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Market failures and market framings:

Can a market be transformed from the inside?

Susi Geiger, University College Dublin, College of Business*. Email: susi.geiger@ucd.ie

Nicole Gross, University College Dublin, College of Business. Email: Nicole.gross@ucd.ie

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Abstract

How do actors innovate markets in cases of perceived market failures? This paper's aim is to examine what happens when a market is innovated or, as we call it, 'redevised' in situations where public and commercial interests significantly diverge. Market devices can serve an important function in such attempts to innovate markets: they are material and/or social arrangements that are put into place to shape the market in question in certain ways. But can such devices really transform a market from within? To examine this question we trace the history of the Geneva Medicines Patent Pool, a civil society initiative introduced to change pharmaceutical firms' licensing and collaboration practices in the market for HIV/AIDS medicines. Our empirical results indicate that redevising a market in response to market failures can shift the market's frames and contribute to altering its momentum, but that this is a pragmatic and often lengthy process that is never fully predictable in advance. By attending to the intended and unintended consequences - or misfires - of redevising a market, our study raises important questions around acting in and on the market, devices' ontological impact, zooming in and zooming out when studying devices, and attending to the temporality of market innovation.

Key words: market failure, market device, patents, pharmaceutical industry, market innovation, patent pool

Introduction

What does it take to innovate a market? Market innovation happens when market actors reconfigure the interfaces, practices or social and material arrangements in and through which market exchanges take place (Kjellberg, Azimont and Reid, 2015; Milyaeva and Neyland, 2016). Market devices can serve an important coordinating and shaping function in attempts to innovate markets (Muniesa, Millo and Callon, 2007). The Oxford Dictionary defines a device as a “thing made or adapted for a particular purpose” (www.oxforddictionaries.com). Market devices are particularly interesting to study when they are deployed with an intent to make the market ‘better’ or more just, for instance in situations where public and commercial interests significantly diverge. Introducing a new market device in such situations may trigger an ‘in vivo experiment’ that has the potential to shift power distributions, calculative agencies and market practices (Callon, 2009; Doganova and Karnøe, 2015). The introduction of an eco-friendly label or a shopping guide for sustainable consumption, for instance, can have significant consequences on producers’ and consumers product evaluation and exchange practices (Dubuisson-Quellier, 2013). Such dynamics have previously been described in the case of carbon trading (Veal and Mouzas, 2012) or fishing quotas (Holm and Nielsen, 2007), but this research has only begun to explore the intended and unintended consequences of redevising a market in response to market failures. Can market devices help to transform a market from the inside, so to speak? Our empirical results indicate that they certainly shift the market’s frames over time, but that it can be difficult to both alter the frames radically and to direct this change purposefully. With our study, we reflect on: how redevising may act in and on the market’s overflows; the ontological impact of devices in shifting a market’s frames, being attentive to a device’s workings and concurrent market innovation efforts; and the temporality of market innovation.

We focus our inquiry on an industry that is situated at a fault line between market and civic frames and so subject to multiple and often shifting values, interests and demands (Sjögren and Helgesson, 2007; Dussauge et al., 2015; Geiger and Finch, 2016) : the pharmaceutical industry. The constitution of the World Health Organization states that “the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being” (www.who.int). With stated commitments to improving public health, pharmaceutical firms have at least on a rhetorical level embraced responsibilities that reach beyond commercial profitability and shareholder interests (de Wildt and Khoon, 2008). Concerns have been raised, however, around practices such as systematic price gouging (Pollack, 2015), ghost management of public opinion (Gagnon, 2016), inflation of patent protection periods (Finch and Geiger, 2011) and neglecting vulnerable patient groups (Blackwell, 2015). At a policy level, calls have been made on the pharmaceutical industry to rethink their R&D and innovation system in the light of patient needs rather than shareholder demands (Gagnon, 2013). Observers note for instance that a lack of innovation pressure may have contributed to slow the development of vaccines and drugs for some diseases (de Wildt and Khoon, 2008). The patenting system represents a focal point of criticism levied against the pharmaceutical industry as it allows the ring-fencing of intellectual property (IP) and enables firms to charge significant price premiums for their drugs (Cox, 2012; Gagnon, 2013; Lezaun and Montgomery, 2015).

We study a civil society initiative that was conceived as a potential solution to some of this market’s perceived failings: the Geneva Medicines Patent Pool (MPP). This patent pool, in existence since 2010, is a voluntary market mechanism that brings together pharmaceutical companies’ patents for HIV and antiretroviral (ARV) drugs for distribution and sale in low- and middle- income countries. Patent pools are arrangements that allow for the collective

management of IP rights such as patents, copyrights, know-how and data (Serafino, 2007). Their remit is often mainly commercial, either to lower R&D costs and risks in an industry or to enforce a common standard. However, as in the case of the US aircraft industry in the First World War, the creation of a patent pool can also be entwined with political objectives (Teulings, 1982). The MPP, as a specific example of a patent pool, was created with the intent of innovating the pharmaceutical market by working with and around IP regimes that stand in the way of global access to medicines and health equality (de Wildt and Khoon, 2008). It was designed to contribute at once to lowering drug prices and to product development in the shape of fixed-dosed combination medicines, by enabling generic competition on the one hand and by facilitating collaboration between pharmaceutical firms on the other. Yet, despite good levels of acceptance on the part of pharmaceutical companies and very noteworthy progress achieved, some voices in the community remain skeptical of the real power of this pool to transform the HIV/AIDS medicines market from the inside

Our approach is exploratory: we study the ‘making’ (Latour, 1987) of the Geneva Medicines Patent Pool from its conceptual beginnings in the early 2000s to current dates. Our method combines expert interviews with archival research to trace this device’s contributions to changes in the market for HIV/AIDS medicines. Following Law and Ruppert (2013: p. 233), our mission with this paper is to move from “looking to see what is written on the package [of a device]... to looking to see what others - especially sceptics - are saying”. Doing so allows us not only to ask questions about a market device’s potential to open up a market’s frames to public concerns, but also to interrogate more broadly the notion of market innovation from a market studies perspective.

From market failure to market innovation

Our conceptual apparatus stems from a research stream that considers markets as practical outcomes of multiple actors' organizing efforts (Callon, 1998; Kjellberg and Helgesson, 2006; McKague, Zietsma and Oliver, 2015; Giamporcaro and Gond, 2016). Some of these efforts are dedicated to market framing, that is drawing boundaries around what market actors do and do not take into account in their market interactions (Callon, 1998; Çalışkan and Callon, 2010). Framing indicates that what is included and excluded in markets depends on 'what counts', or how value is assigned to market objects, actors and arrangements (Neyland and Simakova, 2012). It also signals that as an active accomplishment, it can only ever be temporary and partial (Callon, Méadel and Rabeharisoa, 2002). This partiality points to overflows – or those matters, actors or values that are temporarily excluded but at all times threaten to 'strike back' against the market's frames (Neyland and Simakova, 2012).

With overflows, Callon and colleagues reconceptualize the classic neo-economic concept of externalities, or that which is left outside the market calculus but which bears social costs or benefits (Coase, 1960; Zerbe and McCurdy, 1999). Typically, government or policy actors are exhorted to intervene in such cases to correct the market's 'failure' or 'inefficiencies' and restore an order where the market balances out self- and public interests (Bator, 1958). In line with economic thinking, overflows indicate that what is excluded when the market's frames are drawn – such as carbon emissions, social values or widespread access to medicines - can be made visible, for instance by the activities of affected groups or regulators (Callon, Lascoumes and Barthe, 2009; Doganova and Karnøe, 2015). But the notion of overflows pushes this thinking much further than the neoclassical notion of externality. From the perspective of market framing, markets 'fail' all the time, but they are also in a process of continual reconfiguration, and this opens up the prospect of market innovation as a crucial aspect of market actors' organizing work (Callon, Méadel and Rabeharisoa, 2002; Kjellberg et

al., 2015). For the researcher, the task thus moves toward studying the negotiations and innovations that happen in and around a market's failures (Neyland and Simakova, 2012). This also focusses our attention on the dynamics of market innovation over time, as overflows come in and out of view, are fought over, contested and instrumented, and as these contests in turn unveil vistas onto new overflows.

Redevising markets

Market innovation has been defined as “altering the way business is done” (Kjellberg et al., 2015: p. 6). At first sight, market innovation can have two manifestations: actors may innovate *within* a given market frame, for instance by installing self-checkout facilities into supermarkets in order to alter shoppers' practices and roles (Cochoy, 2007). Market innovation can also be about shifting the market's frames, such that certain overflows can be taken into account (Milyaeva and Neyland, 2016). For instance, a plastic bag levy makes bags' polluting potential visible and includes it within the market exchange (Hawkins, 2012). Market devices play an important role in both kinds of market innovation efforts. In Science and Technology Studies (STS), market devices have been described as “the material and discursive assemblages that intervene in the construction of markets” (Muniesa et al., 2007: p. 2). This definition indicates that devices hold often highly discontinuous elements together – they articulate and mediate the relationships between different market actors and coordinate their actions. In the past, studies of market devices have often focused on material devices introduced by market actors to ‘do’ specific things: shopping carts, financial equations, telephones, tickers, or computer screens (e.g. Beunza and Stark, 2004; Preda, 2006; Cochoy, 2007; Hardie and MacKenzie 2007). By exploring how these devices change the ways in which market actors calculate, this research has been very valuable in illuminating how a market's materialities and practices are interrelated.

More recently, research has started to move beyond a narrow focus on devices' 'thing-ness'.¹ In stating that "Devices do not have to be pieces of kit", Law and Ruppert (2013: p. 299) encourage us to view them as "patterned teleological arrangements" and focus on their ontological impact – or the realities they create (see also Hawkins, 2012; Singleton and Law, 2013). Devices are bound up with what Dussauge et al. (2015) call stakemaking – the making of values and stating of what matters – which opens up the researcher's gaze toward their politics (van Hoyweghen, 2014). As Erturk et al. (2013: p. 338) put it, "Power and financial interests are an integral part of any assemblage, and the devices marshalled within that assemblage will often function in the interest of those human agents who marshal them." These interests can be those of focal market actors such as producers, sellers or buyers, but they can also be those of actors marginalized by the market's frames. Market devices are objects of "multiple public articulations" (Marres and Lezaun, 2011: p. 495) and diverse and at times competing registers of value. Introducing a new market device can represent a means to change whose and what interests are taken into account in a market interaction and to redistribute power and calculative agencies – in short, it can be a way to change a market's realities by shifting its frames (Dubuisson-Quellier, 2013; Erturk et al., 2013). In this context Hawkins (2012) for instance considers food packaging as a market device that is deeply enmeshed with political values, and Holm and Nielsen's (2007) Individual Transferable Fish Quota turn schools of fish into market objects. In each of these cases it is difficult to discern whether the device is of the 'market' or of 'public policy' (McFall, 2014a). But what is clear is that by being introduced into the market's assemblage, devices shape what counts rather than just representing neutral props (Zuiderent-Jerak, Grit and von der Grinten, 2015). Accordingly, the

¹ We are indebted to one of our reviewers for encouraging us to reflect on this point.

literature has started to shift from considering devices to studying the ‘devising’ taking place in and around markets (McFall, 2014b).

Of importance to our study, Law and Ruppert (2013) go on to emphasize that devices do not always act in line with the purpose for which they are deployed. In thinking through devices’ collateral realities - those realities that get done ‘along the way’ - they note that “what devices are doing is not necessarily written on the package” (p. 230). Their example of the security camera aptly illustrates this point: while the camera may reduce theft in one place it may also move it to places without a camera, and it may erode privacy and civil liberties ‘without anyone noticing’. Huault and Rainelli-Le Montagner (2009: p. 567) likewise discern a “sharp contradiction between the empirical reality and the rhetorical justification” of the devices they studied in the shaping of the credit derivatives market, in their case leading to increased power concentration and less rather than more transparency. Similarly, Harvey, Reeves and Ruppert (2013) reflect on transparency devices’ collateral effects in producing uncertainty and distrust for instance in the case of a conflict map: by visualizing conflict, the map may in fact facilitate it.

One consequence of devices’ collateral effects is that they seldom show up on their own. Indeed, Neyland and Milyaeva (2016) see market innovation as a recursive problem-solution nexus, where market interventions may solve one problem but, through overflows, create problems in other parts of the market, which require further market intervention. Thus market devices act “invariably in relation to other devices” (Hawkins, 2012: p. 67), and one instance of market innovation is likely accompanied by others. If actors are conscious of devices’ partiality, multiple devices can be employed strategically. Overdevest (2011) for example shows how the EU draws on and supports several instruments within the forestry market, in

the shape of private forest verification systems, several EU regulations and empowerment of civil society groups. She argues that by juxtaposing instruments representing different actors and values, the EU has effectively created “a world of experiments in the wild” (p. 547) where these devices can compete with and complement each other.

We take four important points for our inquiry from this short review of the literature. First, it raises questions about how redevising may serve to shift market frames. As we pointed out, multiple actors with diverse values and concerns devise and redevise markets in multiple ways. In this sense, by acting in the market, market devices also always act on the market – they have an ontological impact. Our second point revolves around devices’ “dynamic unpredictability” (Zuiderent-Jerak, Grit and von der Grinten, 2015: p. 133). Devices are deployed to act in certain ways, but they also tend to ‘misfire’, as Callon (2010) would say, creating unintended consequences that will likely trigger further market innovation efforts. Third, and relatedly, market devices rarely act on their own, but rather alongside other devices as part of what the literature has called socio-technical assemblages or ‘*agencements*’ (Callon, 2013). Innovation in one part of the *agencement* will likely lead to redevising other parts too. Fourth, for those who wish to study market innovation this means that how and with what effects markets are redevised needs to be considered both over time and in the market’s broader context. The effects of redevising a market may well be found in places where one would not readily look for them, and their long-term consequences may be very different from those that are immediately observable (Lezaun and Montgomery, 2015). Thus, research needs to be sensitized toward its own frames - capturing a device’s apparent effects as well as the more distant ripples it creates, its non-linearities and collaterals, its singularity as well as its part in the market’s socio-technical *agencement*, and how its own potentialities change over time through these interactions.

Market Failure and the Pharmaceutical Industry

Pharmaceutical markets are prototypical ‘concerned’ markets where multiple interests, values and agendas coincide and clash (Geiger et al., 2014): for instance those of patients, broader civic society, governments, lobbying groups, R&D intensive pharmaceuticals and generics manufacturers. Overflows are a significant issue for this industry, particularly with regard to its often uneasy relationship with markets in low-income countries. For some time, the pharmaceutical industry has been accused of producing and pricing goods and services to benefit lucrative markets in high-income countries rather than addressing diseases prevalent in low-income countries (Amin and Kesselheim, 2012). Neyland and Simakova (2015: p. 139) have called these conditions diseases “without a profitable market”, and Moon, Bermudez and t’Hoen (2012, n. p.) have spoken of a “broken R&D system” in relation to global access to medicines. The issues at stake are complex: not only may pharmaceutical markets fail certain publics by directing R&D efforts away from some disease categories, but they may also prevent these publics’ access to existing drugs through IP-driven pricing mechanisms (Cox, 2012; Geiger and Finch, 2016).

The access to medicines issue is partly related to ‘what counts’ in pharmaceutical markets, a question that research in the sociology of valuation has begun to address (Sjögren and Helgesson, 2007; Dussauge et al., 2015; Mehrpouya and Samiolo, 2016). Knowledge creation in pharmaceutical markets is traditionally judged in terms of R&D output and subsequent patenting (Gold et al., 2010). Patents have always played a vital role in the pharmaceutical industry because the cost of new drug development is disproportionately high in comparison to drug manufacturing; without patents, it is argued, the industry would be subject to a substantial free-rider problem (Grabowski, 2002). However, some commentators observe that

the industry's patent fixation has created an undue focus on a system that is lacking evidence of effectiveness: "uses of intellectual property that benefit people in one part of the world but conspicuously fail to benefit others, or even act to their detriment, are not what the [patent] system is supposed to be about" (Royal Society, 2003, quoted in Gold et al., 2010: p. 4)². In highlighting the recent Ebola outbreak in Africa, a joint Health Action International/Oxfam Briefing Paper (2014: p. 8) talks about an "R&D system that works for the rich" but excludes the majority of the world's population. This report also argues that while the patent system was created to boost innovation, it may in fact inhibit it by limiting follow-on public and private research that would open up broader access to innovations – a market failure that has been described as the 'tragedy of the anticommons' (Heller and Eisenberg, 1998).

Patent Pools as Market Devices

One way to address this market failure – of pharmaceutical patenting practices restricting access to medicines - is the establishment of a patent pool. Patent pools address the existence of an inefficient or illiquid market, in which buyers and sellers either have a hard time or little incentive finding each other (Hagiu and Yoffie, 2013). As mechanisms for collectively managing intellectual property, patent pools are "arrangements between two or more patent holders in which the relevant patents are licensed jointly as a package" (Aoki and Schiff, 2008, p. 194). Patent pools allow interested parties to gather all the necessary tools to practice a certain technology in one place, in a 'one-stop shop', rather than obtaining licenses from each patent owner individually (Clark et al., 2000). They thus lower transaction costs (Hagiu and Yoffie, 2013) and facilitate access to innovations where patent enforcement would have otherwise prevented it (Childs, 2010). Patent pools can bring economic benefits to patent originating enterprises through the incomes generated from licensing, which are generally

² It is worthwhile noting that similar arguments have been raised as early as the 1950s (cf. Machlup, 1958).

shared between the patent holders, especially if the patents in the pool are complementary in nature (Lerner and Tirole, 2005). However, some voices also highlight their inherent instability, as the very logic of a patent pool arguably stands in direct tension with the idea of intellectual property rights (Aoki and Schiff, 2008; Jeitschko and Zhang, 2014). Due to anti-competitiveness and anti-trust concerns, patent pools are typically quite restrictive regarding the IP admitted. Especially in the pharmaceutical space, firms tend to carefully define and delineate the scope of transactions when it comes to partnering via a patent pool. The fear is of knowledge spillovers, which may result in unlicensed downstream product development and commercialization (Greenlee, 2005). On the positive side, with easier access to IP and greater economies of scale, drugs can potentially be manufactured and distributed globally for significantly discounted prices. Patent pools have been described as refocusing innovating firms' perspective toward the collective management of IP (Cox, 2012). By redirecting economic interactions and revenue flows, their establishment is a direct and incisive market intervention (Hagiu and Yoffie, 2013). In this sense, patent pools “help bring new realities and practices into being” (Hawkins 2012: p. 72) – and thus can arguably be analysed as market devices. So, have patent pools the potential to redevise the pharmaceutical market from the inside?

Research Approach

Our conceptual interest lay in investigating market innovation efforts in response to publicly debated market failures. The MPP, described in more detail below, was one of several mechanisms we initially considered as exploratory empirical sites for this conceptual interest. It was chosen because of the topicality of concerns around pharmaceutical IP management and its potential societal significance in the access to medicines issue. We investigated the MPP's role in innovating this market with a longitudinal perspective, ranging from retracing the first

discussions that mooted the possibility of creating this market device in the early 2000s to the end of our empirical investigation in 2015, thus over a roughly fifteen year period. In a first research phase we reviewed publicly available documents on the Pool's origins, history, past and current performance and interactions with the pharmaceutical industry, including newspaper articles, annual reports, press releases, interviews and license agreements. In order to gain insights into the 'making' and 'doing' of the pool beyond the public discourse, we then approached 20 experts acquainted with or related to the Pool, including representatives of pharmaceutical companies inside and outside the Pool, pharmaceutical association representatives, MPP and UNITAID representatives and activists, of whom 16 agreed to a personal interview (Table 1). All interviews were conducted in 2014 and 2015, but our interviews prompted respondents to recount their involvement with and perspective of the MPP from its earliest beginnings. Though there are obvious caveats in such retrospective interviewing (MacKenzie and Millo, 2003), the data proved a vital source of insights and triangulation to published sources.

-----TABLE 1 ABOUT HERE-----

Interviews were conducted by one or both authors in the informant's workplace or via Skype with the help of a semi-structured interview guide drafted on the basis of insights from our first research phase and subsequently modified in the light of emerging understandings. Individual interviews lasted an average of 60 to 90 minutes and were transcribed by the authors. In analysing the data, our interests lay in the evolution of the MPP as well as respondents' views on its role in innovating the market for HIV/AIDS drugs. We arranged data along a chronological timeline in a first analytical round. In a second round, data were coded separately by the two authors for 'justificatory accounts' of the market device's original purpose and

potential and its subsequent performance (Huault and Rainelli-Le Montagner, 2009). In joint sessions data were then re-analysed, research logs drafted and any divergences in understandings between the two authors resolved.

Conception and Birth of a Market Device: 2000 to 2010

The Geneva Medicine Patent Pool (MPP) was the brainchild of a number of HIV/AIDS activists in the early 2000s. Around the year 2000 most of the world's 34 million HIV infected patients were without access to medicines that could keep them alive, as treatment costs generally exceeded \$10,000 per patient per year (Boseley, 2016). This was seen as a public health crisis as well as a market failure: while medicines existed, their supply was not forthcoming to meet the urgent demand from patients in low- and middle-income countries (Trouiller et al., 2001). One of the early suggestions in response to this crisis was to force pharmaceutical companies to surrender their ARV patents through a mechanism of compulsory licensing (Ulrich, 2015). An alternative suggestion, of patent pooling, was first presented by James Love, a prominent activist and critic of the prevailing IP regime, at the 2002 Barcelona International AIDS conference. The ARV patent pool suggested by Love would be modelled on the 1917 US aircraft patent pool, and participation in the pool would be compulsory for those manufacturers owning patents on essential HIV/AIDS medication (Love, 2002).

From a socio-cultural perspective, the budding debate on widening access to HIV/AIDS drugs in low-income countries fell on highly fertile ground. Not only were mortality and transmission rates at a peak point, the social movement around HIV/AIDS activism had been a particularly strong and vocal one for close to 20 years (www.aids.gov).³ In the year 2000, US President Bill Clinton brought the HIV/AIDS debate to a new level of public awareness when he called AIDS

³ Several of our respondents pointed to the disease's exceptionalism in this regard.

a threat to national security and shortly afterwards issued an Executive Order to assist sub-Saharan countries in importing and producing generic HIV treatments (<http://www.presidency.ucsb.edu>). At the same time, the UN included a focus on ending the HIV/AIDS epidemic in its Millennium Goals (<http://www.un.org/millenniumgoals/>).

The Pool's institutional origins lay in the 'Doha Declaration on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and Public Health' by the World Trade Organization (WTO, 2001). While reinforcing the importance of intellectual property protection as anchored in international trade law through TRIPS, this declaration acknowledged the gravity of the public health problems afflicting many developing and least-developed countries. It reaffirmed the flexibility of TRIPS member states to grant compulsory licences and circumvent patent rights for better access to essential medicines, especially those needed to respond to HIV/AIDS, tuberculosis, malaria and other epidemics. It also gave members the freedom to determine the grounds upon which such licences are granted (WTO, 2005). As part of a wider international momentum to address problems of unequal access to healthcare and medicines, the Doha Declaration was an important precursor to the idea of patent pooling in the pharmaceutical industry. In many experts' view, TRIPS flexibilities could only be implemented on a case-by-case basis and not easily be scaled. In addition, some high-profile court cases concerning compulsory licensing attempts from governments in low- and middle-income countries soon demonstrated the limits of TRIPS flexibilities (Harris, 2010). The creation of the MPP was thus seen both as a timely next step based on the Doha Declaration and a remedial mechanism to assuage its perceived shortcomings (Ulrich, 2015).

The creation of a medicines patent pool was formally proposed to UNITAID in 2006 by Love's organization Knowledge Ecology International (KEI) and the international aid organization

Médecins Sans Frontières (MSF). That same year, MSF submitted two crucial papers to the French Ministry of Foreign Affairs and UNITAID on IP rights and medicines procurement (Childs, 2010). The first paper recommended to UNITAID to purchase antiretroviral therapies from the lowest-cost quality-assured providers and to encourage its beneficiaries to use the provisions of the Doha Declaration when procuring generic antiretroviral therapies. The second paper, written with KEI's support, outlined the case for establishing a patent pool for essential HIV medicines. An MPP expert recalls:

The MPP was seen as an attempt to get beyond some controversies traditionally being on IP and access to medicines...the setup is a collaborative platform with industry and other stakeholders. (MPP expert).

As this quote indicates, the MPP was originally thought of as much as a policy instrument as a market device, offering a neutral ground of sorts where pharmaceutical companies could join their own IP with competitors' for the benefit of generic licensees. From the outset, the MPP was designed to extend existing market mechanisms to facilitate generic competition:

The MPP uses market forces of competition which are instrumental in bringing the price down for medicines but which cannot happen if there is exclusivity or a monopolistic situation where a single player can sell the drug. It is allowing the market to take place, but allowing this to happen through a voluntary mechanism in collaboration with the patent holder and the pharma industry. We allow generic manufacturers to compete. (MPP expert)

A representative from a pharmaceutical association explains the WHO's and UNITAID's thinking in this context as follows, betraying the considerable dose of realism that went into the conception and realization of the MPP: "Political pressure gets you so far as it highlights issues, but unless you have something workable and effective in practice, I don't think the industry will come on board".

However, from the start the notion of working *with* the market's existing practices and players proved a controversial one to some civic society representatives:

There were big splits in the activist communities, some really supported the pool. But others said: this is accepting that patents have a role to play. We hate patents, therefore we hate the pool! (Pharma association representative)

Despite these early controversies, support for the pool's creation gained momentum in a range of forums; the idea was discussed at the World Health Assembly in 2008 and formally referenced in the WHO's report on 'Global Strategy on Public Health, Innovation and Intellectual Property' (WHO, 2009, 2012). At that stage, the patent pool was openly considered by WHO and UNITAID as a mechanism to accelerate the availability of low-cost newer medicines in developing countries (www.medicinespatentpool.org). The patent pool proposal was not the only mechanism considered in addressing the HIV/AIDS crisis during this time. Funded by the Bill & Melinda Gates Foundation and the UK and Dutch governments, an Access to Medicines Index was created in 2008 to serve as a signaling device (Mehrpooya and Samiolo, 2016): the index publicly evaluates and ranks pharmaceutical companies' efforts to improve access to medicines in developing countries (www.accesstomedicines.org). Government aid initiatives such as the U.S. President's Emergency Plan for AIDS Relief (www.pepfar.gov) were ramped up around the same time, and some large pharmaceutical firms started unilateral actions to accelerate drug provision in low-income countries (Sukkar, 2009). Amidst this general activity and heavy campaigning from MSF and other NGOs, the decision was made in December 2009 to create and fund a patent pool focusing on increasing access to HIV medicines in low- and middle-income countries. Six months later, on July 16 2010, UNITAID formally established the MPP, and shortly thereafter the US National Institutes of

Health (NIH) became the first patent holder to share its IP with what came to be known as the Geneva Medicines Patent Pool.

Redevising the ARV market: 2010 to 2015

From an operational perspective, the MPP works as follows (MPP 2014, 2015): In a first step, it draws up lists of targeted priority medicines, based on medical needs and existing patent restrictions. It then approaches the license holders of these priority medicines to join the pool, which would enable the pool to sub-license the patents to generic manufacturers. Participation in the pool is voluntary and negotiated bilaterally between the MPP and the pharmaceutical firm in question. These negotiations also determine on a case-by-case basis which of the company's patents are included in the pool, and for which countries and under what conditions licenses will be provided. While these often drawn-out negotiations happen behind closed doors, license agreements are subsequently made public as a matter of principle:

From day one we had a pre-commitment that all licenses would be fully public. We are publicly funded, which is true, but nobody has ever done that before. It was unprecedented and a risky thing to do because pharma firms are not used to sharing. Their motto is 'just in case, keep it secret'. (MPP expert)

Once an agreement with a patent holder is reached, the MPP can sub-license the medicines to generics manufacturers in the countries included in the license provision. MPP staff work with sub-licensees on product development and regulatory approval and carry out quality controls. They also combine licenses if there is a medical need for complementary ARVs – in fact, the ability to create so-called fixed dose combinations drawing from different patents is seen as one of the chief advantages of the Pool. Patent holders may receive royalties on the sale of medicines based on the provided patents, though some licences are given to the Pool royalty-free. Thus, by simultaneously encouraging generic competition and facilitating the

development of new products in the shape of fixed-dose combinations, the MPP represents a market mechanism that allows patients in resource-poor countries to access the treatment they need at affordable prices, low-cost manufacturers to produce affordable new medicines more easily and rapidly; and originator pharma firms to achieve modest royalties.

Despite its relative simplicity and the promise of a win-win scenario, negotiations between the MPP and pharmaceutical firms started off slowly. One official told us just how worried pharmaceutical companies were at the beginning by this initiative that seemed to break with existing industry thinking and practice:

Handing over IP - they find it hard to do...It is all about relationships, trust and working together. They consider IP the most precious thing they have, their entire business model is built around that! (MPP expert)

This initial sluggishness among pharma firms to join the MPP in its first years of existence became a bone of contention for civil society, as was the fact that pharmaceutical firms were perceived to essentially pick and choose the countries their licences would be available in:

There was an unexpected factor when the pool was set up and the first pharma companies signed - there was a backlash from civil society. Some parts of the activists were pleased and others were critical. They were disappointed that not all low and middle income countries were included. That criticism was unexpected. Some people had expected and hoped, perhaps unrealistically, that all countries would be included, but that is too big of an ask and there was disappointment. (UNITAID expert).

This trade off indicates that in playing within existing market frames - in this case characterized by existing IP provisions and a tradition of secrecy - market devices can only work slowly and

patiently; perhaps too slowly for those parts of civic society who would like to see the market transformed more quickly or more dramatically.

Over time, the commercial argument for joining the pool seemed to have become clearer, and the MPP business developers learned to speak the language pharmaceutical companies arguably needed to hear:

Talking to pharma is not an easy process and takes a long time. On the geoscope side we make a business case and build a commercial case for each country separately... For example a company may not have any business in Thailand at all, in that case we say that you don't have any business already and would not be worse off giving the license for Thailand for generics - this is the one argument we have. (MPP representative).

Commercial and cost recovery arguments are part of these negotiations, for instance where a voluntary donation of a licence for one country comes along with facilitation of access to higher-income markets, as this quote indicates:

If they give the license away to countries, who so to speak can't afford it, then maybe you give them a little bit of reciprocity for their main countries in terms of dealing with the licensing and regulatory authorities when it comes to other drugs. I know that in the US, the FDA works with them. (UNITAID expert).

It is fair to say that the interactions around framing market access between pharmaceutical actors and the MPP, as characterized by their scope, content, and significance, are permeated by a strong commercial logic. Beyond the argument that "they make money this way" (MPP expert), the prospect of positive publicity weighs heavily in an industry tired of having to bat off negative media headlines:

[For pharmaceutical firms] the MPP has social value but there is also an economic incentive to be part of it. It is a pro-bono - you get all street credit ‘look we are helping all these people’! They never say ‘we get 10 cent of every dollar that is spent on that’. (UNITAID expert).

Participation in the MPP also plays into a more general trend among pharmaceutical companies to set up philanthropic structures and social responsibility activities: “Over the last ten years pharma has tried to be involved more in global health, for example Pfizer has global health desks” (UNITAID expert).

Overall, between 2011 and 2015 organizations including AbbVie, Bristol-Myers Squibb, Gilead Sciences, MSD, the US National Institutes of Health and ViiV Healthcare have signed up to the pool and donated 12 licenses for HIV medications. Bristol-Myers Squibb also transferred a license for Hepatitis C in January 2016, thereby allowing the pool to widen its remit to other diseases for the first time. However, many other ARV drugs with high clinical priority have not yet been admitted to the pool, and negotiations are still ongoing over licensing agreements with a number of high-profile pharmaceutical companies (Medicine Patent Pool Annual Report, 2012, 2013, 2014, 2015).

Changes - they are a comin’? 2015 and beyond

So, after five years of existence, what has the MPP’s ‘ontological impact’ on this market and its failures been? Has it managed to innovate pharmaceutical market practices that have been so heavily entrenched in the market’s IP focus for so long? The short answer, in the words of a UNITAID expert, is: “Yes and no, we had mixed reviews”. MPP representatives and advocates emphasize that the breakthroughs achieved in securing agreements mean that by 2015 key ARV drugs could be supplied at low cost to 121 countries that are home to 93% of

adults and 99% of children living with HIV (Burrone and Perry, 2014). Prior to the MPP's existence, it took as long as ten years after registration in the USA for newly approved anti-retroviral drugs to become available as quality-assured generics for use in low-income countries, a time frame that has been substantially reduced (Burrone and Perry, 2014). Other significant achievements include the development and distribution of so-called fixed dose or combination drugs that specifically require the pooling of drug licences, and the licensing of paediatric solutions, which are usually neglected due to a difficult regulatory context. In financial terms, the MPP points to US\$ 195 million in achieved savings and projects further savings of up to US\$ 2.2 billion by 2028 (MPP Annual Report, 2015). Thus, not only has the MPP contributed to significantly reducing global ARV prices, it has also shortened lead-times substantially, and it has encouraged new product development in vital areas. From a commercial perspective, early entrants into the MPP have seen their drug combinations adopted and recommended in many global markets' guidelines and were thus rewarded for moving first. In addition, the MPP is now paralleled by a range of other mechanisms that aid technology transfer into low-income countries, and pharmaceutical philanthropic efforts overall have increased dramatically in the past five to ten years. And most importantly, as many as 40% of HIV and AIDS sufferers worldwide now have access to affordable medicines (WHO, 2015). These developments may of course be partly attributable to larger socio-economic changes and to the cumulative effects of complementary devices such as the aforementioned Access to Medicines Index (Mehrpouya and Samiolo, 2016; de Felice, 2017). However, it is fair to assume that the MPP's working as a 'really existing market device' has substantially contributed to the observed changes over time.

On the other hand – and moving our gaze to the device's misfires – critical voices in the community point out that many ARV licences still only operate in select markets, with middle-

income countries often left to grapple with their own access to medicines issues (Saez, 2015). From a calculative perspective, the numbers, assumptions and methodologies used in the MPP's impact projections have been contested by civil society groups advocating for compulsory licencing mechanisms, who have produced counter-analyses (e.g. IMAK, 2011). Sceptics also fear that with the re-negotiation of TRIPS and other multilateral trade agreements global IP protection may be strengthened even further, and in-market mechanisms such as the MPP will simply not be able to provide companies with real incentives to participate (www.unsgaccessmeds.org). Indeed, several of our respondents maintained that a market-based solution to the global access crisis may never have enough bite to fundamentally transform the market:

The MPP works through that by accepting the rules that are there today and not being able to develop a new system of innovation, even though a lot of people think about that.

The MPP takes rules as given and works around the rules. These licenses accept that IP rules are established globally. (Intellectual Property lawyer and activist).

From the sceptics' perspective, the effect of 'taking [market] rules as a given' is that that the market frame between the pharmaceutical market and political and social values is normatively reinforced rather than perforated: "The MPP is enforcing the current system even more and it was never intended like that!" (Activist). Part of this criticism concerns the potential of a market device muting other, policy-driven mechanisms to broaden access to medicines, such as scalable compulsory licenses where a government uses its sovereign right to gain a patent for a specific product in cases of high need or national interest.

The fear is that considering the industry's commercial interests and market flows may take the political energy and momentum out of the social movement's broader policy shaping efforts. This suggests that introducing a device at one point of the market/civic society fault line has ripple effects way beyond the device's immediate market shaping effects; by introducing

something over *here*, something else may not be introduced over *there*, or may be introduced with less effect, fanfare and momentum. The larger question behind this last point directs us back to the paper's central concern: can a *market* device ever be truly transformative in addressing and alleviating a market's failures?

Discussion

Our empirical analysis shows the MPP to be a pragmatic way of accommodating access to medicines concerns into a well-entrenched economic order by shaping and redirecting some of the market actors' licencing and collaboration practices. While this device may have caused some misfires – for instance by arguably weakening voices advocating for policy rather than market-driven solutions – it has greatly contributed to moving the market's compass toward a future where it becomes better able to take these concerns into account. When the notion of a patent pool for ARVs was first raised in 2002, HIV mortality was at its peak, and action was urgent. Fifteen years later, the access to medicines movement can build upon a much improved treatment rate and an industry that has slowly gotten used to the idea of patent commons and licencing (see also Lezaun and Montgomery, 2015). Discussions have now widened to include other market failures, for instance different disease categories such as Hepatitis C and Tuberculosis and access issues in middle-income countries. Activist-driven patent pools thus act toward a future-in-the-making where equal access to medicines and social justice go hand in hand with the industry's profit interests. While this utopian end point may never be reached, by opening the market to access concerns, the MPP and its companion devices (chiefly the Access to Medicines index) have succeeded in moving pharmaceutical market practices closer toward this future.

More specifically, our longitudinal analysis suggests that over the past fifteen years the MPP has helped to shift the market's temporal modality (the way things work), timing (the right

moment) and tempo (the right pace) (Adam, 1998; see also Lezaun and Montgomery, 2015). In terms of temporal modality, it has helped to at least partly correct a history of blatant neglect of the needs of low-income countries by opening up the industry's valuation practices toward the economic viability of these markets. In terms of timing, the MPP was able to capitalize on a twenty-year history of vocal AIDS activism coinciding with a crisis point in the pharmaceutical industry, which faced the end of the blockbuster era in the early 2000s and was seeking to explore new business models. And in terms of tempo, it contributed to accelerating the manufacturing and distribution of generic medicines to an ever-widening set of patients. Thus, the MPP may not have fundamentally rattled the IP focused thinking on which this market is based – as one commentator predicted, “The patent pool keeps the patent system intact” (Sukkar, 2009). However, it has shifted its momentum one licence negotiation at a time toward a market that is more reflective of its own overflows.

Conceptual contributions

Roscoe and Townley (2016: p. 121) have recently criticized the “hegemonic discourse of economics that recasts social problems as market failures requiring appropriate interventions”. We offer an alternative view of market failures, cast in the pragmatic terms of market innovation and redevising, and draw particular attention to how these innovations unfold over time.

Our study contributes to the market studies literature by giving substance to the four conceptual points raised in Section 2, namely the questions of market devices' frame-shifting effects, their intended versus unintended consequences, the multiplicity inherent in redevising markets, and how market innovation may unfold over time. First, in line with previous work we show that redevising a market happens through an often laborious work in progress on the basis of

existing market practices and arrangements, a process for which MacKenzie and Pardo-Guerra (2014) use the term *bricolage*. The patient, pragmatic work we have described in our study is no doubt reminiscent of those processes that standard innovation language would describe as incremental, building on and improving the status quo. Would a device acting from ‘outside’ the market, so to speak – for instance a policy instrument - have been able to challenge prevailing patenting practices more ‘radically’ and to introduce a complete different market reality? Among our respondents at least there was a sense of the problems of playing *within* the market frame in order to transform the market, and the MPP’s other, in the form of compulsory licensing, was a ready-to-hand comparator device. MacKenzie and Pardo-Guerra (2014) utilize the image of cogs and cars when reflecting on the relationship between market devices and broader socio-economic structures. Based on our analysis, we contend that even if it represents a relatively small cog, a market device may be able to accelerate or slow down the broader market or institutional momentum – the ‘car’ – but that it takes time and a lot of patience to change its direction.

Second, in line with recent empirical insights from a performativity perspective (e.g. Hébert, 2014) we have illustrated that the process of redevising a market may not only be slow to unfold but it may also be ridden with misfires (Callon, 2007; 2010). Market devices are unruly and their effects not always predictable; indeed, as much as good people can do bad things, ‘good’ devices may have ‘bad’ misfires. This highlights the fact that innovating markets can only ever be an exercise in experimentalism, with uncertain and multiple effects (Zuiderent-Jerak et al., 2015; Neyland and Milyaeva, 2016). Pushing this argument further, we argue that in a sense it does not matter where in a market a device is being introduced, and which device exactly. A device will always capture certain overflows and miss others; internalize some actors’ values and marginalize others even further; address certain market failures while being blind to many more. In short, each market innovation will enact one of the many possible realities of a market

failure. Following Law (2011), by attending to how markets are redevise in practice, we find ourselves plunged into the realm of ontological politics.

Third, and relatedly, while the MPP can claim a very impressive list of achievements and successes in the space of its relatively short existence, we note that it has not achieved these on its own but rather as part of a larger socio-technical assemblage, with complementary and competing devices each acting on (and enacting) one version of the market failure that is the lack of access to essential medicines. In our case, as we briefly pointed out, the market was simultaneously redevise through several activist-driven instruments, government initiatives, philanthropic investments, and firms' corporate social responsibility programs. While these cogs have not always interlocked perfectly, in their own partial ways together they have managed to open the market toward a future where social and economic values may co-exist. Thus, at a pragmatic level, while we fully acknowledge the value of 'zooming in' to study one device at a time to comprehend its specific doings, we also suggest that it is highly unlikely that market innovation only happens at one place at one time. On this basis, we would encourage future research on market devices to take into account the larger shifts in a market's frames, as well as the multiplicity of the devices that work in and on the market.

Fourth, and following on from this point, we would strongly argue that researchers interested in devices' ontological impacts need to be attentive to temporality – in our case, while its initial workings may have been practically invisible, the MPP has for five years chipped away at the ARV market's frames and through this pragmatic work over time has achieved a considerable uptake in pharmaceutical license sharing. And we would expect to see further and possibly very different effects if revisiting this device in another five years. In this context we would like to briefly point to the interdependencies between market devices and the various publics they create (Marres, 2011; Marres and Lezaun, 2011). The MPP has worked to unsettle the market's practices on two levels. At a pragmatic level it has rechanneled specific licensing and

exchange mechanisms in the ARV market. At a more normative level it has acted on market actors' valuation practices by opening pharmaceutical business models toward issues of collective welfare, and it has expanded some activists' willingness to take into account pharmaceutical business concerns. In turn, these changes in the device's publics have opened up new possibilities for what the device can do and how it can act in the market. Its successes in shaping licensing agreements around HIV/AIDS drugs for low-income countries have over time allowed the pool to create publics for 'lesser publicized' diseases such as Tuberculosis and Hepatitis C and for access issues in middle-income countries. In this sense, the device's actions will change its publics, but importantly this change in publics will also create different potentialities for the device to act.

Concluding remarks

With our case of the MPP, we show how market devices open up the possibility for collective market innovation in response to publicly debated failures, or in short, for redevising a market. While the effects of such redevising may not be as transformative as some publics would perhaps hope, they can move the market toward a future-in-the-making that is more reflective of the market's overflows. Acting in the market thus goes hand in hand with acting on the market, or rather, on the market's frames. Of course, Law and Ruppert (2013: p. 233) remind us that our studies of what devices do are also always partial, depending on "our own questions, and our own agendas". We readily acknowledge that our narrative of the MPP as a market (innovation) device is an incomplete one, driven by our analytical questions and lenses, and that many different stories could have been told. For instance, a different story could have illuminated the concrete challenges the device made to actors' calculative practices, and those counter-challenges that were made for instance when its own calculative tools were questioned. Another interesting story could be told about those realities of market failure that haven't been enacted yet – for instance by following proposals for devices aimed to replace the dominant

IP-driven market frame with practices that uncouple pharmaceutical innovation incentives from gains in manufacturing and distribution.⁴ And a very different story could widen our admittedly narrow gaze on market issues toward the greater pharmaceutical ecosystem of IP and pharmaceutical governance; such studies could for instance trace the effects of ‘upstream’ market innovations on the ‘downstream’ market practices of manufacturing and distribution of generic medicines. We hope that these other stories will be told, as they are worthwhile and important stories. We also hope that we can engage with future research in a fruitful discussion over how we as researchers can become better at asking questions that allow us to study what *is* and, more importantly, what *isn't* written on a market device’s package. By providing further evidence of the pragmatic, patient and performative process that is market innovation, market sociologists and STS scholars may thus be well placed to wrestle the notion of market failure from the ‘hegemonic discourse of economics’.

⁴ Radical alternatives to the patent system have been vigorously discussed in activist and academic circles and include for instance innovation prizes, grants, and tax incentives (e.g. Hemel and Ouellette, 2013).

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Table 1 - List of Interview Participants

Organization	Type	Interviewees
UNITAID	NGO	<ul style="list-style-type: none"> • Intellectual property expert • Market expert • Communications expert
Medicines Patent Pool (MPP)	NGO	<ul style="list-style-type: none"> • Policy expert • Business development expert • Advocacy expert
Knowledge Ecology International (KEI)	NGO	<ul style="list-style-type: none"> • Advisor and IP expert • Representative
Médecins Sans Frontières (MSF)	NGO	<ul style="list-style-type: none"> • Policy and advocacy expert
International Centre for Trade and Sustainable Development (ICTSD)	NGO	<ul style="list-style-type: none"> • Expert on intellectual property
International Federation of Pharmaceutical Manufacturers and Associations (IFPMA)	Industry Association	<ul style="list-style-type: none"> • Corporate strategy and legal expert
i-Mak	Activist	<ul style="list-style-type: none"> • Intellectual Property lawyer
Pharma 1	Pharmaceutical firm	<ul style="list-style-type: none"> • Global health expert
Pharma 2	Pharmaceutical firm	<ul style="list-style-type: none"> • Connected health expert
Pharma 3	Pharmaceutical firm	<ul style="list-style-type: none"> • Global public health expert • Operations expert
<i>Total interviews</i>		<i>16</i>