

DIGITAL TRANSITION BY COVID-19 PANDEMIC? THE GERMAN FOOD ONLINE RETAIL

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Received: April 2020; accepted May 2020

ABSTRACT

The COVID-19 pandemic has led to a sharp increase in online trade. This article examines the impact of the pandemic on online grocery retail in Germany. Here we follow and refine the multi-level perspective by Geels, and examine to what extent and why the online grocery retail expanded during the pandemic. A particular focus is on the spatial expansion into rural areas. The study shows a general upswing in the grocery trade and disproportionately high growth in online grocery trade and identifies driving and limiting factors. While COVID-19 has opened a window of opportunity, our results indicate little transition of grocery to e-grocery. This finding can be explained by the sudden and temporary constellation at the level of the socio-technical regime during the pandemic. As a result, we argue for a rethinking the temporality of windows of opportunities and the related vulnerability of the innovations which need them.

Key words: COVID-19; digitalisation; e-commerce; e-grocery; food retail; Germany

INTRODUCTION

The coronavirus (COVID-19) pandemic, and the associated preventative measures (such as ‘stay at home’) introduced in Germany in March 2020, caused severe societal and economic restrictions as well as an enormous surge in digitalisation. The required reduction in face-to-face contact tremendously increased the use of digital media in economy and society. This paper focuses on online grocery retail (e-grocery) and its expansion, in economic terms and spatially. Crisis can create and push innovations and their diffusion because of changing socio-political contexts (Archibugi 2017). Indeed, the pandemic has led to a sudden increase of online grocery (Nielsen 2020). This has as-yet unclear implications for the long-term digital transition

of food retail (dynamic perspective) and the spatial expansion of e-grocery, which has so far mainly excluded rural areas (geographical perspective). For this purpose of better understanding the dynamic and spatial dimensions, this paper critically adapts Geels’s (2002) multi-level perspective (MLP). Here it follows an economic geography perspective, which discusses Geels’s distinction of levels, namely niches, regimes and landscapes in the context of socio-spatial relationships (Truffer 2008; Hansen & Coenen 2015; Murphy 2015). Regarding the COVID-19 pandemic’s effects on online retail, the paper asks if changes that were rather incremental before, now are becoming ‘thicker and more transformative’ (Murphy *et al.* 2014, p. 264) but also broader spatially. This paper therefore asks how and why the innovation of online food retail

expands during the COVID-19 crisis. Such a view on change contributes to the recent debate on Geels's (2002, 2012) MLP within the broader context of transition studies and economic geography, particularly by specifying and critically revising the levels, space and temporality of change.

Besides the academic interest, this analysis was also motivated by predictions in the media, which were partly euphoric statements and partly horror scenarios. Such notions appeared in prominent German media during the COVID-19 pandemic. Wallstreet Online (2020) commented that COVID-19 'fear is causing a boom in online food retailing'. The critical newspaper TAZ (2020) claimed that the pandemic was 'Good for Amazon' and feared that the company could 'break the neck of small retailers'. Similarly, the Frankfurter Rundschau spoke of an 'escape to digitisation' and feared that the virus would be the death of the corner shop (Nickisch 2020).

Seizing upon such academic and public interest, the following section explains the MLP (Geels 2002, 2012), links it to economic geography (Truffer 2008; Murphy 2015) and discusses it in the context of online grocery retail. After a section on the methods employed in this study, we show that the spread of COVID-19 is an event at landscape level and the implementation of 'stay at home' changes the socio-technical (sub-)regime of food retail. The results specify the windows of opportunity in the current transition and explain limitations of a broader digitalisation of retail. The conclusion reflects on the findings.

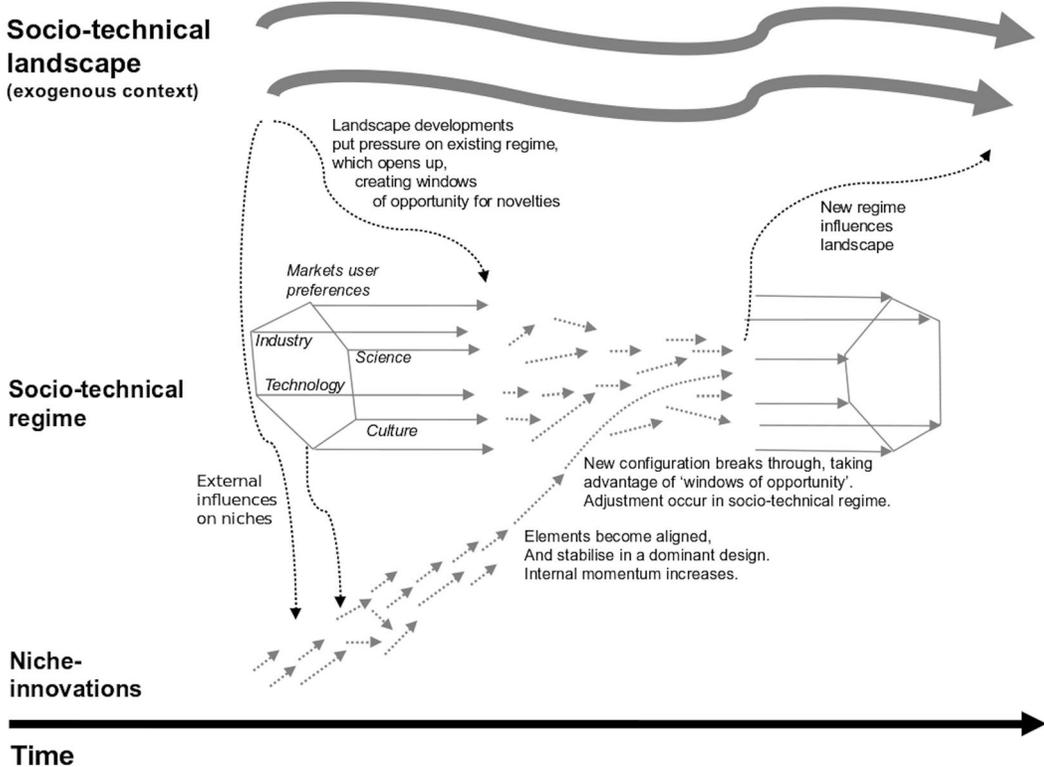
THE MULTI-LEVEL PERSPECTIVE

Transition studies have recently shifted into focus in economics, social sciences and geography. Given their multidisciplinary spread, they relate to different epistemic interests and research fields. A common core of such studies is that they do not perceive time, or development, as deterministic sequences of waves or as stairways, but as processes that are framed by economic and socio-cultural settings, implying some openness and contingencies. The

multi-level perspective (MLP; Geels 2002, 2011) provides a nuanced view on such long-term transitory processes (such as digitalisation), sudden crisis (COVID-19) and innovation (e-grocery). Hence, the paper focuses on a field of established economic approaches in the institutionalist tradition (Bathelt & Gibson 2015; Archibugi 2017), thereby extending the view on organisations and their contexts to space.

The MLP (Geels 2002, 2011) offers a framework to understand the different dynamics of innovations. The model provides an analytical framework to explain under what circumstances and with what effects an innovation can move from a niche to a growth phase. The MLP explains how innovations disseminate by focusing both on technology and socio-economic contexts. It draws on the concept of technological regimes established by Nelson and Winter (1977), who contributed to a comprehensive perspective on complex regimes (cf. Genus & Coles 2008). Successful distribution of an innovation is not explained by the technology itself but by its application, exploitation, supporting policies, availability of capital, and so on. Hence, it requires a comprehensive perspective in the context of transition studies (cf. Geels 2002), particularly those that focus on the interrelation of economic crisis and innovation diffusion (Archibugi 2017). In economic geography, this is part of research strands that deal with path creation from a politically, socio-economically and spatially inspired perspective (MacKinnon *et al.* 2019). Geels (2002, 2011) distinguishes this into socio-technical landscapes, socio-technical regimes and niches (see Figure 1).

Socio-technical landscapes are predominant framework conditions that can only marginally be influenced by individual actors. Landscapes include basic social issues (e.g. the values of a society), political settings (e.g. constitution) as well as economic conditions (e.g. oligopolies) or ecological conditions (e.g. climate). Such a landscape is usually relatively rigid but can change in the long term ('longue durée', e.g. due to demographic change; Geels 2011). Landscape can also change through economic and political crisis (Dederichs & Dannenberg 2017).



Source: (Geels 2011, adapted by the authors).

Figure 1. Multi-level perspective on transition.

Socio-technical regimes are embedded in the landscape. Regimes are characterised by established practices. A stable regime configuration offers actors a safe and stable framework for their activities. In contrast to the comparatively rigid structure of the landscapes, regimes can change significantly faster, for example through learning processes. Regime components are particular technologies, actual markets and policies. Moreover, they include, for example, infrastructure, technological knowledge, and company networks (Zademach & Schulz 2016). There is a special focus on the driving role of customers (or users).

Technological niches are protected areas (e.g. from competition). They are fields of experimenting and trying out, such as R&D laboratories, subsidised demonstration projects, or settings in which users have special demands and are willing to support innovations

(Geels 2011). Lee and Malerba (2017) distinguish three types of windows of opportunity: (i) windows that are opened by new basic technologies like within digitalisation; (ii) windows based on a new type of demand or a major shake-up of existing demand, and (iii) institutional windows induced by public intervention. Digitalisation during 'stay at home' could be such field of special demands and policy intervention. The innovation of food online trade has already emerged in a niche and could now significantly affect the middle – and mediating – level of the socio-technical regime and possibly the landscape. This happens when a window of opportunity opens (Geels 2002, 2011).

While the different levels in the MLP model originally do not include a spatial dimension, studies on economic geography apply the MLP to a spatial dimension (Hansen & Coenen 2015). While landscape

developments are usually associated with a national or global expansion and regimes are discussed, for example, at a national level (e.g. national regulatory and political framework), the niche can be based on 'a localized or fragmented socio-spatial context that one encounters in few locations and/or at the margins of the mainstream regime (e.g. among certain social groups or in particular locations)' (Murphy 2015, p. 81). In this context, different studies have focused the importance of specific local settings for innovation processes (e.g. concerning trust and the exchange of tacit knowledge) linking it with studies on innovative milieus and regional innovation systems (e.g. Truffer 2008). However, MLP levels cannot simply be linked to certain spatial scales (Murphy 2015). As such, particular regionalisation showing how innovations disseminate spatially is necessary.

The MLP (and its geographical adaptation) has some limitations. The assignment of phenomena to the long-term landscape level and to the level of the regime is ultimately arbitrary, as there is no clear boundary on how long a phenomenon has to exist in order to become part of the landscape. Given the importance of long-term impact in the model, this paper argues that 'stay at home' is a political measure of a particular period, and hence part of the regime. The landscape, on contrary, relates to long-term structures (e.g. digitalisation) as explained below. Hence, landscape and regime are less specified by particular objects (such as institutions, technologies, etc.) and rather by the time that they survive. In the course of examining the effects of the COVID-19 pandemic, however, sudden landscape development driven by a crisis is particularly important. This has hitherto been relatively neglected (for an exception see van Driel & Schot 2005). Such change can open a window of opportunity for niche innovations. Furthermore, so far there is relatively little knowledge regarding to what extent a window of opportunity can also close again. To overcome such limitations, we regard the COVID-19 pandemic as a sudden, temporary event of landscape development. The following, therefore, explains how such an overall landscape influences the constellation of the socio-technical regime, with its

policies and 'stay at home' practices. Such constellations shape the window of opportunity as a chance for the existence of online grocery retailing to breakout from the niche. To specify the change, we consider Murphy *et al.* (2014) who argue that transition occurs, for example, if new business models or players succeed in breaking up the oligopoly of the stationary food retail trade and broadly establishing their own value creation structures. The following considers business models and actor constellations of German food retail, thereby including established firms with considerable market power and recently grown start-ups. Besides the supply side, the particularities on the demand side also play a role. Of particular importance is urban-rural disparities.

The MLP offers insights in the differentiation of levels and economic and spatial penetration of innovations, within the comprehensive socio-economic conditions. It is useful to analyse the impact of COVID-19 on online grocery retailing. Before the COVID-19 crisis, online grocery retail was a typical example of an innovation in a niche, compared to other industries that already serve large online segments (such as book and apparel retail). It was marked by small networks of actors, low turnovers and often only viable based on supporting measures (e.g. transfers from other segments of the executing companies, see Dederichs & Dannenberg 2017). Furthermore, it was mainly limited to urban and, in particular, larger metropolitan areas (BBSR 2019) where food online retailers used the dense urban population and their demands as a spatial niche and field of experimentation. The COVID-19 pandemic and 'stay at home' practices raises the question to what extent a window of opportunity has opened up, and a related transition process is taking place.

METHOD

This study follows a mixed method approach, which is based on qualitative interviews, secondary statistics and media analysis. Considering researchers' and decision makers' current need for up-to-date knowledge

on the impact of the pandemic, the data used in this study was only collected from 10 March 2020 to 15 May 2020 during the COVID-19 pandemic and the related 'stay at home' lockdown in Germany. Given the short time-frame since the start of the lockdown in Germany in March 2020, data collection was not as comprehensive as in studies on established issues. However, in this study we analyse and triangulate a broad variety of secondary and primary data to derive robust preliminary results.

The focus was on food-sector-related articles, general newspaper articles and online-media articles. The search engine Nexis Uni was used as the main search engine for our sampling units. It was complemented by further online news resources of retailing and digitalisation (e.g. Lebensmittelpraxis, iBusiness), associations (e.g. behv, Bitkom, HDE) and German official statistics (Statista). German search terms related to COVID-19 and e-grocery, as well as brand names of German e-grocery companies, in various combinations with operators, were used. The selected categories related to the business models, actor constellations on the supply and the demand side, institutional frameworks, infrastructure and technology. A particular interest was the recent situation and outlook of online retailers, and indicators of transition and possibly changing regional disparities.

To triangulate, confirm and interpret the secondary data analysis, eight interviews were carried out (online and telephonically) with stakeholders from the retail sector. Four of these interviews are quoted below (also see the Appendix), the other interviews are used as background information. In the sampling process, we listed all German e-grocery retailers mentioned in the articles, as well as further company names resulting from search engine requests. After identifying and contacting the interviewees, the interviews were conducted, recorded and the results described and classified. The structured interviews were based on an interview guide with questions regarding the categories (business models, actor constellations on the supply and the demand side, institutional frameworks, infrastructure and technology) in order to understand and differentiate impacts and resulting strategies.

The results were interpreted using an adapted model of Mayring (2000). Quotes used in the empirical part below were translated from German to English.

THE DEVELOPMENT OF ONLINE FOOD RETAILING IN GERMANY

E-commerce is part of digitalisation, which is a long-term development on the landscape level. The earlier digitalisation of economy and society in Germany began in the 1980s (Malecki & Moriset 2008). Later, 'smart' digitisation expanded in the 2010s, creating a broad basis for e-commerce (Fuchs 2020). In Germany, digitalisation is 'moderate' compared to other countries in the European Union (EBIS 2020). Moreover, digitalisation has not reached all households nationwide; peripheral-rural areas are less digitally developed. This is partially due to a lack of digital infrastructure and of digital competency. Concerns about digital surveillance and monopolisation play a role in digital scepticism in Germany (Fuchs 2020). However, with COVID-19, the intensity of use and distribution of digital media have skyrocketed (World Economic Forum 2020). Especially in the crisis and with 'stay at home' protocols, the broad opportunities that digitisation offers to keep the socio-economic system running have become clearer.

While, generally, online retail in other sectors had significant turnover even before the COVID-19 crisis, online food retail has remained in a niche. When the first online food retailers were founded in the 1990s in an initial experimental phase (Dannenberg & Franz 2014), there were difficulties because of slow modems, customers' lack of internet, problematic online payment methods and inadequate logistics (Zook 2002). For e-grocery especially cold chain problems, and the impossibility for the customer to see and feel the product in advance, were larger barriers (Dannenberg & Dederichs 2019). Then, a phase of slowly increasing growth began in the 2000s and spiked in the late 2010s. From 2016 (€932M) the online food retail turnover could increase strongly to 2018 (€1,595M; Statista 2020). This was due to companies increasingly trying and testing digitisation. Furthermore, fears regarding data and payment security could generally be dispelled. Acceptance on the

part of older population groups also increased (Einzelhandels-Monitor 2020). Besides innovative start-ups, the sector expanded due to large supermarket chains, such as REWE, and online marketplaces, such as AmazonFresh, entered the e-grocery segment with extensive offers and were able to build their online retail columns in a protected manner based on existing infrastructures and cross-financing. This cross-financing by the parent company is a typical feature of innovation in a niche. Despite this growth, overall, the online grocery trade remained at a significantly lower sales level than in other online retail segments (Statista 2020), and also compared to e-grocery in other countries (e.g. Great Britain, EHI 2018a). Still, the growth was limited and remained in the niche in Germany. Remaining problems were the requirements for uninterrupted cold chains, the last mile problem, the lack of possibilities to smell and feel the food, and the generally low willingness of customers to pay an additional charge for online orders with home delivery (Dannenberg *et al.* 2016; Kulke 2016; Seitz *et al.* 2017). Parallel to this, in comparison to other European countries, German e-grocery was characterised by a late entrance of the larger supermarket chains into e-grocery and a lack of flat-rate delivery charges. On the other hand, German stationary retail provides the densest net of food stores in Europe, which limits the necessity for online retail (Dannenberg & Franz 2014; EHI 2018b). As an interviewee described the situation before the COVID-19 pandemic: 'There is no need, the Germans are satisfied with their food trade' (Interview 1, 11 May 2020).

Furthermore, the comparatively high transport and logistic requirements implied that most of the offers were aimed at the larger urban areas, while rural-peripheral areas are mostly left out, even by larger online grocery providers (Mensing 2018; Dannenberg & Dederichs 2019). Indeed, German online food retail has so far mainly operated in an urban market niche. Generally, the share of online retail users of the largest cities in Germany (Berlin 73% and Hamburg 71%) is much higher than the German average (65%) and the most rural Bundesland Mecklenburg-Vorpommern in the Eastern part of Germany (55%; BBSR 2019, see also Figure 2). This can be also seen in a high correlation between

urbanity and the use of e-grocery ($r = 0.7$; own calculations on Länder-Level based on population density; BBSR 2019).

The difference between the usage of e-grocery in rural and urban areas can be explained through the following factors:

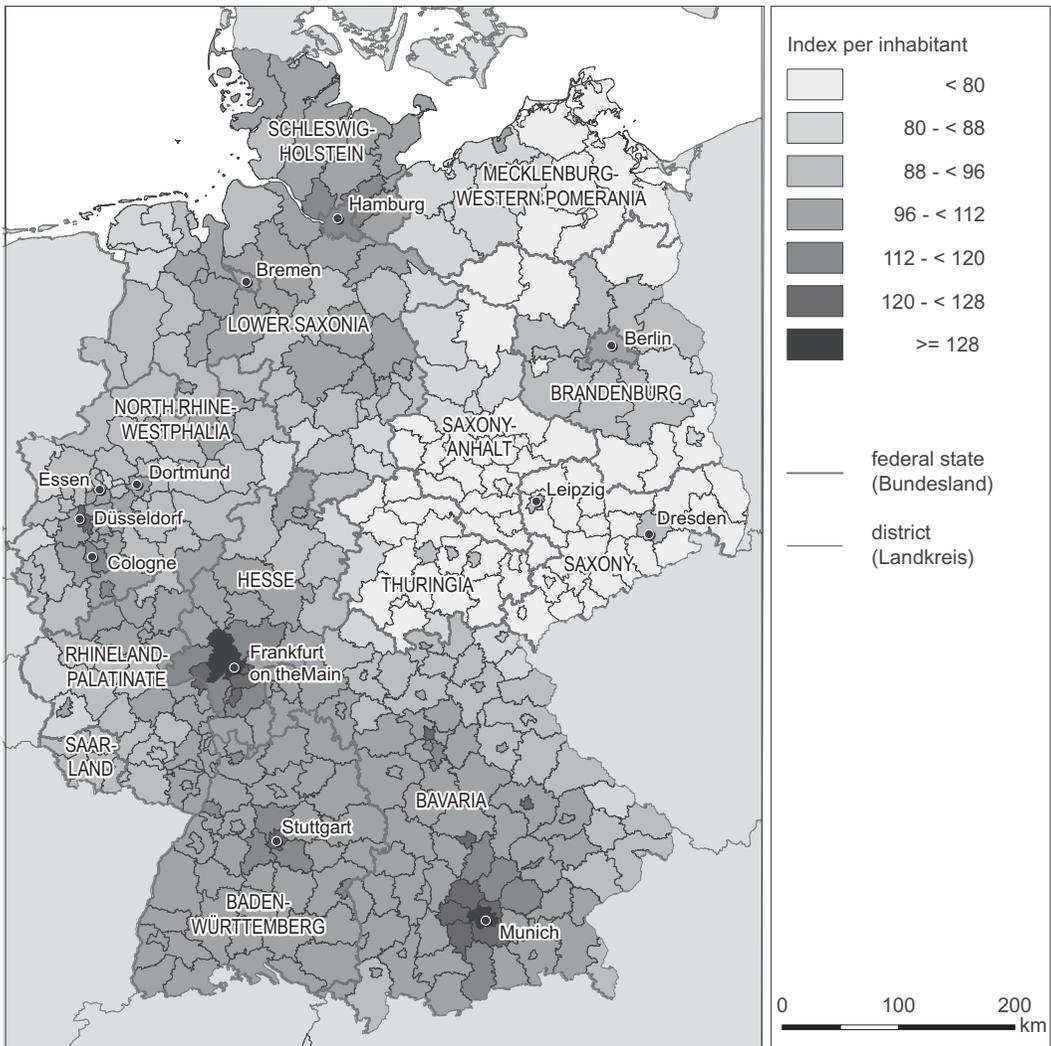
- German food retailers generally only achieve margins between one and three per cent (Nufer & Kronenberg 2014). The profit margins are further depressed by longer journeys to sparsely populated rural areas, in which few scattered customers lead to a loss of overall return. Customer orders in peripheral areas are too low in volume for a delivery service to be profitable (Interview 1, 11 May 2020).
- Many of the business models (Table 1) are based on stationary food retail structures that are often missing in rural areas. This is particularly evident in the delivery or click & collect models of complementary e-commerce that use their branch networks as important logistics infrastructures. Structures of this type are more present in urban areas, so that delivery services can be established from a branch, pick-up stations at busy locations or delivery from specially constructed logistics warehouses (Dederichs & Dannenberg 2019).
- The previously typical customer groups of food online retail are less represented in rural areas than in cities. This is particularly the case for 'double income no kids' households, young families, highly busy people, and internet-savvy retirees, for whom stationary shopping is a (physical) challenge (Dannenberg & Franz 2014). Especially in the sparsely populated eastern German states, incomes are lower than in cities. In western Germany, there are more cities with over 500,000 inhabitants than in the east of Germany. Consequently, there is a higher demand in the West (Interview 1, 11 May 2020).

Hence, prior to the COVID-19 pandemic, the established grocery stores that offer their fresh food segment online, focused on delivering to urban areas (Fruchtportal 2020). AmazonFresh only delivers to Berlin, Potsdam, Munich and Hamburg. Broader Germany-wide deliveries were mainly limited to a specific high-value market niche (e.g. certain organic products or ready-to-cook combinations; Mensing 2018).

Today, the market leader in German online food retail is the purely e-commerce HelloFresh, a specialised internet start-up, with a turnover of €479.4 million. They are followed by the food division of Amazon.de with €218 million a year, and REWE with €130.4 million a year (Statista 2019). These new actors contributed to a variety of business models and distribution channels which could help overcome existing barriers and support a transition. Now, with the

COVID-19-induced increase in digitalisation, it is possible that online food retail could move into a new phase of growth, with newly emerging adjusted food retailing regimes. Such new regimes could manifest in new actor constellations, the establishment of new business models, an attractiveness for new customer segments and spatial dispersion of e-grocery.

Currently, three larger business models of German online food retail can be



Note: GfK consumer panel index includes a nationwide annual 30,000 household survey on online and offline retail activities. The German average is 100, a higher index indicates higher e-grocery activities).

Source: GfK 2018; figure adapted by the authors.

Figure 2. Potential for e-grocery in Germany based on GfK consumer panel 2016.

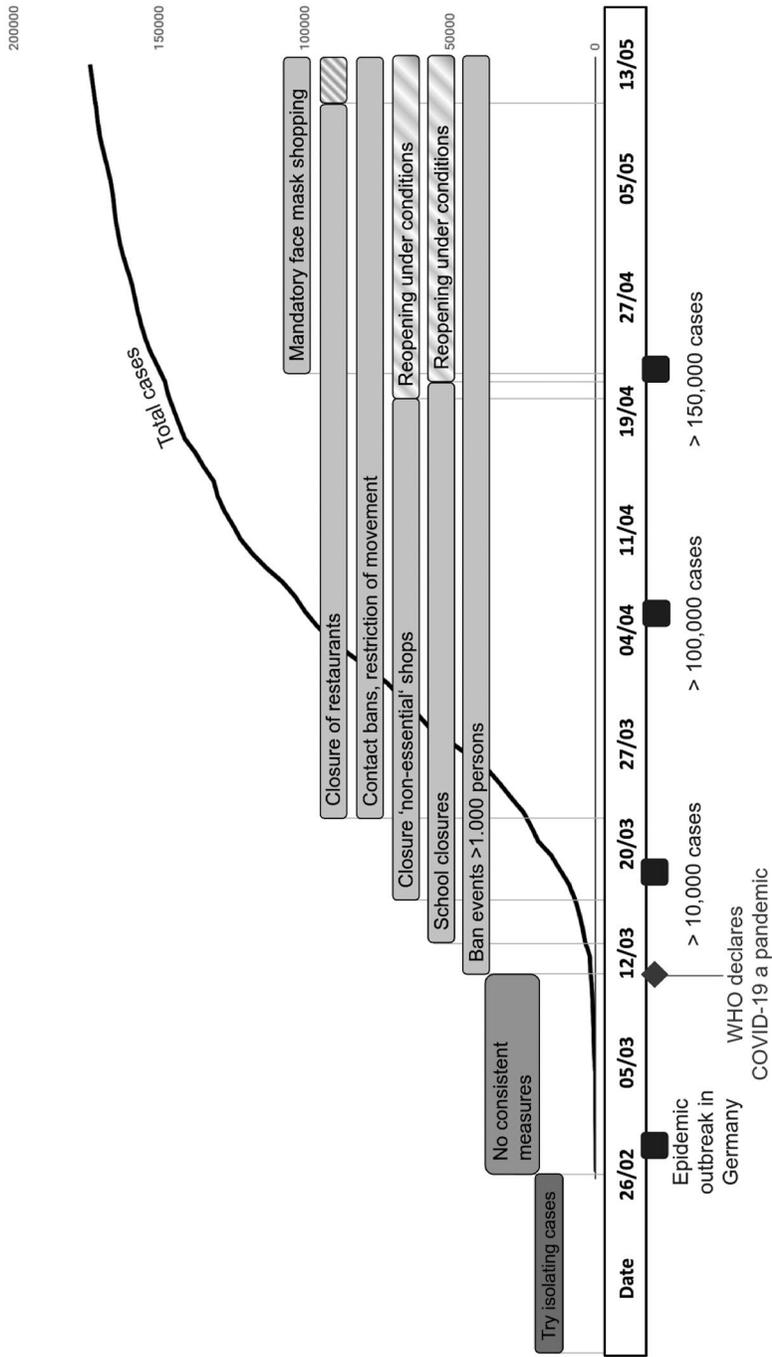
Table 1. *Business models and distribution mechanisms in online food retail.*

Business model (right) Distribution mechanisms (below)	Complementary (hybrid) e-commerce (e.g. supermarkets with multi-channel online offers)	Pure e-commerce	Combined e-commerce (e.g. online platforms such as AmazonFresh)
Own home delivery logistics	<ul style="list-style-type: none"> • Home delivery with own logistics from branch store • Home delivery with own logistics from central warehouse 	<ul style="list-style-type: none"> • Home delivery with own logistics from central warehouse 	<ul style="list-style-type: none"> • Online platform with own logistics for home delivery
Click & collect models	<ul style="list-style-type: none"> • Delivery to delivery lockers with own logistics from branch store • Delivery to delivery lockers with own logistics from central warehouse • Collection by consumer at branch store • Delivery to delivery lockers by third party service from central warehouse 	<ul style="list-style-type: none"> • Delivery to delivery lockers with own logistics from central warehouse • Delivery to delivery lockers by third party service from central warehouse 	<ul style="list-style-type: none"> • Collection by consumer at distribution point
Third party delivery models	<ul style="list-style-type: none"> • Home delivery by third party service from central warehouse 	<ul style="list-style-type: none"> • Home delivery by third party service from central warehouse 	<ul style="list-style-type: none"> • Drop shipping

Source: own compilation; see also Dannenberg *et al.* (2016).

distinguished: (i) Large food retailers that sell both online and in stationary grocery stores, so called *complementary e-commerce* or hybrids like REWE; (ii) *pure e-commerce* such as HelloFresh or Picnic; and (iii) combined e-commerce companies, like AmazonFresh, which prove an online platform (see Table 1). Sometimes mergers between the segments occur. Apart from these business models, online retailers also differ according to how the goods are transferred (e.g. delivered to the customer, in a drop box, or at a central location), the ordering and payment methods (e.g. before or after receipt of the goods) and the storage location of the goods before the goods are handed over (e.g. via a central logistics warehouse or decentrally via branches). Table 1 shows the different business models and distribution mechanisms of online food retail. Concerning the current ‘stay at home’ situation, this offers various options for customer contact, especially considering the need for physical social distancing. At the same time, the current situation presents many challenges for the technical infrastructure, the personnel in logistics, and the third-party delivery service providers.

With *complementary e-commerce*, stationary food retailers and especially large supermarket chains (such as REWE) offer the option for their clients to order their goods online (in addition to buying them in the branch as a multichannel offer). In addition to their logistic centres, these companies can therefore use their branch network structure in which the stationary stores also serve as places of delivery or starting point for delivery to the end customer. The goods can be transported in different ways. In contrast, *pure e-commerce* actors naturally do not have own branch structure. Pure e-commerce sends (shipping model) or delivers (delivery model) customers’ purchases from a geographically central warehouse to the front door or, if necessary, an alternative pick-up location. Picnic as an example of pure e-commerce has so far been delivering in North Rhine-Westphalia (Eschborn 2020). In *combined e-commerce*, on the other hand, goods are offered by various providers via online marketplaces and transported to end customers via service providers. One example is AmazonFresh. Against this background, the following discusses to



Source: The authors.

Figure 3. Time axis of the spread of COVID-19 and related measures in Germany.

what extent changes due to the COVID-19 pandemic in landscape and regimes are leading to further, possibly long-term dynamics in food retailing.

THE RISE OF ONLINE FOOD RETAIL IN THE CONTEXT OF THE COVID-19 PANDEMIC

Spread of COVID-19 as a shock at landscape level and ‘stay at home’ as a change in the socio-technical regime – COVID-19 can be seen as an exogenous global landscape development (see Geels 2011), which led to the ‘stay at home’ measures at the political sub-regime of Germany and further interdependent dynamics at the regime level (Figure 3). The following explanations illustrate these processes, which led to a fast increase of e-grocery during this time, in detail.

Since late 2019, COVID-19 has been spreading rapidly – first within China and then internationally. Following the rise of cases in Germany, the Federal Government and the state governments successively started a number of restrictive protection measures, which included different social distancing rules, cumulating in the ‘stay at home’ protocols (see Figure 3; BMI 2020). COVID-19 had a substantial impact on the legal framework in Germany, at least temporarily. At the same time, media awareness campaigns took place, such as ongoing reporting on COVID-19, Chancellor Merkel’s television address on 18 March 2020 and the widespread use of hashtags and (online) campaigns, especially #stayathome. These campaigns advised citizens to leave the house only when it was essential. This resulted in a rapid increase in internet use, as essential areas of private contacts (with friends), professional activities (work from home) and other societal issues (e.g. public administration contacts) were shifted to the use of online media.

Effects on the sub-regime of food retail – Food retail entered a special situation. In general, while retail stores that did not provide essential goods or services had to close, and politicians responded to this with economic support measures, the food trade

as a ‘systemically important service’ remained open to ensure supply for the population (Bundesregierung 2020). This included retailing for groceries, weekly markets, pick-up and delivery services and ‘to go’ offers from the catering trade. Nevertheless, food retail faced severe restrictions. There were strict hygiene measures (disinfection, compulsory use of shopping trolleys, limitations on the number of customers, and rules to keep distance from food counters and cashiers). Other food providers, like restaurants and canteens were required to close entirely. In total ‘stay at home’ led to an increased demand in food trade retail, and – partly due to stocking up and panic buying – even bottlenecks in terms of the supermarkets’ ability to supply products (BEVH 2020). Products that were considered to have a shelf life aspect were purchased more frequently, sometimes with growth rates of over 400 per cent compared to the same period last year (Nielsen 2020).

General implications for online grocery retail: the expansion of the niche – The following section first discusses to what extent the COVID-19 ‘stay at home’ preventive measures helped online grocery retail to develop a new configuration that breaks through by taking advantage of a windows of opportunity and in this way adjusts the socio-technical regime (Geels 2011). Subsequently, special attention is given to the extent to which the changes in online food retailing are now experiencing a ‘thicker and more transformative’ (Murphy *et al.* 2014, p. 264) dynamic, through which the previous food retail regime is changing in its nature and with its actor constellations. In this context, we also discuss the special characteristics of the COVID-19 induced window of opportunity.

The ‘stay at home’ measures and the general reduction of activities (especially in terms of gastronomy) have expanded a protected area for online food retailing. This is characterised by less competition from other industries and a continued high demand for food. Here, the food retail trade needs to be distinguished from other retail trades, as it satisfies short-term basic needs rather than medium-term goods needs, such as clothing,

where customers can postpone purchases. This enabled the online grocery retail to conquer larger markets and growth rates of ca. 150 per cent in March 2020 (Nielsen 2020). Online purchases were replacing offline retail purchases. A survey among customers of online food retail in Germany on 27 March 2020 showed that 44 per cent of customers had ordered groceries online for the first time in the preceding month (Halm 2020). At the same time, this situation came as a surprise to food retail, and online retailers' capacity quickly reached capacity limits. Ultimately, 22 per cent of potential new customers could not place an order because the desired products or delivery dates were not available (Nielsen 2020).

A main reason for using food online retail during the crisis was the fear of infection. Twenty per cent of customers indicated that this was an important motive for buying groceries online. For new customers, however, the most frequently mentioned motive (31% of those surveyed) was panic buying (fear of contagion and the aim to buy ahead). In contrast, this was a minor motive for existing customers (9% of those surveyed). This difference suggests that some customers mostly register with the online services for the purpose of buying stocks and above-average quantities when they place their first order (Halm 2020). The study indicates that new e-grocery customers due to COVID-19 crisis were driven by the temporary motives limited to the crisis.

Different effects on online food retailing –

The following provides examples in how far the changes in online food retailing took place in different business models. Afterwards we discuss to what extent these changes can result in long-term transformative dynamics (as understood e.g. by Murphy *et al.* 2014). The discussion illustrates why companies largely stayed in the niche.

Complementary e-commerce: in Germany, the best-known example in e-grocery is the food retailer REWE. REWE is one of the leading providers of fresh food retail in Germany and has been the first full-range retailer in online retail (since 2011). REWE offers a delivery service with its own vehicles in 75 cities. In addition, there are more than 200

pick-up points for ordered groceries across Germany, which are supplied via DHL (Büchel & Etezadzadeh 2020). Even before the pandemic, REWE recorded strong growth in sales and new customers (Tewes & Mende 2020), which already led to longer delivery times, as REWE spokesman points out: 'The high demand means waiting times of up to one to two weeks – the waiting times depend on the respective delivery area and are not the rule' (Hansen 2020). As part of the 'stay at home', REWE experienced a sudden increase in demand. As a result, REWE therefore expanded its multi-channel distribution system and invested specifically in the infrastructure and expansion of the pick-up service at around 870 locations (REWE 2020). In April, REWE already installed more pick-up-stations than planned for the entire year (Lebensmittelzeitung 2020). However, a change in delivery spread which includes more rural areas was not seen.

Pure e-commerce: generally, purely online providers grew during the COVID-19 pandemic. For example, the stock market price of the market leader HelloFresh rose sharply (from €8 in April 2019 to €19 mid-March 2020 and even to €41,38 mid of May 2020, boerse.ard 2020). The delivery service Picnic was another example that achieved strong growth, with demand increasing by more than 100 per cent during the crisis (Schaal 2020). The Dutch company Picnic cooperates with the German food retailer Edeka (Reimann 2020). Picnic, which had around 800 employees before the crisis, reacted to the increasing demand by making massive investments. This included the short-term hiring of additional 200 employees (in February and March 2020; Knaudt 2020). Furthermore, and as a result of the pandemic crisis, Picnic quickly opened up a new logistics centre (in Herne), in addition to the established centre (in Viersen) to double their overall capacity (Eschborn 2020; Schaal 2020). In doing this, they expanded their market reach to smaller cities in North-Rhine Westphalia but kept their focus on Germany's largest urban agglomeration: the Ruhr area. Picnic then also began delivering on Sundays and offered delivery dates with a waiting period of three days so that more customers could be supplied (Knaudt 2020).

However, Picnic also reached its capacity limits during the crisis. For example, the company had to introduce waiting lists for new registrations for around 80,000 potential new customers in mid-April (Hartmann 2020; Picnic 2020). Our interviews show that the investments by these stakeholders were rather conservative, and particularly focus on investments in packaging or realising earlier investments that had been planned prior to the pandemic (Interview 2, 15 April 2020). Other interviewees expressed that their companies refrained from investing due to economic uncertainty (Interview 3, 16 April 2020). Yet, as shown below, specialised online-traders like HelloFresh, which were start-ups, have experienced strong growth.

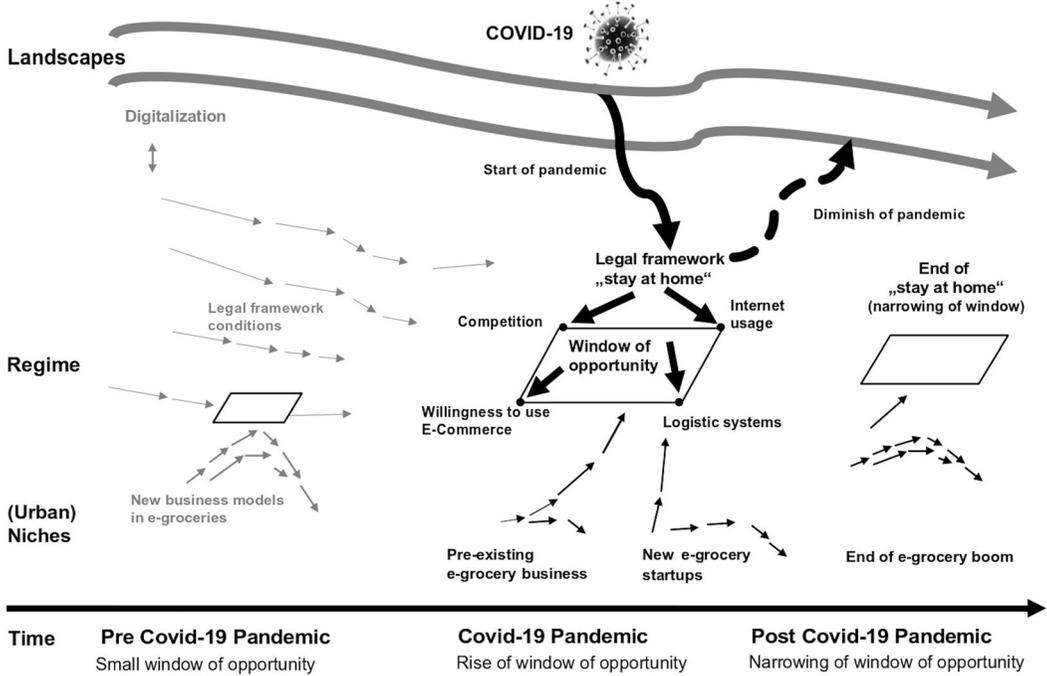
Combined e-commerce: the largest global online retailer, Amazon, has generally achieved a leading position in Germany with its infrastructure, delivery quality and payment security. The division AmazonFresh benefited from Amazon's general popularity. At 63 per cent, the majority of new customers who shifted to e-commerce (also beyond food) moved to Amazon (IFH 2020). The market leader from Seattle (USA) experienced a tremendous upswing in the course of COVID-19 in its various divisions and subsequently expanded its workforce. They also expanded their food segment AmazonFresh. However, with the sudden rise in demand AmazonFresh also faced capacity limits and was partially unable to meet the booming demand (Amazon.de 2020).

Besides AmazonFresh, smaller food retailers have profited from the increased demand during COVID-19. In combined e-commerce, one example is the start-up Pielers.de, an online platform for sustainable food that takes a multi-channel approach. Pielers.de acts as a weekly online market for producers and customers. As an intermediary, it offers a digital platform and receives a sales commission for each purchase made. The start-up recorded a tenfold customer interest in the first weeks of March 2020 (Köhn 2020). Its business model is characterised by decentralised storage locations and is therefore more flexible than companies with central logistics locations. Their CEO (interview 3, April 16, 2020) confirmed that the company has grown rapidly, which has led to practical

problems in all areas (logistics and packaging process). Pielers still used the crisis to launch a new ordering platform ('Getfoodlocal') for fresh food, which is currently (May 2020) in the testing phase and is aimed at connecting business like butchers and greengrocers with online markets. The interviewee hopes that COVID-19 will open a long-term prospect for Pielers to develop more resilient supply chains across Germany. However, no large investments (e.g. for an own delivery fleet or framework contracts) are made, as the duration of high demand still is open.

Digital farm shops, such as Frischepost ('fresh mail') and Marktschwärmer ('market enthusiasts'), act in a similar way and support regional producers (Bitkom 2020). Frischepost experienced a five-fold increase in private sales (Willing 2020). The online marketplace Marktschwärmer, which connects local food sellers with customers in the Cologne region, has seen a double increase in customer numbers since the COVID-19 pandemic and the average customer purchase has increased by 20–25 per cent. The increased demand has led to the rapid introduction of a paid delivery service, in addition to the previous pick-up service. However, because of the fear of an overloading demand, the company also reduced their online sales offer. Still in the long run, Marktschwärmer sees COVID-19 as an opportunity to expand their catchment area. This is aimed by providing their customers with more reliable supply systems through direct marketing from farmer to consumer and advanced click-and-collect options (Interview 2, April 15, 2020). Generally, many providers in the segment of combined e-commerce were not able to cope with the boom in demand and therefore engaged in digital networks to cooperate with regional or local food suppliers. Here, local retailers (together with food producers) have helped each other with web competence and have started or expanded their online activities through such platforms (Vieser 2020).

Evidence for the long-term configuration of the regime in favour of online trading – According to the key notions of the MLP, changes in the landscape generally occur rarely and as long-term and gradual processes. However,



Source: The authors, Geels (2011), and Dederichs & Dannenberg (2017).

Figure 4. Potential rise and decline of a window of opportunity through COVID-19-related ‘stay at home’ measures.

Table 2. Identified potentials and barriers for present and future sustainable establishment of online grocery retail in the context by COVID-19 and ‘stay at home’ measures.

Indicators for long term transition	Indicators for no long-term transition
<ul style="list-style-type: none"> • Generally greater use of internet and online services • Generally higher levels of willingness to buy groceries online (‘overcoming the first order barrier’) • Long-term habituation effects of customers to the use of online trading • Rapid introduction of new technologies in different e-grocery businesses • Strategic capacity building (i.e. logistics) by e-groceries as result of the crisis (however only few examples identified) • Establishment of more reliable supply systems • Entry of new stationary businesses into the online business 	<ul style="list-style-type: none"> • Persistent challenges of rural areas including low consumer density, lack of branch stores for complementary e-commerce • General limitations in digital infrastructure (Köhn 2020) • So far relatively little long-term adjustment measures at some large companies such as Amazon • Only temporary window of opportunity concerning ‘stay at home’ measures • Because of the problems that have arisen, there is a risk of deterring new customers again • Crisis revealed large restrictions on the functionality of the online food trade • Decrease in changes in consumer wishes caused by the crisis (special hygiene, social distancing)

Source: own compilation.

sometimes processes can also be affected by sudden crises (Geels 2002). The COVID-19 pandemic represents such a radical event within the socio-technical landscape, with a

clear and unusually fast impact on the socio-technological regime in Germany with its sub-regimes and its previously established practices, rules, and policies. *In principle*, this radical

disruption offered online food retailers an opportunity to establish themselves broadly on the market. Hence, one could expect a further establishment of the associated innovative business models and distribution mechanisms leading to a reconfiguration of the regime in the sense of the transition studies.

In view of the currency of this paper, no clear long-term developments in online food retailing can be identified yet. However, some trends are appearing (see Figure 4 and Table 2). Interviewee 4 (13 May 2020) comments: 'COVID-19 has fundamentally improved the conditions for e-grocery'. For e-grocery, the regime changes included the sudden general increase of internet usage in German society and a sudden push in e-grocery demand, as described above. There are the high dynamics of small and now expanding grocery stores to enter the online business via their own delivery services or delivery service providers (see Keybits 2020; Nielsen 2020). Krempleski (2020) also foresees potential through further innovations and adaptations such as the improved options via parcel machines, parcel acceptance shops, drop boxes, delivery dates and 'click-and-collect'.

While generally these changes offer a window of opportunity, several issues can narrow it again and hinder a clear breakthrough of online trading (Table 2). Online grocery retail was not able to meet the sudden growing demand due to its previously limited capacities as a previously niche provider (especially in terms of deliveries to customers). A particular issue is that online food retail has no nationwide extension. This applies in particular to the supply of peripheral rural areas. For example, AmazonFresh only delivers in Hamburg, Berlin, Potsdam and Munich; and REWE has so far only delivered to urbanised areas in Germany. Hence, metaphorically spoken, due to own limitations e-grocery was not really ready to jump through the window of opportunity when it opened during COVID-19.

Furthermore, this window of opportunity is fragile, and the special time-limited nature of the crisis and its measures must be taken into account (Figure 4). This likely applies both to the legal framework (the rules to stay at home and related regulations) and to consumer claims. COVID-19 temporarily reduced the 'last mile' because the customers were predominantly at home, the contactless use of drop

boxes and so on for packages was accepted, and the population had a greater understanding of delivery difficulties and services (Lebensmittel Praxis 2020). As the risk of infection diminishes, the hygiene aspect of online retailing is likely to recede into the background compared to brick-and-mortar retailing (Halm 2020). Many customers are likely to choose goods in-store again and want to experience them with their senses. Keeping in mind that most e-groceries include direct or indirect delivery charges, price advantages might also lead to a return of customers to stationary retail (in particular in case of a recession). Studies on other epidemics also point to a temporary upswing and a subsequent marked flattening, for example Forster and Tang (2005) on online food sales in the wake of the SARS pandemic in Hong Kong 2003 and Jung and Sung (2017) on MERS in South Korea. These results are in line with current developments on the Chinese market (which is more than two months ahead to Germany in the pandemic's development). Indeed, official data from the National Bureau of Statistics China (2020) shows no signs of an exceptional lasting effect on e-grocery sales in China. We find similar trends in a study conducted in Canada, in which Goddard (2020) perceives uncertainties about how the public will react after states of emergency.

CONCLUSION

Following the multilevel perspective, the COVID-19 crisis became a landscape development that placed pressure on the socio-technical regime. The results of this investigation showed that the pandemic and the policies of 'stay at home' opened a window of opportunity for grocery e-commerce to disseminate, which was driven by radical institutional changes and major shake-ups of existing demand (see Lee & Malerba 2017). The study illustrated that there has been a strong upswing in the food trade and a disproportionately strong growth rate in the online food trade since the start of the crisis. Still, the spatial diffusion of online food grocery was limited. Both larger and smaller businesses in our study were trying to cope with the increased demand rather than expanding their catchment area. A key reason

for this is that the COVID-19 pandemic was not foreseeable for online retail. Thus, COVID-19 is not the stable regime configuration that offers actors a safe and stable framework for their activities, as the MLP suggests. The quick onset and unpredictability of the event limited the expansion of online food retail during COVID-19, and the conceivably limited timeframe of 'stay at home' practices acted as a barrier for expansion. Thus, the window of opportunity caused by 'stay at home' offered only limited space for experimentation and trying out new methods, such as initiatives by local retailers to help each other. 'Stay at home' practices also created high pressure to satisfy the soaring customer demand. With regard to digitalisation in space, this study shows that digitalisation does not generally help to overcome spatial disparities.

At the time of completing this manuscript (with 'stay at home' still in place), there was no true reconfiguration of the general actor constellation. So far, even the unprecedented growth in e-grocery during the crisis does not indicate a fundamental long-term shift from stationary to online food retail. In e-grocery itself, the strong player AmazonFresh gained customers; yet it did not fundamentally change online food retail during the COVID-19 pandemic in Germany. The German market leader HelloFresh also profited. Even though new start-ups appeared, the online food retail remained essentially unchanged in terms of the dominant business models and distribution mechanisms. In this sense, no transition could be identified in this period. In fact, our results indicate that a fast and wider establishment of e-groceries and a related transition of the retail sector as a whole is unlikely to happen in Germany in the foreseeable future, particularly in its peripheral parts.

Generally, the case of the COVID-19 pandemic and 'stay at home' practices illustrated the importance of better understanding the temporality and fragility of socio-technical regime changes and related windows of opportunity in the MLP. While works in transition studies have mainly regarded long-term changes, for example related to climate change, our case illustrates how the particular settings within the pandemic produced a limited 'window of opportunity' that can close again in post-pandemic times.

Acknowledgements

We gratefully acknowledge the support of the research project 'Regional Employment Effects of Online-Trade' by the Hans Böckler Foundation (Grant No. 2019-571-3). Our gratitude goes to Martin Franz for his supportive comments. We also thank the anonymous reviewers for their helpful remarks.

REFERENCES

- AMAZON.DE (2020), Aktuelles zu Unserem Fresh-Lieferservice. Available at <<https://www.amazon.de/b?node=21086310031>>. Accessed on 9 April 2020.
- ARCHIBUGI, D. (2017), Blade Runner Economics: Will Innovation lead the Economic Recovery? *Research Policy* 46, pp. 535–543.
- BATHELT, H. & R. GIBSON (2015), Learning in 'Organized Anarchies': The Nature of Technological Search Processes at Trade Fairs. *Regional Studies* 49, pp. 985–1002.
- BEVH (2020), Corona-Pandemie Führt zu Deutlichem Umsatzverlust im Onlinehandel. Available at <https://www.bevh.org/fileadmin/content/05_presse/Pressemitteilungen_2020/200406_-_PM_Zahlen_1._Quartal_2020_im_Online-Handel.pdf> Accessed on 9 April 2020.
- BITKOM (2020), Digitale Hofläden, Available at <<https://www.bitkom.org/Themen/Digitale-Hoflaeden-in-Zeiten-von-Corona>> Accessed on 9 April 2020.
- BMI (2020), Vorübergehende Grenzkontrollen. Available at <<https://www.bmi.bund.de/ShareDDocs/pressemitteilungen/DE/2020/03/grenzschliessung-corona.html>> Accessed on 9 April 2020.
- BOERSE.ARD (2020), HelloFresh SE Inhaber-Aktien O.N. Available at <https://kurse.boerse.ard.de/ard/kurse_einzelkurs_uebersicht.htm?i=18099726>. Accessed on 17 April 2020.
- BBSR. (2019) Online-Handel in Deutschland. Available at <https://www.bbsr.bund.de/BBSR/DE/Veroeffentlichungen/AnalysenKompakt/2019/ak-03-2019-dl.pdf?__blob=publicationFile&v=2>. Accessed on 2 June 2020.
- BUNDESREGIERUNG (2020), Vereinbarung (...) Angesichts der Corona-Epidemie in Deutschland. Available at <<https://www.bundesregierung.de/breg-de/aktuelles/vereinbarung-zwisc>>

- hen-der-bundesregierung-und-den-regierungs-
chefinnen-und-regierungschefs-der-bundeslaen-
der-angesichts-der-corona-epidemie-in-deuts-
chland-1730934> Accessed on 9 April 2020.
- BÜCHEL, D. & C. ETEZADZADEH (2020), Interview:
Die Zukunft im Blick – Wie die REWE Group den
Urbanen Wandel Gestaltet. In: C. Etezadzadeh,
ed., *Smart City – Made in Germany*, pp. 211–217.
Wiesbaden: Springer Vieweg.
- DANNENBERG, P. & S. DEDERICHS (2019),
Online-Lebensmittelhandel in Ländlichen
Räumen – Hemmnisse einer Expansion des
Onlinehandels mit Lebensmitteln aus Perspektive
Unterschiedlicher Akteure in Deutschland. *Raum
Planung* 202, pp. 16–21.
- DANNENBERG, P. & M. FRANZ (2014), Essen aus dem
Internet. *Standort* 38, pp. 237–243.
- DANNENBERG, P., M. FRANZ & A. LEPPER (2016),
Online Einkaufen Gehen: Einordnung Aktueller
Dynamiken im Lebensmittelhandel aus Perspektive
der Geographischen Handelsforschung. In: M.
Franz & I. Gersch, eds., *Onlinehandel ist Wandel*,
pp. 133–156. Mannheim: MetaGIS.
- DEDERICHS, S. & P. DANNENBERG (2017),
Vom Nischenmarkt in die Expansion: Die
Aktuelle Dynamik des Deutschen Online-
Lebensmitteleinzelhandels im Kontext der
Transitionsforschung. In: P. Dannenberg, M.
Willkomm & K. Zehner, eds., *Einzelhandel in
Deutschland*, pp. 59–82. Mannheim: MetaGIS.
- EBIS (2020), Who is Prepared for the New Digital
Age? Available at <<https://www.eib.org/en/publications/who-is-prepared-for-the-new-digital-age>>
Accessed on 30 April 2020.
- EHI (2018a), Online-Lebensmittelhandel. Available at
<[https://www.handelsdaten.de/handelsthemen/
online-lebensmittelhandel](https://www.handelsdaten.de/handelsthemen/online-lebensmittelhandel)>. Accessed on 31
March 2020.
- EHI (2018b), Online-Lebensmittelhandel. Available
at <[https://www.ehi.org/de/pressemitteilungen/
andere-laender-andere-fritten/](https://www.ehi.org/de/pressemitteilungen/andere-laender-andere-fritten/)>. Accessed on 09
May 2020.
- EINZELHANDELS-MONITOR (2020), Zahl der über
60-jährigen Online Shopper. Available at <[https://
einzelhandel.de/index.php?option=com_
attachments&task=download&id=10168](https://einzelhandel.de/index.php?option=com_attachments&task=download&id=10168)>
Accessed on 30 March 2020.
- ESCHBORN, N. (2020), Nachhaltiges Wachstum,
Befeuert durch Corona. Available at <[https://
www.rundschau.de/artikel/picnic-im-inter
view-nachhaltiges-wachstum-befeuert-durch
-corona/](https://www.rundschau.de/artikel/picnic-im-inter-view-nachhaltiges-wachstum-befeuert-durch-corona/)> Accessed on 16 April 2020.
- FORSTER, P. & Y. TANG (2005), The Role of Online
Shopping and Fulfillment in the Hong Kong
SARS Crisis. *Proceedings of the 38th Annual Hawaii
International Conference on System Sciences* 8, p.
271. Available at <[https://doi.org/10.1109/
HICSS.2005.615](https://doi.org/10.1109/HICSS.2005.615)> Accessed on 2 June 2020.
- FRUCHTPORTAL (2020), Die Neue Real
Lebensmittelshop-App. Available at <[https://
www.fruchtportal.de/artikel/die-neue-real-leben
smittelshop-app-bequem-lebensmittel-einka
ufen/038267](https://www.fruchtportal.de/artikel/die-neue-real-leben-smittelshop-app-bequem-lebensmittel-einkaufen/038267)> Accessed on 13 May 2020.
- FUCHS, M. (2020), Does the Digitalization of
Manufacturing Boost a ‘Smart’ Era of Capital
Accumulation? *The German Journal of Economic
Geography*. Online First. Available at <[https://
doi.org/10.1515/zfw-2019-0012](https://doi.org/10.1515/zfw-2019-0012)>. Accessed on 15
April 2020.
- GEELS, F. (2002), Technological Transitions as
Evolutionary Reconfiguration Processes: A Multi-
level Perspective and a Case-study. *Research Policy*
31, pp. 1257–1274.
- GEELS, F. (2011), The Multi-level Perspective on
Sustainability Transitions: Responses to Seven
Criticisms. *Environmental Innovation and Societal
Transitions* 1, pp. 24–40.
- GEELS, F. (2012), A Socio-technical Analysis of Low-
carbon Transitions: Introducing the Multi-level
Perspective into Transport Studies. *Journal of
Transport Geography* 24, pp. 471–482.
- GENUS, A. & A.-M. COLES (2008), Rethinking
the Multi-level Perspective of Technological
Transitions. *Research Policy* 37, pp. 1436–1445.
- GfK (2018), Press Release. Available at <[https://
www.gfk.com/de/insights/press-release/online
-ek/](https://www.gfk.com/de/insights/press-release/online-ek/)>. Accessed on 15 May 2020.
- GODDARD, E. (2020), The Impact of COVID-19 on Food
Retail and Food Service in Canada: Preliminary
Assessment. *Canadian Journal of Agricultural
Economics*. Online first. Available at <[https://doi.
org/10.1111/cjag.12243](https://doi.org/10.1111/cjag.12243)>. Accessed on 9 May
2020.
- HALM, S. (2020), Corona und Online-
Lebensmittelhandel. Available at <[https://www.
ibusiness.de/members/aktuell/db/909947sh.ht
ml?pay=1](https://www.ibusiness.de/members/aktuell/db/909947sh.html?pay=1)>. Accessed on 13 April 2020.
- HANSEN, K. (2020), Lieferdienste Teilweise bereits
auf Wochen Ausgebucht. Available at <[https://
www.mdr.de/nachrichten/ratgeber/lieferserv
ice-laengere-lieferzeiten-wegen-corona-102.html](https://www.mdr.de/nachrichten/ratgeber/lieferservice-laengere-lieferzeiten-wegen-corona-102.html)>
Accessed on 16 April 2020.
- HANSEN, T. & L. COENEN (2015), The Geography
of Sustainability Transitions: Review, Synthesis

- and Reflections on an Emergent Research Field. *Environmental Innovation and Societal Transitions* 17, pp. 92–109.
- HARTMANN, G. (2020), Der Online-Supermarkt Startet durch. Available at <<https://www.welt.de/regionales/nrw/article207245367/Der-Online-Supermarkt-startet-durch-in-NRW.html>> Accessed on 14 April 2020.
- IFH (2020), Corona Consumer Check. Available at <<https://www.ifhkoeln.de/pressemitteilungen/details/corona-consumer-check-konsumverhalten-in-zeiten-von-corona/>> Accessed on 16 April 2020.
- JUNG, E. & H. SUNG (2017), The Influence of the Middle East Respiratory Syndrome Outbreak on Online and Offline Markets for Retail Sales. *Sustainability* 9, p. 411.
- KEYBITS (2020), Corona-Krise. Available at <<https://www.keybits.de/news/corona-krise-ist-das-verae-nderte-online-kaufverhalten-im-b2c-handel-nachhaltig>> Accessed on 9 April 2020.
- KNAUDT, F. (2020), Nachhaltiges Wachstum, Befeuert durch Corona. Available at <<https://www.rundschau.de/artikel/picnic-im-interview-nachhaltiges-wachstum-befeuert-durch-corona/>> Accessed on 16 April 2020.
- KÖHN, J. (2020), Klein, Fix, Digital. Available at <<https://www.sueddeutsche.de/stil/lebensmittel-klein-fix-digital-1.4856047>> Accessed on 16 April 2020.
- KREMPLEWSKI, A. (2020), Corona: Engpässe beim Online-Shopping. Available at <<https://www.watson.de/leben/coronavirus/354822133-corona-engaesse-beim-online-shopping-rewe-meldet-sich-zu-wort>> Accessed on 28 March 2020.
- KULKE, E. (2016), Dimensionen der Internationalisierung des Einzelhandels. *Innsbrucker Geographische Studien* 40, pp. 61–78.
- LEBENSMITTEL PRAXIS (2020), Chancen für Alle. Available at <<https://lebensmittelpraxis.de/corona-update-mobile/26940-lebensmittel-lieferdienste-chance-fuer-alle-2020-03-31-12-29-51.html>> Accessed on 16 April 2020.
- LEBENSMITTELZEITUNG (2020), Rewe baut Abholservice aus. Available at <<https://www.lebensmittelzeitung.net/handel/Click-Collect-Rewe-baut-Abholservice-aus-145912>> Accessed on 12 May 2020.
- LEE, K. & F. MALERBA (2017), Catch-up Cycles and Changes in Industrial Leadership: Windows of Opportunity and Responses of Firms and Countries in the Evolution of Sectoral Systems. *Research Policy* 46, pp. 338–351.
- MACKINNON, D., S. DAWLEY, A. PIKE & A. CUMBERS (2019), Rethinking Path Creation: A Geographical Political Economy Approach. *Economic Geography* 95, pp. 113–135.
- MALECKI, E.J. & B. MORISET (2008), *The Digital Economy. Business Organization, Production Processes and Regional Developments*. London: Routledge.
- MAYRING, P. (2000), Qualitative Content Analysis. *Forum: Qualitative Social Research*. Available at: <<http://www.qualitative-research.net/index.php/fqs/article/view/1089/2385>>. Accessed on 9 May 2020.
- MENSING, M. (2018), Lebensmittel-Onlinehandel – Alternative zur Zukünftigen Versorgung der Bevölkerung Ländlicher Räume? (Doctoral thesis, RWTH Aachen). Available at <<https://publications.rwth-aachen.de/record/758124/files/758124.pdf>> Accessed on 9 May 2020.
- MURPHY, J. (2015), Human Geography and Socio-technical Transition Studies: Promising Intersections. *Environmental Innovation and Societal Transitions* 17, pp. 73–91.
- MURPHY, J., P. CARMODY & B. SURBORG (2014), Industrial Transformation or Business as Usual? *Review of African Political Economy* 41, pp. 264–283.
- NATIONAL BUREAU OF STATISTICS CHINA (2020), Domestic Trade: Online Retail Sales. Available at <<http://data.stats.gov.cn/english/easyquery.htm?cn=A01>> Accessed on 8 May 2020.
- NELSON, R.R. & S.G. WINTER (1977), In Search of Useful Theory of Innovation. *Research Policy* 6, pp. 36–76.
- NIEKISCH, M. (2020), Das Coronavirus ist Tante Emmas Tod. Available at <<https://www.fr.de/meinung/corona-pandemie-einzelhandel-coronavirus-tante-emma-kolumne-13607675.html>> Accessed on 24 March 2020.
- NIELSEN. (2020), Die Auswirkungen von COVID-19 auf den Deutschen Handel. Available at <<https://www.nielsen.com/de/de/insights/article/2020/der-auswirkungen-von-COVID-19-auf-den-deutschen-handel/>> Accessed on 9 April 2020.
- NUFER, G. & S. KRONEBERG (2014), *Chancen für Nachhaltige Geschäftsmodelle im Lebensmittel-Onlinehandel*. Reutlingen: Reutlinger Diskussionsbeiträge zu Marketing & Management.
- PICNIC (2020), Häufig Gestellte Fragen. Available at <<https://www.picnic.app/de/fragen>> Accessed on 9 April 2020.
- REIMANN, E. (2020), Corona Beflügelt Lebensmittel-Lieferdienste. Available at <<https://www.absatzwirtschaft.de/ploetzlich-beliebt-coron>

- a-befluegelt-lebensmittel-lieferdienste-171226/> Accessed on 6 April 2020.
- REWE.DE (2020), Der Rewe Abholservice. Available at <<https://www.rewe.de/service/abholservice>>. Accessed on 15 May 2020.
- SCHAAL, S. (2020), E-Lieferdienst Picnic eröffnet Zweites Deutsches Logistikzentrum. Available at <<https://www.electrive.net/2020/04/03/e-lieferdienst-picnic-eroeffnet-zweites-deutsches-logistikzentrum/>> Accessed on 17 April 2020.
- SEITZ, C.J. POKRIVČÁK, M. TÓTH & M. PLEVNÝ (2017), Online Grocery Retailing in Germany. *Journal of Business Economics and Management* 18, pp. 1243–1263.
- STATISTA (2019), Umsatzstärkste Online-Shops im Lebensmittel- und Getränke-Segment in Deutschland 2018. Available at <<https://de.statista.com/prognosen/861540/top-online-shops-deutschland-lebensmittel-getraenke-ecommerce>> Accessed on 28 March 2020.
- STATISTA (2020), Warengruppen im Online-Handel. Available at <<https://de.statista.com/statistik/daten/studie/253188/umfrage/umsatzstarke-warengruppen-im-online-handel-in-deutschland/>> Accessed on 17 April 2020.
- TAZ (2020), Gut für Amazon. Available at <<https://taz.de/Onlinehandel-und-Corona/!5670732/>> Accessed on 25 March 2020.
- TEWES, W. & J. MENDE (2020), Corona Stresst Rewe Group. Available at <<https://www.lebensmittelzeitung.net/handel/Haertetest-Corona-stresst-Rewe-Group-145624>>. Accessed on 9 April 2020.
- TRUFFER, B. (2008), Society, Technology, and Region: Contributions from the Social Study of Technology to Economic Geography. *Environment and Planning A: Economy and Space* 40, pp. 966–985.
- VAN DRIEL, H. & J. SCHOT (2005), Radical Innovation as a Multi-level Process: Introducing Floating Grain Elevators in the Port of Rotterdam. *Technology and Culture* 46, pp. 51–76.
- VIESER, S. (2020), Händler Helfen Händlern ins Internet. Available at <https://etailment.de/news/morning_briefing/H%C3%A4ndler-helfen-H%C3%A4ndlern-rein-ins-Internet-eBay-Amazon-Alibaba-DPD-22905> Accessed on 25 March 2020.
- WALLSTREET ONLINE (2020), Corona-Angst Sorgt für Boom im Online-Lebensmittelhandel. <<https://www.wallstreet-online.de/nachricht/12336847-virus-corona-angst-sorgt-boom-online-lebensmittelhandel>> Accessed on 3 April 2020.
- WILLING, J. (2020), Digitale Hofläden in Zeiten von Corona. Available at <<https://www.bitkom.org/Themen/Digitale-Hoflaeden-in-Zeiten-von-Corona>> Accessed on 9 April 2020.
- WORLD ECONOMIC FORUM (2020), This is How COVID-19 has Changed Media Habits in Each Generation. Available at <<https://www.weforum.org/agenda/2020/04/covid19-media-consumption-generation-pandemic-entertainment>>. Accessed on 15 April 2020.
- ZADEMACH, H.-M. & C. SCHULZ (2016), Wirtschaft und Entwicklung. In: T. Freytag, H. Gebhardt, U. Gerhard & D. Wastl-Walter, eds., *Humangeographie kompakt*, p. 142–162. Berlin: Springer Spektrum.
- ZOOK, M.A. (2002), Hubs, Nodes and By-passed Places: A Typology of E-commerce Regions in the United States. *Tijdschrift voor Economische en Sociale Geografie* 93, pp. 509–521.

APPENDIX

Interviewee 1	Representative of a German trading company	11 May 2020
Interviewee 2	Representative of a German food assembly	15 April 2020
Interviewee 3	Representative of a German food online retail start-up	16 April 2020
Interviewee 4	Academic expert and analyst in the field of e-grocery and rural areas	13 May 2020
Interviewee 5	Representative of a German cooperative online supermarket	29 April 2020
Interviewee 6	Representative of a German surprise foodbox delivery start-up	28 April 2020
Interviewee 7	Representative of a German organic food online store	07 May 2020
Interviewee 8	Representative of a German business school	13 May 2020
