

Estudo polêmico diz que pirataria de software favorece Windows

Dois pesquisadores de Havard criam modelo para analisar a competição entre o Windows e Linux e chegam a conclusões surpreendentes.

A pirataria de software ao contrário do que pensa o senso comum pode ajudar a Microsoft em sua batalha contra o Linux.

Essa é uma das conclusões de um estudo polêmico de dois pesquisadores da Havard Business School, dos Estados Unidos.

O texto acadêmico (Dynamic Mixed Duopoly: A Model Motivated by Linux vs. Windows) foi escrito pelo professor assistente Ramon Casadesus-Masanell e pelo professor Pankaj Ghemawat e publicado em uma edição especial da revista Management Science.

Os dois basearam seus estudos em modelos econômicos simplificados para recriar a dinâmica de competição entre o Windows e o Linux, no qual o Windows tem participação de mercado e lucratividade de seu lado, enquanto o Linux beneficia-se de um ciclo de desenvolvimento mais rápido e de um custo mais baixo.

Casadesus-Masanell e Ghemawat, para surpresa deles mesmos, descobriram que as vantagens do Linux sozinhas não significam que com isso ele vai superar o Windows, que se beneficia inicialmente de seu poder dominante de mercado.

Um fato que poderia ajudar o Linux a ganhar espaço são os "compradores estratégicos" - grandes empresas e governos, que se sentem mais confortáveis em ter acesso ao código fonte.

"Esta deve ser uma das razões porque a Microsoft está fornecendo acesso ao código fonte do Windows para os governos", disseram os pesquisadores.

Outra surpresa, segundo os pesquisadores da Harvard Business School, é que a pirataria do Windows pode, na verdade, ajudar a Microsoft. Isso porque quanto mais pessoas usam o software, maior é o efeito rede, o que torna o Windows mais valioso e permite que a Microsoft cobre mais por ele.

O estudo diz também que a pirataria do Windows ajuda a reduzir o entusiasmo pelo Linux. "Descobrimos que em países onde a pirataria é alta, o Linux tem as taxas mais baixas de penetração", disseram Casadesus-Masanell e Ghemawat.

A terceira descoberta dos estudiosos é que o Linux não significa necessariamente um efeito de bem-estar social melhor do que o Windows.

"Com o monopólio, os esforços para desenvolver um novo software e melhorar uma plataforma são direcionados para um único sistema e isso pode ser melhor em uma perspectiva de bem-estar social", escreveram os pesquisadores.

Os dois pesquisadores admitem que o modelo econômico que construíram para estudar os impactos do Windows e do Linux é bastante simplificado e pode não refletir fatores importantes que existem no mundo real.

Detalhes da pesquisa podem ser conferidas em uma entrevista dos dois pesquisadores (abaixo).

Leia mais:

Microsoft vs. Open Source: Who Will Win?

Sean Silverthorne

Q&A with: Ramon Casadesus-Masanell and Pankaj Ghemawat

Want to get a heated debate going among technologists? Ask them this question: Can the open source software movement defeat (or severely cripple) Microsoft in the marketplace?

With little academic attention focused on this question, Harvard Business School professors Pankaj Ghemawat and Ramon Casadesus-Masanell decided to dive in. Most research to date into the OSS movement has focused on the organization and management issues surrounding OSS. Ghemawat and Casadesus-Masanell chose to explore the fundamental competitive dynamics question: Will OSS ever displace traditional software from its market leadership position?

"We believe that there is still a great deal of confusion and puzzlement on how this competitive battle will develop," say the authors of the academic paper *Dynamic Mixed Duopoly: A Model Motivated by Linux vs. Windows*, which has just been accepted for publication in a special issue of *Management Science*.

Ultimately, the authors believe, neither side is likely to be forced from the battlefield—Microsoft has too much market share and OSS offers too many benefits for users. But there are strategies each can use successfully against the other, as they detail in this e-mail interview.

Sean Silverthorne: Why should OSS ever displace traditional software?

Ramon Casadesus-Masanell and Pankaj Ghemawat: One main advantage of open source software is that because users can modify the code directly (as they encounter problems or have new ideas on how to improve it), the development cycle is significantly shorter. Proponents of OSS claim that if this demand-side learning (as we call it) is sufficiently strong, OSS will oust traditional software. In addition, software engineers claim that the better architecture of most OSS projects make them a potentially superior product, adding to the probability of success.

However, OSS has disadvantages too. Most importantly, it comes from behind in terms of market share (installed base). Because the value of an operating system depends critically on the number of users, traditional software has an advantage. Clearly, a larger installed base implies that there will be stronger direct and indirect network effects, and this will enhance the value of the operating system to current and potential users. In addition, a larger installed base also implies that there will be more feedback on bugs and more suggestions for new features.

Our paper introduces a dynamic mixed duopoly model in which a profit-maximizing competitor (Microsoft) interacts with a competitor that prices at zero (Linux), with the installed base affecting their relative values over time. We use a formal model to ask what conditions are needed for Linux to take over Windows. The questions that we address are: Is Linux's superior demand-side learning sufficient to win out? What is the effect of forced procurement by governments and some large corporations on the long-run equilibrium? How do cost asymmetries play out? Can Microsoft use piracy strategically to improve its market position?

From a managerial perspective, these are significant questions. If it turns out that OSS will incontestably displace traditional software, software firms need to adapt as quickly as possible to the new competitive landscape by, for example, incorporating some aspects of the open source development model, or else be ready to exit. In fact, the model suggests ways in which the likelihood of OSS winning out can be minimized (see below). If, to the contrary, OSS turns out not to be a threat to the traditional model, firms should not waste time and attention trying to figure out ways to fight this battle.

Q: Could you summarize your results?

A: First of all, let us make a caveat regarding our approach. Our methodology is formal economic modelling. What this means is that we construct a stylized mathematical model of the relationship. The model captures what we believe are the most important features of the Linux-Windows competitive battle (faster demand-side learning on the part of Linux and an initial installed base advantage for Windows), but makes important assumptions regarding other aspects. Without these simplifications, the model would not be tractable and it would not be possible to obtain results. After having analyzed the base model, we relax some of these assumptions.

Harnessing demand-side learning more efficiently is not sufficient for Linux to win the competitive battle against Windows. Our main result is that in the absence of cost asymmetries and as long as Windows has a first-mover advantage (a larger installed base at time zero), Linux never displaces Windows of its leadership position. This result holds true regardless of the strength of Linux's demand-side learning. Furthermore, the result persists regardless of the intrinsically better design and potential differential value of Linux. In other words, harnessing demand-side learning more efficiently is not sufficient for Linux to win the competitive battle against Windows.

Having obtained this basic result, we investigate the conditions that will warrant that Linux ends up forcing Windows out. We do this by modifying the model in two ways. First of all, we look at the effect of having buyers such as governments and some large corporations committed to deployment of Linux in their organizations. We call such buyers strategic. In addition to cost-related reasons, governments back Linux because having access to the source code allows them to verify that sensitive data is treated securely. Binary code makes it hard to figure out who has access to information flowing in a network. Companies such as IBM, in contrast, back Linux because they see in OSS one way to diminish Microsoft's dominance. We find that the presence of strategic buyers together with Linux's sufficiently strong demand-side learning results in Windows being driven out of the market. This may be one main reason why Microsoft has been providing chunks of Windows' source code to governments.

Second, we look at the role of cost asymmetries. In the base model we assume that the cost structures of Windows and Linux for the development, distribution, and support of software coincide. A natural question is then whether the central result that Windows survives in the long-run equilibrium regardless of the speed of Linux's demand-side learning persists if there are cost asymmetries. We find that because OSS implies lower profits for Microsoft, the larger the cost differences are between Linux and Windows, the less able Microsoft is to guarantee the survival of Windows.

We also show that it is not all bad news to Microsoft. We analyze the effect of having forward-looking buyers and the presence of piracy, and conclude that both benefit Microsoft.

We question the effectiveness of influencing forward-looking buyers' perceptions on the value of an operating system. The model suggests that the more forward-looking buyers are, the more advantageous it is to use fear, uncertainty, and doubt (FUD) tactics to drive the competing system out. Consider SCO, a small Swiss-based "vulture" firm that had bought up the intellectual property rights to a particular version of Unix and threatened Linux users with lawsuits over infringement of those rights unless they agree to pay substantial licensing fees. IBM, which was one of the prime corporate sponsors of Linux as well as the target of a lawsuit by SCO that sought \$1 billion in damages, alleged in mid-2003 that SCO was in cahoots with Microsoft. Our model indicates that if buyers are sufficiently forward-looking, such actions may jeopardize the ability of Linux to continue as an effective competitor in the operating system space.

We also look at the effect of piracy and ask whether piracy can ever be beneficial to Microsoft. This extension was motivated by analyzing data on a cross-section of countries on Linux penetration and piracy rates. We found that in countries where piracy is highest, Linux has the

lowest penetration rate. The model shows that Microsoft can use piracy as an effective tool to price discriminate, and that piracy may even result in higher profits to Microsoft!

Finally, the paper investigates the societal welfare consequences of OSS availability by comparing different industry structures (monopoly and duopoly). We find that while a monopoly of Linux is always preferable (from the point of view of societal welfare) to a Windows monopoly, it is ambiguous whether a duopoly Linux-Windows is better than a Windows monopoly.

The basic trade-off is the following: With a duopoly, more individuals and organizations use PCs because prices are lower, and this raises welfare. However, with a duopoly, no operating system ends up exploiting fully its potential because developers' efforts wind up divided between the two systems. However, with a monopoly, the efforts to develop new software and improve the platform are directed towards one system only and this may turn out to be better from a social welfare perspective.

Q: In general, what surprised you about the results? What assumptions did you have going in that didn't hold up?

A: When we began the project, we thought that network effects and demand-side learning would result in Linux forcing Windows out. After all, we reasoned, if Windows is sold at a positive price and Linux is free, there will always be Linux users, and if the strength of Linux's network effect is large, the value of Linux to prospective users should eventually become larger than that of Windows.

Well... we were wrong (and this illustrates the usefulness of developing a formal model). What we had missed is that Microsoft's initial advantage (larger installed base) together with its pricing power allow the company to price strategically to control Linux's market share going forward. By lowering the price of Windows, the demand for Linux shrinks to the point where Linux is not a threat to the survival of Windows. The model also shows that a "milking strategy" (setting high prices in the short term and leaving the market at some point in the future) is not desirable to Microsoft. The reason is that if Microsoft follows such a strategy, as the last period becomes closer and closer, the relative benefit of abandoning it and lowering prices to survive a few more periods increases dramatically.

The model shows that Microsoft can use piracy as an effective tool to price discriminate, and that piracy may even result in higher profits to Microsoft! The "Windows persistence" result turns out to be robust to different specifications of the model. In fact, in the first few months into the project we had developed several alternative models and every one of them yielded this very same finding.

In addition to this main result, we were also surprised to find that piracy may end up increasing Microsoft's profits. To understand why, notice that there are two types of pirates: those who would not have bought Windows in the first place because it is too expensive, and those who would have bought Windows but now decide to pirate it. The first category increases Windows' installed base without affecting sales. As a consequence, this group increases the value of Windows. And thanks to these pirates, Microsoft is able to set higher prices in the future (because the value of the system goes up). In addition, having these pirates means that Linux's installed base does not grow as much as it would have if piracy weren't there. The second type of pirates (those who in the absence of piracy would have bought Windows) reduces Windows' sales and profit. Thus, if the proportion of first-type pirates is sufficiently large, Microsoft's profits will increase with piracy.

Finally, the social welfare result that a Windows monopoly is not always worse than a Linux-Windows monopoly was also unexpected. This questions the social desirability of policies aimed at guaranteeing Linux's survival.

Q: You mention in the paper that the model is not to be taken as a literal model of the Linux/Microsoft competition. But can you say anything about why Linux has enjoyed success against Microsoft?

A: Linux's success against Microsoft is still relative. In the client space, Windows is the undisputable leader, and in the server space, Linux and Windows have both been gaining positions for the past ten years. The big losers are Novell, Unix, Solaris... everybody except Linux and Windows.

Despite this, Microsoft is visibly concerned about Linux's upsurge. The Halloween memos (see <http://www.opensource.org/halloween/>) are an obvious testimony of this concern: "OSS poses a direct, short-term revenue and platform threat to Microsoft, particularly in server space. Additionally, the intrinsic parallelism and free idea exchange in OSS has benefits that are not replicable with our current licensing model and therefore present a long-term developer mindshare threat."

Microsoft has a great deal to lose if Linux wins the operating systems battle. Microsoft is a software company, and a defeat in operating systems would point to the vulnerability of its entire business portfolio. In addition, the operating systems group is one of Microsoft's biggest revenue generators. Moreover, to a large extent Microsoft's sustained success over time in such a dreadfully rugged landscape has been due to its dominant position in operating systems. It is well known that Microsoft won the browser wars leveraging its dominant position in client operating systems. And the same will happen in the media player space unless the American or European antitrust authorities prevent it. We expect Microsoft to put all its ammunition to fight this battle.

Part of the reason why Linux has made significant inroads is the determination of Richard Stallman and the Free Software Foundation to have a free (as in freedom) operating system. According to Stallman, application software will never be truly free unless there is a free operating system that supports it. Thus, since the moment Linus Torvalds and Richard Stallman joined forces, a big chunk of the foundation's efforts have been directed at building a free operating system.

Then there are some large corporations and governments backing the development of Linux. These players use Linux as a way to curb Microsoft's dominance. This support is important because there are tedious portions of the code that would rarely be developed spontaneously by members of the Linux-developer community.

Q: From your modelling, what can Microsoft do strategically to remain competitive against a product that is argued to be of better quality, is updated more frequently, and is free?

A: A few actions that the model suggests Microsoft could do to remain competitive are:

- A. Increase its own demand-side learning.
 - a. Listen to the demands of the user community to better exploit the benefits of demand-side learning. Microsoft must facilitate communication between the user base and the company to have prompt feedback on the performance of its products.
 - b. Make an effort to incorporate improvements in the code (fix bugs and introduce new features) as soon as possible.
 - c. Reward those who propose improvements for the code. At the very least, Microsoft could publicly acknowledge those who proposed new features or discovered bugs.
- B. Feed its direct and indirect network effects.
 - a. Support as much as possible the independent software vendor community so that the quantity and quality of complements is substantially above that of Linux.

- b. Encourage competition between the different ISVs. The lower the prices of applications, the more appealing the Microsoft system will be.
 - c. Price discriminate. Give Windows and applications away to schools and universities so that users build their file libraries on Microsoft, not Linux.
- C. Minimize the number of strategic buyers.
 - a. Let governments access the source code and give guarantees that sensitive data is treated confidentially.
 - b. Price discriminate. Give binary away to organizations and individuals who are not willing to spend money on Windows but who would be willing to use Linux because it is free.
- D. Reduce costs to be able to sustain long periods of time with low prices.
- E. Decrease Linux's demand-side learning.
 - a. Because the way to do this involves some questionable (from a legal point of view) actions, we will refrain from suggesting specifics.
- F. Lessen Linux's direct and indirect network effects.
 - a. Make it as hard as possible for Windows applications to work on Linux.
 - b. Same for MS Office documents.
 - c. "Promote" Linux's code forking.
- G. Infuse fear, uncertainty, and doubt into the Linux user community. For this to work, the statements must be perceived as credible. Credibility requires some past FUD announcements to be realized.

Q: Is there a scenario where Linux could be kicked out of the market by Microsoft?

A: Strictly speaking, within our model the only way in which Microsoft can get rid of Linux is by setting the price at zero. But, even if Microsoft did that, the company would still be selling MS Office for a positive price. Thus, we conjecture that even in this case, there would be people developing and using Linux.

The more important question is: What motivates developers to contribute to open source projects in the first place? As long as the drivers are there, Linux will persist. Given that Linux was born in 1992 in an industry already dominated by Microsoft, and given that the financial motive is secondary, it will be very hard for anyone to oust Linux.

The organizational stream of research on OSS has identified several drivers of motivation to contribute to open source projects. For Microsoft to have a chance to kick Linux out of the market, it needs to successfully fight them.

First, some developers see software as scientific knowledge to be shared "like the sharing of recipes among cooks." In fact, some describe software developers more like artists seeking fun, challenge, and beauty in their work than like calculative, square-minded engineers. Second, some individuals find it fun to go against Microsoft. As the OSS/free software movement gains momentum and developers foresee that victory is within reach, they increase their effort to accomplish this. Third, because most OSS projects have a log file listing all contributors to the code, some developers find it desirable to participate in OSS projects to signal their ability and to enhance their chances of promotion and professional advancement. Finally, user-developers sometimes fix bugs that they find and then release the improved code so that everybody can benefit.

It will be very hard for anyone to oust Linux. To the motivations of independent developers to contribute to Linux, we have to add the important support that the free operating system receives from companies and governments. As long as the motives that induce these organizations to back Linux persist, Linux will not go away.

Finally, and as we mentioned above, having a free operating system is central to the mission of the Free Software Foundation, Richard Stallman, and Linus Torvalds. It is thus hard to see how Microsoft can "persuade" Stallman or Torvalds to cave. And even if it did... Linux is no longer Stallman's or Torvalds' property. The project is dispersed and there is no "owner" of the code. Thus, someone else can take the lead.

Q: What's next for the both of you for future research projects?

A: There are several ways in which our work on Linux can be extended. One avenue would be to empirically estimate the difference in demand-side learning between Linux and Windows. This would allow us to make educated guesses on the chances of survival of Windows and make managerial and policy recommendations to OSS advocates, Microsoft, and administrations.

In its present form, the paper models the organization of Linux's development in a very stylized way. Having a closer look at issues of effort coordination may help us better understand how to deal with code forking, one of OSS's biggest potential problems.

A second organizational issue that could also benefit from formal analysis is that of incentives to contribute to OSS. While most research on this issue has been sociological in nature, the economic approach may shed light on why supposedly rational individuals are willing to spend valuable time and effort without extrinsic, financial incentives.

A final question that we believe is of utmost importance but that has not attracted much attention thus far (at least among academics) is: What are the drivers of adoption of OSS? Aside from its empirical relevance for both individuals and organizations, it is an interesting question from a theoretical point of view, too. The presence of network effects and demand-side learning make this a non-trivial problem. We conjecture that there are multiple equilibria and that the use of FUD to mold perceptions about future value becomes crucial.

Fonte: < <http://hbswk.hbs.edu/item/4834.html>>. Acesso em 14 set. 2006.

Disponível em: <<http://computerworld.uol.com.br>>. Acesso em 14 set. 2006.