 2-digit NACE codes (macro-sector). This entropy-based measure of relatedness (firstly proposed by Frenken et al. (2007)) reads as follows:

$$RELVARENT = \sum_{g=1}^G E_g H_g \quad [3]$$

where E is the relative employment share of sector g and H is the entropy of the macro-sector g (as defined by [4]).

$$H_g = \sum_{il=1}^L \frac{E_{il}}{E_g} \log \left(\frac{1}{\frac{E_{il}}{E_g}} \right) \quad [4]$$

The higher is the coefficient the more evenly the employees are distributed within the macro-sector, meaning that the local system can benefit from the presence of firms belonging to technological related sectors and from the presence of workers endowed with related skills and employed in similar occupations. Basically, the assumption is that the higher is the value of the aggregated entropy of a region the higher is the potential for productive inter-firm knowledge transfers and spillovers.

¹⁶ NACE codes are drawn from the statistical classification of economic activities in the European Union and are uniformly interpreted across all the Member States.

Appendix A.2

Table A.2.1 – Profile of interviewed stakeholders

	Project managers and designers	Manufacturing-related entrepreneurs	Associations	Experts
No.	7	5	4	3
Interviewees	1 CEO of a real estate management company 1 manager of a regional development agency 3 architects 1 project developer 1 regional chief architect	2 car dealers 1 makers' workspace manager 1 CEO of recycling (materiali edili) company 1 CEO of a packaging company	1 Neighborhood-centre coordinator 1 Representative of a socially-oriented public-private partnership 1 Responsible of a local NGO 1 representative of a meat-producers association	2 university researchers (1 anthropologist and 1 urban planner) 1 independent researcher (1 sociologist)

Table A.2.2 - Manufacturing-related planning policies and tools in Brussels

Relevant Urban Policies	Context and scale	Orientation towards manufacturing	Goals	Actions
Plan Canal – PC	In 2013, urban design competition to get scenarios for the Brussels Canal. In 2015 Plan Canal was adopted.	Regeneration of deindustrialized areas	Keeping economic activity in the city and strengthen its urban integration; Creating housing, improving unifying public spaces; promoting a mix of functions and population diversity.	<ul style="list-style-type: none"> •Localization of grey-fields; •publicly owned reservoir. •Imagination exercise of spatial configuration of urban renewal sites. •Public space and services network along the Canal.
Land Use Plan – PRAS 'Plan Regional d'Affectation du Sol' and Enterprise Zone in Urban Context – ZEMU 'Zone d'Entreprises en Milieu Urbain'	The PRAS is at the top of regional regulative planning policies. Adopted in 2001, it determines land uses and functions in the city. In 2013 the PRAS was given the extension demographique to consider population growth, adding a new zone called ZEMU	Mixing housing and manufacturing	Address the challenges posed by the increased demand for housing; consider a functional mix within today's monofunctional zones; strengthening economic activities and job-seekers; urban recomposition of certain areas.	<ul style="list-style-type: none"> •Allow urban transformation with new housing but making place for manufacturing
Neighbourhood Contracts – CDQD 'Contrats de Quartier Durable'	It has recently been re-oriented from providing affordable housing and urban equipments (schools and social services) towards including also space for entrepreneurship	Improve living environment of neighbourhood. Foster inclusive manufacturing within the city	Five main pillars: Housing, Facilities And Local Infrastructures, Public Spaces, Socio-Economic Actions, Productive Economic And Commercial Spaces	Progressively incorporate central issues at the crossroad of economic and social development. Include the strengthening of entrepreneurship and the development of SMEs, support the development of circular economy and sustainable productions.
European Regional Development Fund – ERDF	During the last two round 2007-2013 and 2014-2020, the fund has been used to foster public lead urban transformation in the city-region	Bridge research and entrepreneurship, stimulate innovation in urban transformation and development of entrepreneurship	Four Axis: improve transfer research and innovation; strengthen entrepreneurship and development of SMEs in promising sectors; Support circular economy and the rational use of resources; Improve the living environment of neighborhoods and disadvantaged populations.	<ul style="list-style-type: none"> • support the development of circular economy and sustainable productions or business models • envisage the (re)localization of manufacturing production in the city and thus economic resilience and social inclusion via work

Table A.2.3 – Effects of agglomeration economies on average productivity in different type of manufacturing industries in the Kanal area (Pooled OLS estimator)

	(1)	(2)	(3)	(4)
Area	Kanal	Kanal	Kanal	Kanal
Industries	All	All	All	All
Dep. Variable	Turnover per employee (log)	Turnover per employee (log)	Turnover per employee (log)	Turnover per employee (log)
Inclusive manufacturing	-0.194*** (0.045)			
Incl. man.*specialization	0.378*** (0.066)			
Local manufacturing		-1.738*** (0.590)		
Loc.manuf.*rel_var		0.288*** (0.094)		
Distributed manufacturing			0.497*** (0.096)	
Dist.manuf.*specialization			-0.260* (0.148)	
Distributed manufacturing				0.422*** (0.120)
Distr.manuf.*unrel.var.				-0.013 (0.031)
Control variables	Assets (log), Years, industrial specialization, industrial related and unrelated variety, Brussels municipalities, Regional GDP	Assets (log), Years, industrial specialization, industrial related and unrelated variety, Brussels municipalities, Regional GDP	Assets (log), Years, industrial specialization, industrial related and unrelated variety, Brussels municipalities, Regional GDP	Assets (log), Years, industrial specialization, industrial related and unrelated variety, Brussels municipalities, Regional GDP
Observations	20665	20665	20665	20665
Adjusted R ²	0.176	0.192	0.175	0.175

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Local manufacturing includes food and beverage industries (NACE codes included between 10000 and 11999). Inclusive manufacturing industries also includes repairing industries (NACE codes between 33000 and 33999, and NACE codes between 45200 and 45499). Distributed manufacturing includes NACE codes from 27000 to 32999 following Rauch et al. (2018). NACE codes are drawn from the

statistical classification of economic activities in the European Union and are uniformly interpreted across all the Member States.

Table A.2.4 – Effects of agglomeration economies on employment in different type of manufacturing industries in the Kanal area (Pooled OLS estimator)

	(1)	(2)	(3)	(4)
Area	Kanal	Kanal	Kanal	Kanal
Industries	All	All	All	All
Dep. Variable	Employees (log)	Employees (log)	Employees (log)	Employees (log)
Inclusive manufacturing	0.107** (0.048)			
Incl. man.*specialization	-0.618*** (0.071)			
Local manufacturing		1.635** (0.643)		
Loc.manuf.*rel_var		-0.275*** (0.103)		
Distributed manufacturing			-0.706*** (0.126)	
Dist.manuf.*specialization			0.786*** (0.217)	
Distributed manufacturing				-0.259* (0.136)
Distr.manuf.*unrel.var.				-0.029 (0.030)
Control variables	Assets (log), Years, industrial specialization, industrial related and unrelated variety, Brussels municipalities, Regional GDP	Assets (log), Years, industrial specialization, industrial related and unrelated variety, Brussels municipalities, Regional GDP	Assets (log), Years, industrial specialization, industrial related and unrelated variety, Brussels municipalities, Regional GDP	Assets (log), Years, industrial specialization, industrial related and unrelated variety, Brussels municipalities, Regional GDP
Observations	20665	20665	20665	20665
Adjusted R^2	0.485	0.504	0.483	0.483

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Local manufacturing includes food and beverage industries (NACE codes included between 10000 and 11999). Inclusive manufacturing industries also includes repairing industries (NACE codes between 33000 and 33999, and NACE codes between 45200 and 45499). Distributed manufacturing includes NACE codes from 27000 to 32999 following Rauch et al. (2018).