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Why the QWERTY-phenomenon is not just “in the minds of theorists” and why it could nonetheless be no problem in reality¹

Jens Weghake* and Fabian Grabicki**

Abstract

Researchers disagree about the relevance of the so called QWERTY-phenomenon which simply means to get stuck in a bad equilibrium. There exists two contrary parties. One side says that the major influence for market success comes from greater quality. In consequence an inferior market player should not persist and the possibility of the QWERTY-phenomenon is denied by this party. The opposite side emphasize the importance of network effects which can lead to lock-ins in inferior situations. This papers investigates this debate. We demonstrate that the missing consideration of the status quo bias in previous studies leads to a rejection of the QWERTY-phenomenon. We give several examples of different industries with inferior market share leaders. However, we suggest that this phenomenon is just a temporary harm and the lock-in could be overcome by a specific form of Schumpeterian creative destruction. Therefore we claim that even if lock-ins exist it is no problem as long as innovative market participants have the opportunity to develop and introduce new business models.

Keywords: platform selection, two-sided markets, status quo bias, QWERTY-phenomenon, creative destruction

JEL: D43, L13, O33, O38

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1. Introduction & related Literature

The emergence of the theory of two-sided markets has shown that whenever indirect network effects occur there is a tendency that in equilibrium just one platform will prevail (Ellison & Fudenberg, 2003). Standard models of two-sided markets suggest that the prevailing platform is not inevitably the superior platform; this evolved standard may be inferior compared to the superior platform of the defeated competitor. Due to the indirect network effects market participants will presumably get stuck in this situation.

The situation described above is closely related to the so-called QWERTY-phenomenon introduced by Paul A. David (1985). In the original context the reason for ending in an inferior state lies in direct network effects and self-fulfilling expectations. However, the theoretical mechanism that suggests tipping to a single dominant player is comparable: In a market with direct network effects costumers benefit more from a product when other individuals of the same type purchased it as well. In a setting with indirect network effects there are at least two types of individuals. In such a case the value of the product (i.e. platform) for one individual increases when individuals of the opposite type choose or purchase it. In both cases (with only positive network effects) coordination to a single platform is a state of equilibrium (Ellison & Fudenberg, 2003; Katz & Shapiro, 1985). If an ex ante inferior platform reaches a lead in the installed base over the superior platform the externalities can outweigh the inefficiency of this inferior platform. This lead over competitors may be reached by a first-mover-advantage or by chance. However, choosing the ex ante superior alternative would be better for society in terms of efficiency. Accordingly, the core question of the debate around the QWERTY-phenomenon is how realistic or relevant the possibility of being locked-in in an inferior equilibrium is in real-world situations.

Liebowitz and Margolis (1990, 1994) re-examine the “David’s (1985) case” of the QWERTY-phenomenon. They find evidence in favour of a possible superiority of the QWERTY-Keyboards (Kay, 2013). That means it is at least questionable whether this eponymous example of this kind of market convergence into inferior solutions describes this phenomenon at all. For other prominent examples of the QWERTY-phenomenon (e.g. VHS vs. Betamax) they come to similar conclusions.

Another relevant study that suggests a limited relevance of the QWERTY-phenomenon is Tellis et al. (2009). In their empirical study of competition in software and operating system markets they demonstrate that – temporary – there are single dominant players; but no market leader can hold this position in the long run. Thus in these markets there seem to be no lock-in effects.

Their used quality-indicators suggest that the new market leaders always offer a higher quality; that is even more important regarding the QWERTY controversy.

To investigate the case with indirect network effects Hossain and Morgan (2009) and Hossain, Minor and Morgan (2011) conducted laboratory experiments. Their participants repeatedly had to choose between two platforms. In all tested settings the subjects managed to coordinate to the superior platform – even when the inferior platform had a first-mover-advantage. Considering their own experimental results, the empirical study by Tellis et al. and Liebowitz' and Margolis' findings, Hossain and Morgan (2009) conclude that the QWERTY-phenomenon “lies more in the minds of theorists than in the reality of the marketplace”.

However, Heggedal and Helland (2014) reproduce the experiment by Hossain and Morgan (2009) with slightly different out-of-equilibrium payoffs. They show that coordination to the superior platform frequently fails under this modified conditions. More recent, Halaburda et al. (2016) demonstrate in a theoretical model with dynamic competition and costumer expectations that an inferior platform can dominate the market.

Also in a two-sided market setting Meyer (2012) demonstrates in a simulation-study that a lock-in in inferior situations may arise under diverse circumstances. As important factors for the probability of coordination failure he identifies the relative strength of the indirect network effect compared to the difference in quality. Strong network effects and small quality-differences increase the probability for choosing an inferior platform. Further factors affecting the probability for an inferior lock-in are (i) information level of agents (lower or more incomplete information levels increase the probability), (ii) rationality (more rationality corresponds to a higher probability, because in his study bounded rationality counteracts against the impact of the indirect network effect) and (iii) successive market entry (coordination to the first mover is likely). Especially the last point is driven by the simulation design: The simulated agents (individuals of both market sides) differ in market entry timing. Furthermore, agents do not reconsider their platform choice in each period of the simulation but only after fixed periods of time. Meyer checked for this “decision horizon”: If they choose their platform in every period no inferior lock-in occurred (Meyer, 2012).

We highlight this aspect because it reveals one shortcoming regarding the external validity and of the experimental studies by Hossain and Morgan (2009), Hossain, Minor and Morgan (2011) and Heggedal and Helland (2014): In the context of platform selection numerous switching between platforms seems to be quite untypical (Lam, 2015). Therefore we going to introduce the status quo bias to give a reason why individuals may keep their initial self-selected status

quo to account for this market characteristic. We scrutinise how the experimental findings and conclusions may be affected by this bias in favour of the QWERTY-phenomenon.

However, how Liebowitz and Margolis and Tellis et al. demonstrate there are hardly any examples for the QWERTY-phenomenon in the long run. It seems a lock-in in an inferior equilibrium is at least a temporary harm. Liebowitz and Margolis suggest that through market dynamics sooner or later an inferior product will be displaced by a better one. Beyond these established market dynamics arguments we will argue that the replacement of one market leader may also follow from “creative destruction” as described by Schumpeter (2008). In our case one product is replaced by another more or less identical product that is integrated in a superior business model. In this setting higher quality of the examined product is not a necessary condition, but the whole business concept of the successor has to be superior.

In the remainder of the paper we explain the status quo bias in the context of platform selection. We demonstrate how this bias favours the QWERTY-phenomenon and how it could influence the results of the mentioned experimental studies if the authors had designed their treatments in regard of this bias. We then present the Schumpeterian interpretation of breaking up lock-in effects. For this purpose we give an alternative interpretation of the results of Tellis et al. (2009) and two further examples which suggests this idea as well. The paper ends with a brief conclusion.

Status quo bias

Since first introduced by Samuelson and Zeckhauser (1988) the status quo bias has received considerable interest from economic, marketing, psychology and political science literature. Substantial research on decision making has repeatedly demonstrated that economic agents not always choose among alternatives in accordance with well-defined preferences. They make extensive use of simplifying heuristics and thus often experience a cognitive bias. We suggest that such effects may also apply when consumers are faced with the decision to choose between different platforms. One of these biases, namely status quo bias, describes decision makers’ tendency to stick with a given default option when confronted with new options (Kahneman, Knetsch, & Thaler, 1991; Ritov & Baron, 1992; Samuelson & Zeckhauser, 1988). This status quo alternative can be set exogenously or as the alternative that an individual chose in a previous decision situation (Kempf & Ruenzi, 2006). Evidence from subsequent research reveals that status quo bias can be observed in numerous cases of economic decision making. The

methodology that underlies these investigation is quite straightforward. In order to get the basic idea of this methodology we refer to Samuelson and Zeckhauser (1988) who use an experimental setup to test subjects for an occurring status quo bias in a sequence of decision scenarios. Using a questionnaire in which subjects faced a set of hypothetical choice tasks the experiment was conducted in the following pattern: In a neutral framing, random subjects were given a set of alternatives, with no alternative labelled as the status quo – the neutral framing scenario. These subjects were presented with the following hypothetical scenario that was described in writing: "You are a serious reader of the financial pages but until recently have had few funds to invest. That is when you inherited a large sum of money from your great uncle. You are considering different portfolios. Your choices are to invest in: a moderate-risk company, a high-risk company, treasury bills, municipal bonds" (Samuelson & Zeckhauser, 1988). In a status quo framing scenario, other subjects were given the same set of alternatives, but one alternative was exogenously labelled as the status quo. In this case, after the same opening sentence the passage continues: "...That is when you inherited a portfolio of cash and securities from your great-uncle. A significant portion of this portfolio is invested in a moderate risk company ... the tax and broker commission consequences of any change are insignificant" (Samuelson & Zeckhauser, 1988). Investigating different scenarios, all using the same basic experimental design, results imply that an alternative became significantly more popular when it was labelled as the status quo. A significant status quo bias was demonstrated in 31 out of 54 cases (Samuelson & Zeckhauser, 1988). Similar results can be found in the decision, which electricity contract to choose from (Hartman, Doane, & Woo, 1991), which car insurance to go for (Johnson, Hershey, Meszaros, & Kunreuther, 1993), of being an organ donator or not (Johnson & Goldstein, 2003), and of choosing among different retirement plans (Madrian & Shea, 2001). Existing studies of status quo bias have proposed numerous explanations for how the status quo affects choice. For instance, loss aversion theory (Tversky & Kahneman, 1991) assumes that the status quo serves as a reference point and losses relative to the reference point have greater impact on preferences than gains. Inertia theory (Ritov & Baron, 1992) assumes that people have a preference for inaction and sticking with the status quo requires no additional effort or action but is the easy option. Decision avoidance theory (Anderson, 2003) assumes that people prefer not to make a decision, especially when they have to choose one from many options. Incomplete preference theory (Mandler, 2004) brings together status quo bias with the traditional consumer theory by proposing that people with an unchanging but incomplete preference show a tendency of sticking with a status quo, because to their knowledge their choice is currently the best. Boxall et al. (2009) conducted two separate choice experiments to

examine respondents' tendency to choose the status quo when faced with high complexity (increasing number of alternatives per choice task) in choice. They demonstrate that increasing complexity leads to increased choice of the status quo. Taking all these explanations for granted status quo bias could be categorized in the consequence of (1) rational decision making in the presence of transition costs and uncertainty, (2) cognitive misperceptions and (3) psychological and emotional commitment (Camerer, Issacharoff, Loewenstein, O'Donoghue, & Rabin, 2003; Samuelson & Zeckhauser, 1988). In our study the focus lies on the first category and takes up on the brief mention of Samuelson and Zeckhauser as they somehow refer to the QWERTY phenomenon by saying "more efficient alternatives seem to have little chance of replacing the classic typewriter keyboard". Looking at the results of Hossain and Morgan (2009) who study dynamic platform competition, they come to the conclusion that subjects do not get stuck on the inferior platform. They state "the quest for QWERTY in the lab proved utterly fruitful" (Hossain & Morgan, 2009). Somehow referring to the phenomenon of status quo bias and not considering any existence this is in strong contrast to previous findings on research of status quo bias. Using 60 iterations of somewhat rudimentary binary choice tasks between a superior and inferior platform in the absence of any transaction and/or opportunity costs will produce such outcomes. Referring to a recent article from Geng (2016) the author designs a series of laboratory experiments in which subjects choose among objects of fixed monetary value, expressed in addition and subtraction operations. Subjects are incentivised to seek the alternative that has the greatest value within a given time frame. The experiment builds up on the work of Caplin et al. (2011) as well as Gabaix et al. (2006) and tries to make evaluating alternatives more cognitively costly and subjects must expend effort to do so. Geng identifies that decision makers fail to select an object better than the default in 28% of time. Using a model of dynamic competition among platforms in a market with network externalities, Along with the modified experimental settings from Heggedal and Helland (2014) and Meyer (2012) this challenges the results of Hossain and Morgan (2009). These results show that the changes in market leadership, following technological developments, that we observe in numerous markets for platforms (e.g. software and operating systems, internet browsers and video game consoles), may not inevitably result in outcomes in which platforms with higher quality win. A systematic implementation of the considerations mentioned above might have led to different results. Given all this evidence the assumption that decision makers exhibit a significant status quo bias when faced with a series of simple hypothetical choice tasks is very likely. According to the rational choice model subjects should simply select their most preferred alternative when facing a decision. The presented findings, however, suggest that subjects are somewhat biased

by an exogenously pre-existing status quo option and do not act completely rational in choice situations. Based on all this empirical evidence we conclude by recalling Kahneman et al. (1991) “we have become convinced that (...) status quo bias (...) [is] both robust and important”. Having established that status quo bias could be present when consumers are confronted with platform selection we want to take a closer look at the Schumpeterian interpretation of market development and how lock-in effects might be broken up.

3. A Schumpeterian interpretation of market development

In the previous chapter we offered arguments favouring the QWERTY-phenomenon. Despite these considerations permanent lock-ins are hardly found on markets (neither lock-ins in inferior nor in superior situations). According to Liebowitz and Margolis to retain an inferior platform in the presence of a better alternative means not using profit opportunities. These profit opportunities should offer an incentive to the owner of the superior platform to capture the market, even if the owner had to share some switching costs that the customers of the incumbent would have to take (Liebowitz and Margolis, 1994). Obviously, the higher the quality differences the higher the incentives for a potential newcomer. The findings for software and operating system markets by Tellis et al. (2009) apparently echo this “quality-wins-argument”. Gretz (2010) analyses the home video game market with a similar scientific problem formulation. In his paper he also finds evidence for the major significance of quality. Based on Gretz (2010), Gretz and Basuroy (2013) investigate this question once again under consideration of the home video game console life cycle. With this more sophisticated approach they identify periods in the product life cycle (growth and maturity phase) in which network effects are more important than quality.

Besides these conflicting results there is another more fundamental problem: the quality measurement. For the 32 to 64 bit era in the home video game market Liu (2010) suggests that the Nintendo 64 is of higher quality compared to PlayStation. Contrary, Dubé et al. (2010) find evidence in favour of PlayStation’s quality superiority. Gretz (2010) and Gretz and Basuroy (2013) use a quality measure solely based on hardware components (e.g. central processing unit speed). For their study Tellis et al. (2009) include these hardware aspects into their quality definition, too. Furthermore, they use some “softer” indicators as “ease of use” collecting this information from consumer and computer magazines. This approach comes with two restrictions. On the one hand subjective evaluation by the writers of these magazines may be problematic and on the other hand a measure of quality may not consider all relevant factors.

For any empirical study in this field it is obviously necessary to choose a useful measure of quality, but inconsistent or subjective measures may lead to conflicting conclusions in regard of the “quality-wins” debate. However, an ex post analysis as in Liebowitz and Margolis (1990 and 1994) which suggests coordination to superior outcomes, depends on a correct measure of quality. Otherwise the main findings could change with every improvement in empirical methods or accuracy.

Our understanding of competition in which “creative destruction” breaks up lock-ins does not need higher product or platform quality as a necessary condition (even though the products might have a higher quality). Most important is to recognize that an isolated view on a single product of a multi-product company is misleading when such a company operates an overall strategy.

Following Joseph A. Schumpeter “real” economic development only arises when economic players develop “new combinations” of production factors in a new manner (Schumpeter, 2004). These discontinuously appearing incidents of economic activities fundamentally affect equilibria and lead to structural changes. Incumbent providers of goods and services may exit the market due to their lost competitiveness. Schumpeter created the term “creative destruction” (Schumpeter, 2008) for this process. The following examples shall emphasize that this process of creative destruction might be the reason for breaking up lock-ins although the original product remains. The main point of our argumentation is that innovative business models can eliminate the old and change the equilibrium position fundamentally.

1. The software and operating system market – Tellis et al. (2009)

In Table 4 of Tellis et al. (2009) the authors present an overview of the switches in market share leadership for their objects of investigation. It is striking that nine of the seventeen analysed examples are Microsoft products or services. Furthermore, Microsoft replaced the respective leader in every case. Apart from the personal finance software market, Microsoft was/is not present in the remaining eight investigated markets and therefore fell/fall not in the main scope of Microsoft’s business model. Tellis et al. (2009) argue that the higher quality of every single product is the main driver for the market share leadership switches in the respective partial markets.

Following our approach of creative destruction these findings rather suggest that it was Microsoft’s complete package comprising operating system and complementary, mutually compatible software which was able to break up a potential lock-in. This resulted in Microsoft

becoming the new market share leader. Selling PCs with Windows and frequently preinstalled software helped and still help to penetrate the market. With every sold Windows PC Microsoft creates a default option (status quo) for their respective customers. One could assume that Microsoft uses this hardware-software-bundle in a targeted manner. Thereby time-consuming search for alternative software may be omitted. Beyond this, increasing diffusion leads to stronger network effects. In summary, this bundling strategy became a competitive advantage over competitors which were focused on their stand-alone software. Obviously, Microsoft's overall strategy was superior so that it could overcome other established business models. At least for the affected markets this bundling strategy represents a new combination of already existing factors with a huge impact for the market structure and possible business models. Hence we call Microsoft's successful activities in its targeted markets an act of creative destruction.

However, Tellis et al. (2009) highlight the counterexample of the unsuccessful software "Microsoft Money" and deduce that the leadership of the other Microsoft products and services do not result from the embedding in the overarching Windows platform. They conclude: "the failure of Microsoft Money to dominate Quicken shows that even such bundling power fails to swamp the effect of quality". Certainly, Microsoft Money seems not to fit in our approach. The same is true for the fact that Google Chrome overtook the market share of Microsoft's Internet Explorer in 2012 (StatCounter, 2016). Nevertheless, Microsoft redefined the business and the failure of Microsoft Money was obviously not crucial for their corporate success. Microsoft Office still has a vast market share and we doubt that Word, Excel, PowerPoint and Co. would have reached this position as stand-alone software without Microsoft's overall strategy. That does not mean that Microsoft will inevitably hold this position until all eternity. The development in the internet browser market demonstrates that another innovative company with a good (or even superior) concept in its turn may replace the market leader. We will discuss this example, inter alia, in the next section.

2. The rise of Google

Google, founded in 1998, is another example for a company that captured a number of markets through a revolutionary new business model. We do not present the whole history, but highlight some aspects that echoes our interpretation of competition. In Google's beginning it solely was a search engine – with high quality (PC-Magazine, 1999) Due to the quality and cooperation

with strategic partners² Google gained the market share leadership against Yahoo!, AltaVista and others (Wall, 2015). Shortly after their market launch Google build up their business on advertisement. The essential basis is the combination Google AdWord (launched 2000) and Google AdSense (launched 2003). These two tools allow advertisers to place content targeted ads. Furthermore, since 2009 Google has offered preference targeted ads on partner-websites and their own websites such as YouTube. In summary Google does not depend on selling a particular product or service to consumers but to offer an attractive platform for advertisers; Google's attractiveness depends on the number of users respectively large target groups for the advertisers. This is a typical case of indirect network effects: the platform value for one group, the advertisers, increases with the number of other platform participants, the search engine users. Considering Google's further activities, offering several free of charge products and services, it seems Google have been aware of that. Some examples that demonstrate Google's effort to bind consumers to become attractive for advertisers are: Gmail (email service; since 2004), Google Maps (map and satellite images, route planning, GPS Navigation; since 2005), YouTube (video content platform; since 2006), Android (mobile operating system; since 2007) and Chrome (web browser; since 2008) (Google, 2016b). The list could be continued, but it is important to note that in Google's business strategy this effort is necessary to earn money from the advertisers. Further examples are Yellow Books (independent Yellow Pages publisher) policy of offering advertisement for free in the first year it enters a new city and Adobe's free distribution of Reader. Both strategies establish a technological standard that will generate usage which companies can capitalize on in the future (Rysman, 2009).

However, we have already mentioned that Google Chrome became market share leader in the web browsing market in 2012. To understand how Google broke up this lock-in one have to look at the overall strategy once again: (1) Market share leadership in the search engine market enables Google the opportunity to advertise for Google Chrome. (2) Chrome is preinstalled and the default web browser on most Android devices (Smartphones, Tablets, Notebooks). (3) Chrome is optimized for other Google web products (e.g. Google Docs). Furthermore Chrome regular reaches high positions in web browser rankings (Tripp, 2016). It is likely that Chrome's high quality follows from Google's financial and personal capacities and programming knowhow. Therefore it should not be viewed in isolation from each other or from the overall

² Google became AOL's search partner in 1999 and paid several million dollars to e.g. Mozilla and Adobe to be the default search engine or to implement the Google Toolbar in their software (Wall, 2015).

strategy. In summary Google's position in this partial market can be explained with an efficiently performing business concept.

Microsoft's Internet Explorer and other web browsers survived the emergence of Chrome. There are other markets in which Google's activities have larger impact. Google Maps is an example. Since Google Maps has launched it has become difficult for traditional commercial map providers to sell their products. Google offers maps to consumers for free³. In consequence for many users fee-based cartographical material is obsolete or may be in the view of consumers a worse alternative. Google's free of charge services such as Google Maps are possible because of their advertisement-financed approach – and in the same time these services are necessary to earn money from advertisers. Google's success suggests that this innovative approach works better than business models established until then. There are competitors to Google Maps but most of them pursue a similar strategy: offer a free service to earn money with something different. To our opinion this example demonstrates once again how creative destruction works and reshapes complete branches.

3. Competition between home video game platforms

The history of home video games in the US contains numerous interesting events and developments for our investigation. First of all, the market for portable systems (handhelds) demonstrates that a superior system can be defeated by a worse rival product. Nintendo and Atari released their handhelds "Gameboy" and "Atari Lynx" at almost the same time (Herman, 2001). The original Gameboy got a less than two inches square monochromatic screen without backlight, powered by an 8-bit processor. On the other hand, the Atari Lynx got a slightly bigger colour screen. Moreover the screen was backlit. That means users were able to play games without an extra light that was mandatory to play games on the Gameboy. The Atari Lynx used a 16-bit processor whereby it was way faster than the Gameboy. Although the introductory price of the Atari Lynx was higher (\$ 149 vs. \$ 109), it needed two more "AA" batteries and it was a bit heavier, the Atari Lynx seemed to be superior compared to the Gameboy. However, due to a delivery shortage the Atari Lynx missed the 1989 Christmas season and the Gameboy captured the market share leadership. The Gameboy became the unchallenged market leader and held this position for several years despite its technical inferiority. Main reasons were the large number of available games (and especially some very popular blockbuster games like Mario Bros. and Pokémon) and the huge user base – in other words – because of the indirect network effects (Herman, 2001). Many competitors tried to establish a portable system next to

³ Limitations are in the "Terms of Service" (Google, 2016a).

the Gameboy. Many of these got a higher quality (e.g. Atari Lynx, Atari Lynx II, Sega Game Gear and SNK NEO Geo Pocket), but all failed to break up Nintendo's dominance on the handheld market. It needed remarkable technical progress (Nintendo Gameboy Advance, Sony PSP) or an innovation that introduced consumers to a new kind of game play experience (Nintendo DS) to overcome the market position of Gameboy (Forster, 2013).

The story of the market for home video game consoles is a more turbulent one. This market has experienced enormous technical development, from processing eight bits of information in the mid-1980s to 128 bits at a time in the most recent systems. Development in processing speed by video game consoles and associated programming techniques by developers explain the improvements in graphic quality and play experience (Rysman, 2009). However, this study will show that it is not inevitable quality or network effects that lead to success but superior business concepts that include these points; and it will show that timing and luck can be important, too. In a brief overview over a part of this history we highlight incidents and developments which echo the significance of our holistic business concept approach.

In the first generation of home video game consoles in the 1970th these consoles had a fixed number of implemented games. Typically these games were popular titles know from arcade centres. Magnavox's Odyssey, the first home video game console ever, came with several hard coded games. Users had to switch circuit boards and plastic overlays for the TV screen to choose which game to play and to get the graphics. Other manufacturers offered video game consoles that got only one title. "Ataris Pong" was particularly popular hence varying Pong clones by different manufacturers entered the market. A very successful of this clones was Coleco's Telstar due to two reasons. First its low retail price and second a chip shortage that entailed Coleco to be the only manufacturer that was able to produce its planned supply. This incident is comparable with the Gameboy vs. Atari Lynx case. However, in 1976 Fairchild introduced their Video Entertainment System (VES, later renamed Channel F), the first console that used game cartridges. This innovation enabled owners to just buy new cartridges instead of completely new consoles if they wanted a new game. This superior system made the dedicated systems obsolete and initiated the second generation of video game consoles that lasted till 1983.

Not long after several companies (Atari, RCA, Fairchild, Magnavox, Coleco, Bally, Mattel) offered cartridge based consoles. Between 1977 and 1980 Bally's Arcade was considered the console that delivered the best graphics. But it suffered from two disadvantages: it costed \$ 100 more than Atari's VCS (in 1982 renamed in Atari 2600) and there were just few games available

for it (Herman, 2001). In contrast, Atari was the company that offered most games. Furthermore, Atari strived to have some very popular titles in its portfolio. For this reason Atari licensed and ported Taito's arcade blockbuster "Space Invaders" for home use which was the first time that a third party game had been made available for home video consoles (Herman, 2001). In 1980 Mattel released the Intellivision, a console that convinced costumers for two reasons: First, it had outstanding graphics. Second, Mattel licensed trademarks like NFL and NBA to give games some kind of "official touch" (Herman, 2001). With these two new aspects, Mattel reached the second highest market share behind Atari despite its comparatively small games library.

However, up to this date Atari approximately sold two million VCSs (Herman, 2001). Since all companies earned most of their money with the sale of cartridges, a new company, Activision, decided to offer games for the VCS to earn some money, too (Herman, 2001). Because of a much smaller installed base they did not offer games for the Intellivision. Activision's games were innovative, challenging and had better graphics than Atari's games because Activision optimally used the capabilities of the VCS. Atari's VCS sales numbers profited from Activision, while Mattel's Intellivision lost market share. But the superiority of the Activision games meant also that Atari itself sold less cartridges. Therefore, Atari unsuccessfully tried to forbid Activision the sale of VCS compatible cartridges through an injunction (Herman, 2001). Motivated by Activision's success other software-only companies were founded to offer games. With the market entries of the game developers a textbook example of a two-sided market emerged. Due to the indirect network effect most third party game developers limited themselves to games for the VCS. Just few third party games were developed for other consoles. As a consequence, the VCS became more attractive for costumers and became the unchallenged market share leader. Mattel and Coleco introduced two new consoles: the Intellivision II and the Colecovision. Compared to Atari's VCS both were technical superior. However, Mattel and Coleco recognized that they were not able to defeat the VCS favouring network effects. Therefore they offered adapters so that all VCS cartridges could be played on these consoles (Herman, 2001). Atari for its part released the 5200 which offered the same technical quality as the Intellivision II and the Colecovision and which was able to play VCS games as well.

Despite these new superior consoles, Atari's VCS was still the best selling console. Its success obviously lay in the importance of the game availability respectively the indirect network effects. However, Atari was not able to internalise the network effects properly. A misunderstanding of the new market structure could explain why they tried to rule out third party developers as Activision. In any case Atari did not manage to earn money from these new

market participants. Quite the contrary, Atari lost revenues due to the new competitors on the software market. Although these competition boosted the VCS sales number it was also the reason why the game console market collapsed in 1983/1984. The market was oversaturated with videogames. Costumers were not able to distinguish good games from bad games. On the other hand, many companies left the market because they were not able to earn enough money anymore. It seems that the indirect network effect from game developers to console users became negative⁴. Moreover, there was a congestion effect on the developer-side. All in all, this suggests that Atari's business model was not suitable to handle the new environment.

This was Nintendo's time to break up Atari's dominance. When Nintendo entered the US console market with its NES (Nintendo Entertainment System) in 1985/1986 Nintendo was well aware of the development that caused the market collapse and adjusted its business model to avoid similar problems (Herman, 2001): Obviously, Nintendo knew that the value of its console significantly depended on the number of available games and that third party developers are the fastest way to get games for the console. Therefore Nintendo allowed third party companies to produce games for the NES. However, to avoid a renewed flood of (inferior) games, third party companies needed a licence from Nintendo to produce games. Furthermore, all game cartridges were produced by Nintendo itself and had a "lockout" chip inside which ensured that solely original, licensed cartridges could be played on the NES. In addition Nintendo raised a royalty per sold cartridge from the third party companies. Nintendo put a "Seal of Quality" on each cartridge box to signal costumers that Nintendo games had to meet quality standards. In summary, it seems that Nintendo's strategy was a conscious decision with regard to the network effects. In 1986 other consoles were released in the US (e.g. Sega Master System, Atari 7800). Critics insisted that Sega's Master System was superior with respect to graphics and playability (Herman, 2001) but the sales numbers of all Nintendo competitors were small. Therefore, there were hardly any third party companies developing games for these consoles. Even the 16-bit systems which were introduced 1989 (e.g. NEC TurboGrafx, Sega Genesis) and which offered much better graphics and speed were outsold by Nintendo's 8-bit NES (Herman, 2001).

In the Christmas season 1993 Sega reached a small victory in the 16-bit market against Nintendo's 16-bit successor of the NES (the Super NES) and sold more consoles than the competitors. But it lasted until the 32 to 64 bit era to really overcome Nintendo's dominant position. To shorten this, we will only highlight some of the main reasons how a new competitor, Sony's PlayStation, captured the market share leadership in this period. First of all,

⁴ more games decrease players' overall platform utility.

Sony seemed to be the first company that really took the structure of the indirect network into account. Sony pursued the so-called “divide-and-conquer strategy”, selling consoles cheap (with a loss) to earn the money from the software-side (Herman, 2001, pp. 218, 220). Sony’s second advantage was that it was easy for third party companies to develop games for the PlayStation. Sony gave developers a huge library containing codes and routines that they were allowed to use. As a consequence the development time for a PlayStation game was much shorter than the necessary time for a comparable Saturn (Sega) or N⁶⁴ (Nintendo) game (Herman, 2001). In addition to the user base, this was an incentive for third party companies to develop for Sony. Thus, the PlayStation became the console with the largest number of available games. However, Sony used Nintendo’s approach: Each third party company needed a licence to release a game for the PlayStation. This restriction was supposed to ensure Sony’s standards of quality. Another strategic move by Sony was the Yaroze. A special version of the PlayStation for non-professional game developers. This console was delivered with a toolkit that allowed the owners to develop their own games, to play it on their console and to upload the games on a special website. Other Yaroze owners were allowed to play the uploaded games, too, that enlarged the amount of available games in a controlled manner (Herman, 2001). This bound users to Sony’s console. Furthermore, Sony got the first right of refusal for the uploaded games so that Sony was able to monetarise any innovative game that a Yaroze owner made.

Although Nintendo’s N⁶⁴ was released about one year after the PlayStation it was able to achieve respectable sales numbers and overcame Sega’s market share (Herman, 2001). One main reason for Nintendo’s success were some very popular games, especially Super Mario⁶⁴. However, the N⁶⁴ was lacking third party games because developers preferred Sony’s larger installed base and the cheaper production costs of PlayStation games⁵. Ultimately, Nintendo was not able to prevail against Sony which had the superior strategy to profit from the two-sided market structure.

We stop at this point in the home video game console history. The more recent history offers further interesting examples⁶. However, our point should be clear after the following brief summary: The first generation of home video games shows that good games (Atari Pong) or luck (Coleco’s Telstar) were reasons for success but – as Fairchild and others demonstrated –

⁵ the PlayStation used CDs which were much cheaper than the N⁶⁴ cartridges (Herman, 2001).

⁶ Limperos et al. (2011) explored in a ergonomic approach the relationship between the type of console played (Nintendo Wii vs. Playstation 2). Their result shows that subjects reported greater feelings of control and pleasure with a traditional control scheme (Playstation 2 as status quo) than with the more technologically advanced control scheme (Nintendo Wii).

that it was easy to replace these companies by the superior cartridge based consoles. Atari's market share leadership suggests that quality was not the most important aspect in the market of the second generation consoles. Otherwise Bally should have won until the Intellivision II and Colecovision were introduced. But Atari's strategy to profit from the importance of available games seemed to be superior. Obviously Atari's business model could not prevent the market collapse in 1983/1984. But this market shake-out enabled Nintendo to capture the market share leadership. Nintendo's approach was a clear advancement because it considered both sides of the market simultaneously. Consequently, Nintendo was able to protect its leadership against superior consoles of competitors. Significant technological progress was necessary for Sony to break up the "Nintendo-lock-in". Sony's strategy simply internalised the network effects better. It is questionable if the lock-ins would have been broken up without the market collapse and technical progress. Nevertheless Nintendo's and Sony's well performing business concepts were at least necessary to initiate a new generation of video game consoles.

4. Conclusion

Are Hossain and Morgan and Liebowitz and Margolis right? Does the QWERTY-phenomenon just lie "in the minds of theorists" and will superior products, platforms or standards always win? We do not think so. Our examples suggest that there are many markets with (at least) temporary lock-in situations. The status quo bias is one well-known phenomenon that can explain why these lock-ins may evolve. Of course, there might be further reasons, but the missing consideration of the status quo bias could be responsible for the clear results and conclusions given in the experimental studies by Hossain and Morgan and Hossain, Minor and Morgan.

Furthermore, the home video game market case most clearly demonstrates that quality does not inevitably win. It is important to mention, that an inferior winner does not necessarily come along with a first mover advantage. For example Sega's Dreamcast was considered as the superior console in the sixth generation and it entered the market first. Nonetheless, it was defeated by Sony's PlayStation II and Microsoft's Xbox (Herman, 2001). The home video game case suggests that network effects are important. Inferior situations with dominant market share leaders in the presence of better alternatives are possible.

Our illustrated three examples also demonstrate that innovative or superior business concepts are able to break up lock-ins; this is compatible with a Schumpeterian interpretation of market development. In the case of the home video game consoles market shake-outs or technological progress seem to be important. However, it appears that the market shake-out after the second

console generation was unavoidable: Atari's business strategy was not able to manage the new circumstances after Activision entered the market. Nintendo's strategy was necessary to account for the two-sided market structure. Microsoft and Google overcame the leaders due to their superior business model and high or at least sufficient quality. The question remains open if the QWERTY-phenomenon actually is a problem in reality. Our answer: It depends. In the short term people may see a superior platform losing against a worse one. Considering such a short term view it is reasonable to call this a market failure. Considering a longer period of observation the situation changes. First mover advantages and/or network effects and/or luck can lead to inferior lock-ins. But, innovative ideas can overcome these lock-ins. Superior products are the essential reason in Liebowitz' and Margolis' argumentation. However, the experimental and empirical studies favouring this argumentation are not entirely convincing. We think that in the experimental studies there was a lack of essential factors. We introduced the status quo bias as one example of such an important but non-tested factor. In consequence there seems to be no external validity of these studies. The empirical studies suffer from contradicting results and a problematic measurement of quality. Moreover, the anecdotal evidence that we offered in our examples draws another picture: quality does not always win.

Undoubtedly, there are switches in market share leaderships. We argue that some kind of Schumpeterian creative destruction – with focus on the superiority of the business strategies of the new market share leaders – may have caused the switches in our examples. We do not see an alternative to ex post analyses to check for this interpretation and we are aware of the shortcomings and limitations of anecdotal evidence.

To break up an inferior market share leadership regulation could be one possibility. However, in a regulated market potential innovators can be negatively affected as well. The decision-making scope is limited. It is possible that innovations do not take place at all because companies cannot implement new strategies. E.g. if the price-setting freedom is restricted on at least one side of a two-sided market a divide-and-conquer strategy is not possible. Nintendo's and Sony's market entries would not have been possible the way described in the previous chapter. Furthermore this restriction typically leads to lesser profits of the market share leader. Market entrance incentives are missing. In consequence potential innovators are confronted with high risks and low profits and forego the opportunity to participate in the market. A new superior product may not be available for customers and a persistence in the current state can be caused. Therefore a wider view of competition should be considered before market interventions are implemented.

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