

# Linux and Economics and the Economics of Linux: Part II

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In the previous article I roughly described the GNU/Linux Operating System and present it as a tool to do economic (and scientific) research. I argued that Linux is superior than proprietary software for this matter. In this article I will focus on Linux as an Open Source solution the enterprise and the government. I will argue that the the potential gains of an Open Source strategy for private firms and public institutions have not been recognized to date in developing countries.

As I mentioned in the previous article, Linux and a large number of software programs are distributed under the GNU General Public License, GNU-GPL, of the Free Software Foundation. The key aspect of the GPL license is that the users (i.e. anyone) can have access to the source code of the OS (unlike proprietary software) and modify it to fit their needs, but they can not hide those modifications and enjoy monopolistic rents. For example, companies like Red Hat, SuSe, Mandrake and Connectiva take the source code of Linux and other GNU-GPL software, add some particular features accordingly to the market that they are targeting, and bundle a distribution of an Operating System that looks and can behave pretty much like Windows or UNIX or in any other way they want to behave. These distributions include the filesystem, web servers and clients, mail server and clients, libraries, programming languages, Integrated Development Environments and almost anything you can image to provide businesses with software solutions. What is the price? Negligible.<sup>1</sup> A small company with say 5 Intel servers and 500 Intel workstations can buy one copy of Red Hat Advanced Server for \$800 and one copy of SuSe Professional for \$80 and install the OS and the included software on every machine, without worrying about licenses and fees. Clearly, the pecuniary aspect of Linux as a software solution for businesses is very attractive.

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<sup>1</sup>As Professor Boldrin correctly points out, the GNU-GPL license embraces the essence of research development and economic progress (see the Webpondo's interview in the April-June Edition). This makes Linux a rival input for the businesses (with a marginal cost of epsilon). Those firms that are able to embed Linux in their human and physical capital will have extraordinary potential gains. The individual firms to exploit the benefits of Linux to offer software solutions to their needs. New firms can be created on offering Open Source solutions to other firms by providing technical support on software services.

However, there are several caveats when implementing Linux as an alternative for businesses: support, interoperability, migration and human capital. External technical support is provided by the distribution vendor (or an out-source company), and works in the same way as Microsoft's support. Internal technical support requires skilled professionals on UNIX administration, since Linux is basically another flavor of UNIX.

Interoperability is a more complicated issue. Essentially, the market for servers has been dominated by Sun Microsystems and its Solaris Operating System (a flavor of UNIX), while the market for desktops and workstations is dominated by Wintel machines (Windows software on Intel hardware). In the last couple of years Microsoft has been exploiting his dominant position in the desktop to penetrate the server market, by offering products that do not fully inter operate with other standards, including Linux.<sup>2</sup> Despite this differentiation efforts, Linux offers a wide variety of compatibility tools: Samba (implements SMB protocol), Ximian (Outlook compatible), and some Office utilities like AbiWord and Gnumeric, can read Office 2000 files.

The migration depends on the type of machine to be migrated. UNIX servers has been plainly replaced by Linux boxes. Amazon.com is one of the most well known experiences of migration. The migration of desktop boxes requires identification of which users should be moved to Linux. The experience of some firms in the US shows that usually secretaries, typists, and regular workers can move quickly to Linux. However, if several users run crucial applications implemented only for Windows (like some accounting programs) it is advisable not migrate their platforms.

It becomes apparent that the crucial issue lies in the dynamics of the market for qualified programmers. Firms require skilled programmers as an input that is able to provide services for the production of goods and services, and the programmers require incentives to invest time and effort developing software solutions. The dynamics of this interaction should create the conditions for faster economic growth and development.

One of the advantages of emerging markets over developed economies is that the penetration of computers and the Internet is rather small. Still users and programmers are at an early stage of the learning curve in the adoption of computer technologies. Several private firms<sup>3</sup> and governments<sup>4</sup> around the world also have recognized all these benefits and have adopted Linux and Open Source software as a strategy to deliver products and services. Let's hope that in Colombia the private and the public sector follow a similar path.

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<sup>2</sup>This issue has been a key point in the current antitrust cases: the US against Microsoft and the EU vs. Microsoft.

<sup>3</sup>Boeing, IBM, Cisco Systems, Deutsche Bank, Intel, HP and GTE to mention a few.

<sup>4</sup>Diverse countries such as Germany, USA (NASA and IRS), Mexico and China. More recently the Peruvian Congress is studying a bill in which state owned computers must use Open Source Software.