

Running Head: Open Source Software Policy in Brazil

Open Source Software Policy and the MNC: The case of Brazil

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Abstract

Brazil has captured headlines around the world as a safe haven for free/open source software (F/OSS), leading the way in what some have termed an “open source revolution,” led by highly publicized F/OSS policy initiatives. Indeed, Brazil has led the way in governmental promotion of F/OSS, and is currently the largest public sector user of F/OSS in South America. In this paper, we examine the scene on the ground in the wake of the implementation of F/OSS policy. This paper sets out to discuss how Brazil’s widely publicized F/OSS policy functions, focusing on how a switch to F/OSS policy changes and restructures the business landscape for global IT companies operating in Brazil. Using a political economic perspective, we investigate the Brazilian policyscape by conducting interviews with executives at IBM Brazil and Sun Brazil, as well as the former head of Brazil’s National Information Technology Institute. Through a series of email-based interviews, as well as public statements, filings and other corporate information, this paper concludes that, in Brazil, MNCs experienced both specific obstacles and specific opportunities that were direct results of F/OSS policy. In addition to the increased use of F/OSS as a direct result of policy in Brazil, governmental promotion of F/OSS policy in Brazil also contributed to alter the playing field at global market level and affected the strategies of IT MNCs worldwide.

Open Source Software Policy and the MNC: The case of Brazil

Around the dawn of the 21st century, a movement began sweeping through governments around the world. While open source software has existed as a method of software production since the 1960s or 1970s, depending on whom you ask, (and “open source” has been a method of creative production since the dawn of human history), the turn of the most recent century marked noticeably increased governmental interest in supporting open source software as countries from Brazil to Germany to Singapore adopted various forms of policy meant to support both the use and development of open source software.

This paper does not set out to investigate the forces driving adoption of free and open source software (F/OSS) policy (a task perhaps best left to political scientists), nor does it attempt to examine the theories behind the optimal manifestation of F/OSS policies (something done best so far by Hahn’s 2002 book *Government Policy Towards Open Source*). Instead we look at one specific case that has captured headlines around the world – the case of Brazil – and examine the scene on the ground in the wake of what has been characterized (perhaps without merit) as an “open source revolution”(Haines, 2004), particularly in terms of the altered IT business landscape for multi-national IT corporations (IT MNCs) operating in Brazil. We discuss how this widely publicized F/OSS policy functions, focusing on how a switch to F/OSS policy changes and restructures the business landscape for IT MNCs operating in Brazil. This is important because, together, these corporations form the anchors of the IT industry in the majority

of countries in which they operate, including in Brazil. We address the interplay between Brazilian F/OSS policy and the perception of global governmental drives towards F/OSS policy and look at the effects of both upon the strategies of MNCs operating in Brazil.

Through a series of email-based interviews with executives in IT MNCs, as well as through press releases, and interviews published in the popular press, this paper aims to answer a series of research questions; how does a switch to F/OSS policy change and restructure the business landscape for IT MNCs?; what are new strategies that this changeover engendered?; what are the similarities and differences in how firms respond to this change?

The structure of this paper is as follows. First, we look at the particular Brazilian operationalization of F/OSS policy (which has been, to be fair, a series of linked policies at both local and federal level as opposed to one over-arching decree) in the context of F/OSS policies adopted around the world, as well as in the context of the long tradition of governmental support for the Brazilian IT industry. We address the spectrum of possibilities for governments in implementing F/OSS policy, and locate the actions of the Brazilian government accordingly.

We then move on to look at the effects of F/OSS policies in Brazil (how the policies have “played out”) from the point of view of three MNCs: Microsoft, as representative of the interests of proprietary software for obvious reasons, and Sun Microsystems and IBM as representative of two corporations with interests in the success of policies promoting F/OSS. The goal here is to examine what new sorts of strategies F/OSS policy can engender for MNCs operating under its tenets. We include excerpts

from interviews we conducted with executives at IBM Brazil and Sun Brazil, as well as Sergio Amadeu, the former head of Brazil's National Information Technology Institute (ITI) and legendary supporter of F/OSS both in Brazil and worldwide.

Open Source Policy Worldwide.

As mentioned above, Brazil is far from the only country to have implemented F/OSS policy. F/OSS has drawn interests from governments worldwide. Public-sector initiatives in support of F/OSS have been undertaken in many countries, including Germany, Peru, South Korea, India, France, China, South Africa, and Venezuela. Each country has implemented F/OSS policy in different ways. Industry analyst Gartner classified governmental F/OSS policy movements into four categories, which will be useful for our discussion by differentiating between Brazil's operationalization of F/OSS from its peers (Drakos, Maio, Arevalo, & Filho, 2003). When we look at Brazil's F/OSS policy, it is important to understand how the Brazilian experience differs from that of other nations promoting F/OSS. The first is preferential and mandatory procurement policy of open-source software by excluding commercial software. Venezuela would be a good example of this, having issued a presidential decree in 2004 mandating its public administration to switch to F/OSS. Similarly, Peru introduced a bill in 2005 mandating the use of F/OSS by the state and viewing F/OSS as a part of a general drive for transparency and openness.

The second is inclusive procurement policy, which allows open-source software to be considered alongside with commercial options. Many countries have chosen this

option. The British government, for instance, announced that it will consider F/OSS alongside proprietary software in its IT procurement decision and make its final decisions based on financial savings on governmental IT expenditure (Lettice, 2002). Similarly the state Department of Information Technology in India has devised a strategy to introduce Linux as a de facto standard in research institutions and other state organizations, such as the Supreme Court (Basu, 2002), while South Africa adopted an official policy promoting the use of open-source software and conferring preferential treatment for F/OSS when proprietary alternatives do not offer a compelling advantage (Festa, 2003).

Gartner's third strategy is governments' direct investment in developing and distributing F/OSS, as exemplified in Taiwan, which launched 'national open source plan' to reduce its dependency on proprietary software in government and education sectors (Benner, 2006). Gartner's fourth category is resource-pooling across diverse governmental agencies and authorities by sharing and reusing open source. The European Commission, for example, suggested in its report in June 2002 pooling resources between different public administrations. It recommended sharing public administrations' developed software across different governmental bodies (Drakos, Maio, & Simpson, 2003).

According to this framework suggested by Gartner, the Brazilian government's national plan for F/OSS migration falls into the second category, or inclusive procurement policy. While F/OSS is set as a de facto standard, Brazilian government also allows for the purchase and use of proprietary software when the decision can be justified. With Brazil categorized into the second type of F/OSS policies on our Gartner spectrum,

this paper focuses on studying the interplay of governments and IT MNCs surrounding second type of policy implementation. While all four types of F/OSS policies serve as a driving force to promote F/OSS in governmental sectors, it is beyond the scope of this paper to examine all four types and their impacts on MNCs.

Although F/OSS policies can take many forms, the drive to promote F/OSS use and production has remained a constant in all countries mentioned above. Latin America has been particularly notable as a hotbed of F/OSS policy in the past five years (Bloor, 2005). Among Latin American countries, Brazil is leading the way in promotion of F/OSS from the government side (Brod, 2003), as it is currently the largest public sector user of F/OSS in South America (Cassidy, 2004). Government officials in Brazil have committed ‘to exporting around \$2 billion worth in software every year, to replacing Windows with Linux in 300,000 federal computers, to transferring \$1 billion from the Telecommunications Fund to the free-software-based Digital Communications System, and to network the country’s 200,000 public schools using open source. The large scale of F/OSS implementation plan in Brazil sets Brazil as an interesting case study country in scrutinizing the interaction between F/OSS policy and IT MNCs.

Open Source Policy in Brazil: A History and Current Policy landscape

It is harder than it may seem to pin down when what is known as “F/OSS policy” arrived in Brazil. Sergio Amadeu places its arrival date in 2003 with the formation of a technical committee on free software (email interview, November 12, 2006), while Luiz Maluf, Director of Sales Operations at Sun Microsystems in Brazil, dates the true origins

of F/OSS policy to the passage of protectionist policies (which began in the late 1970s) for the Brazilian IT industry, known as Market Reserve Policy. He argues that protectionist policies have laid the foundation for F/OSS policy by creating a large pool of technically savvy human resources. Many others see the roots of F/OSS policy in Brazil with the initiatives of local Brazilian governments beginning around the recent turn of the century.

Considering the mass confusion regarding what open source policy actually is, we would like to note that, in the rest of the paper, the term “F/OSS policy” will refer to all efforts by the *national* Brazilian government to promote the usage and development of F/OSS through nationally implemented initiatives. For our purposes here, we look at F/OSS policy as having its most direct roots in the various local adoptions of F/OSS policy in the early 2000s. A few locales approved laws favoring F/OSS in public administration and requiring technical evaluations of proprietary solutions when they seem to be the only available solution to specific needs. For example, the state of Espirito Santo enacted a law in December 2002 requiring state public administrations and state-owned companies to give preferences to F/OSS systems and programs (cited in Lewis, 2006). Similarly, in June 2001, the City Council of Amparo passed a preferential and mandatory policy for F/OSS (Evans & Reddy, 2003) and in 2004, the Sao Paulo state government signed a cooperation agreement with F/OSS companies to train state government professionals in F/OSS and F/OSS IT management (Rose, 2004).

It was 2003 when F/OSS policy became more than a series of interconnected local phenomena, and, instead, graduated to a cohesive national effort. In the beginning of the

Lula presidency, many new and radical cabinet members were installed, including the famous musician Gilberto Gil as Minister of Culture. Sergio Amadeu, a long-standing advocate of F/OSS, was appointed as head of a new IT-focused governmental institution, the National Information Technology Institute (ITI). This was no accident: a new paradigm of IT policy was in the works in Brazil, under the tutelage of Amadeu, with the support of Lula and Gil, as well as a slew of others in the leftist government.

The drive towards a national F/OSS policy began with the formation of a federal free software committee. Regardless of the successes of this committee's proposals, the mere existence of the committee has served to support F/OSS in Brazil, in and of itself. The committee formation set the stage for an attack on the prominence of proprietary software. Also, the setup of the ITI in the early 2000s, of which Sergio Amadeu was the head, signaled Brazil's governmental intention to guide the policy in a centralized manner, thus creating strong momentum to lead the country to F/OSS. Before the setup of the federal committee and the ITI, the Brazilian government's information technology needs were entirely decentralized and each ministry chose its systems and hardware on its own (Economico, 2005). The Presidential decree proposal epitomized the federal government's efforts to speed up the implementation rhythm of F/OSS. A group of federal lawyers in Brazil formulated a presidential decree proposal 'to transform the voluntary adhesion of the agencies into technological politics structured by the presidency of the Republic (S. Amadeu, email interview, November 8, 2006). The proposed decree defined F/OSS as a standard for the public administration and forced all

federal government agencies to migrate to F/OSS, unless they could provide a compelling reason not to (Economico, 2005; Kingstone, 2005).

Although momentum was partially derailed due to resignations and political scandal in 2005, the stage was set and wheels were put into motion. The government had both set into motion F/OSS switchovers in government agencies and also let it be known that this was a country that should be known as a safe haven for F/OSS and was a country no longer “owned” by Microsoft.

The results of F/OSS switchovers were manifest throughout governmental agencies. In Congress, for instance, the House of Representatives in Brazil chose not to renew its Microsoft Office software licenses (Cesar, 2003). According to our interview with the former head of ITI, Sergio Amadeu, 40% of web servers used in government are currently based on F/OSS whereas the number stayed at around 5% three years ago when the technical committee was first established. Amadeu also pointed out a few accomplishments made by governmental agencies. The Federal Revenue and Customs Administration in Brazil, for instance, are employing a F/OSS-based program that allows individuals to send tax declarations via their mobile phones. Before the invention of such software, only individuals with Microsoft Windows installed on their computers could file their tax declarations via computer. In addition, currently more than a half of Brazilian Army units use GNU/Linux, and federally owned Banco do Brasil, Latin America's largest bank, has completed the migration of all its Windows XP computers to the OpenOffice.org open source suite.

Such a strong push towards OSS is important because of its rising significance as an alternative to proprietary software and because of its impacts on computer industry market structure. Gartner reports that the growing interest from government in open source software is changing computer software companies' strategies (Maio, 2006). It emphasizes the need for software vendors to reposition their product offerings in order to compete with OSS alternatives. Especially for software industry conglomerates, such as IBM and Microsoft, Gartner foresees increasing pressure on them to move revenue streams from license fees to services and support (Driver, 2005).

Background: Government and the IT industry in Brazil

Support for F/OSS is part of a lengthier lineage of governmental support for the IT industry. Before we assess the impact of F/OSS policy on MNCs (as well on small to medium enterprises – SMEs) in the IT industry, it is first important to understand Brazil's lengthy history of governmental support for the IT industry in general. How has the IT industry benefited in the past from pro-innovation attitudes of the Brazilian government?

In the 1970s, Brazil initiated a 'market reserve policy' which protected Brazilian computer manufacturers and favored an import substitution model of development. The policy attempted to give domestic companies a competitive advantage in the hardware market. The intent behind this policy was that protection of domestic production would result in the increasing competitiveness of domestic computer manufacturers and related fields. However, contrary to the envisioned international competitiveness, the result was higher prices than the average in the international market due to lack of competition in

the domestic market, and slow adoption of information technology in Brazil (Luzio, 1996).

Even though the policy did not achieve its desired goal, market reserve policy paved the way for fast development of Brazilian software industry in the 1990s after market liberalization. Even though the focus of market reserve policy was computer hardware development, it created the base for software industry development by increasing the number of professionals in computer science and related disciplines (Botelho, Stefanuto, & Veloso, 2005). In 2000, Brazil graduated close to 18,000 people in IT areas, which was 101 persons per million inhabitants. The figure is comparable to that of China producing 41,000 IT graduates (69 per million), and India having 71,000 IT graduates (32 per million) (cited in Botelho et al., 2005, p. 103).

During the 1990s, the Brazilian software market experienced rapid growth. It experienced double-digit growth rate over the last decade. During 1990s, the Brazilian software market became the world's seventh largest among world (Botelho et al., 2005). The growth rate of Brazilian software industry sector outpaced the overall economic growth in Brazil. While the growth rate of Brazilian GDP stayed at around 1 to 3 percent, that of software industry in Brazil recorded 15 to 30 percent. Even with the economic turmoil that led to an overall decline in GDP in the late 1990s, the average annual growth rate of Brazilian software market was close to 30 percent. In 2004, the software market size in Brazil was valued at \$9 billion (US Commercial Service, 2004). The number of software development companies also drastically increased from 4300 in 1994 to 5400 in 2000. In the same period, the number of software company employees with software

development-related jobs (as opposed to sales, marketing, finance or HR) increased from 112,000 to 167,000 (Botelho, Stefanuto, & Veloso, 2003). This figure is important as it illustrates growing domestic innovation in the Brazilian IT market, as opposed to growth in the sales and marketing of software developed abroad.

MNCs and F/OSS policy in Brazil

Given the size of Brazil's software market (and the number of computer science-educated professionals), Brazil is obviously far from a second thought for large MNCs in the IT industry. Any change in IT policy in Brazil, particularly a change in emphasis, could be expected to engender some sort of reaction on behalf of MNCs. We have endeavored to look at Brazil's version of F/OSS policy from the perspectives of three MNCs operating there: Microsoft, IBM, and Sun Microsystems, through a series of email-based interviews with executives, as well as through press releases, and interviews published in the popular press. In this paper, we have set out to answer a series of questions. First, how does a switch to F/OSS policy change and restructure the business landscape for IT MNCs? How does this play out? what new sorts of strategies does this changeover engender? What are the similarities and differences in how firms respond to this change?

We have taken a two-tiered approach to investigating the concrete outcome of what is widely known as Brazil's F/OSS policy. First, what specific opportunities or obstacles appeared for each corporation as a result of the new policy? This is where the policy actually functions – in a series of small individual opportunities, linked together by

a common causal thread. Second, how have these specific opportunities affected each MNC's strategy in Brazil? This is vital, as policy is ideally enacted not to create individual opportunities for specific companies, but rather to change the way that, for instance, an entire industry functions.

To answer these questions, we conducted interviews with individuals with first-hand knowledge of Brazil's F/OSS policy and its implications. Interviewees include Sergio Amadeu, the former head of ITI; Luiz Maluf, Director of Sales Operations at Sun Brazil; and Cezar Taurion, Manager of New Applied Technologies at IBM Brazil. We were unable to secure any responses from Microsoft. The interviews were done via email during the month of November 2006.

Microsoft

Microsoft is certainly the company most visibly affected by anything having to do with open source and Microsoft was definitely affected here in terms of specific local obstacles. And, given the highly visible show-down between Sergio Amadeu and Microsoft Brazil over his comparison of Microsoft "pushing" its proprietary software much as a drug-dealer would (which included brief attempts on behalf of Microsoft to sue Amadeu for slander), one might expect to see a lengthy series of Microsoft reactions to obstacles put in its place by F/OSS policy. While we have found significant obstacles thrown into Microsoft's path as a result of this policy, it is less easy to pinpoint Microsoft's reactions.

In the area of specific obstacles, Amadeu highlighted what he saw as one of the main functions of F/OSS policy in the 2003 – 2005 period: "break[ing] the market

reserve that proprietary software and mainly Microsoft had in the federal public administration” (email interview, November 8, 2006). In other words, much of the initial function of national F/OSS policy may have been in breaking Microsoft’s *mental* monopoly – impressing upon IT decision-makers in government agencies the existence of alternatives to proprietary software, and these realizations have led to concrete changes. As mentioned earlier, this period marked a remarkable increase from 5% to 40% of government agencies that have migrated to F/OSS (S. Amadeu, email interview, November 8, 2006). Clearly, at least in the governmental sector, the business-to-business (B2B) market has experienced a remarkable shift from dominance by Microsoft to a more competitive picture.

In terms of global strategies, we are faced with an interesting situation. While Microsoft is usually loathe to publicly admit that its global level, national level, or local level decisions are direct reactions to market challenges from F/OSS, their 2006 annual report (similar to other Microsoft annual reports in recent years) lists the growing usage of F/OSS, specifically as promoted by governmental policies worldwide, as a “Risk Factor.” Without specifically mentioning Brazil (or any other F/OSS-promoting government), the annual report states:

“...the popularization of the non-commercial software model continues to pose a significant challenge to our business model, including recent efforts by proponents of open source software to convince governments worldwide to mandate the use of open source software in their purchase and deployment of software products. To the extent open source software

gains increasing market acceptance, sales of our products may decline, we may have to reduce the prices we charge for our products, and revenue and operating margins may consequently decline... As open source software development and distribution evolves, we continue to seek to differentiate our products from competitive products based on open source software.”

Differentiation and price reduction, then, could be considered the pillars of Microsoft’s global strategies to counter widespread F/OSS usage – yet Microsoft’s counter-Linux strategy could be considered anything but as clear-cut as the existence of these two “pillars” would suggest.

At a 2005 Financial Analyst Meeting, Kevin Johnsonⁱ, spoke with investors regarding “competing and winning vs. Linux,” detailing Microsoft’s strategy counter-Linux strategy. The focus is on what they refer to as “mobilization,” or communicating to the world at large the value of Microsoft’s proprietary software and why it is superior to F/OSSⁱⁱ (Johnson, 2006). In addition to differentiation through information-based “mobilization,” and the looming specter of price reduction on existing products, we point to two specific Microsoft initiatives currently operating in Brazil (as well as throughout much of the developing world) that may be seen as competing with similar products based on F/OSS: Windows Starter Edition and the FlexGo PC plan.

Windows Starter Editionⁱⁱⁱ is a stripped-down version of Microsoft’s pervasive Windows operating system, with lower levels of functionality (users can, for instance, only run three applications at one time, and may only have three windows open at one time as well). This edition of Windows also has a much lower cost than Windows itself.

It is currently available only to OEM distributors (it is not available for sale directly to consumers), and the pricepoint is not public information. An October 9, 2006 press release by Microsoft boasts of sales exceeding 1 million copies.

Microsoft insists that Windows Starter Edition is not a reaction to F/OSS. See for instance, a 2005 interview with Mike Wickstrand, Director of Windows Starter Edition, where he insisted "our team's inspiration [for Windows Starter Edition] is not about Linux and piracy. It's about helping to improve access to technology for first-time users — people who have never bought a PC and are not pirates." (Foley, 2005). Yet, at the same time, Windows Starter Edition can be seen in many ways as the perfect competitor with F/OSS products. Every computer sold with Windows Starter Edition installed upon it serves three functions for Microsoft. To begin with, all first time users of Windows Starter Edition that are also first time users of PCs (and this is the target market) are becoming acculturated to the Windows environment. In the future, when users are making PC-purchasing decisions, the Windows desktop will seem like the natural PC environment. In addition, every PC running Windows Starter Edition is one more PC not running an open source-based operating system, so computers running the Starter Edition OS both support Microsoft and hurt the potential wider adoption of F/OSS. Last but not least, each computer running Windows Starter Edition puts at least a nominal amount of money in Microsoft coffers, particularly important as the OS nears the end of its life-cycle, and as piracy runs rampant on more expensive versions of Windows.

Johnson, in his 2006 address to investors, actually linked the distribution of Windows Starter Edition (particularly as part of development programs in conjunction

with governments) to Microsoft's efforts to compete with Linux, yet did so without alluding to any of the above points. He mentioned Microsoft's experiences in Brazil (wherein Microsoft convinced the government to allow PCs running Windows to be a part of the PC Connectado program^{iv}) as part of Microsoft's global strategy of partnering with governments engaged in IT development projects. The discussion of such development programs (particularly in Brazil, a country that has recently become widely known for its F/OSS efforts) in a talk on competition with Linux suggests the above strategies without specifically naming them.

The FlexGo strategy is similar to the Windows Starter Edition strategy in terms of the three functions mentioned above, but targets a market with greater prior knowledge of computers. FlexGo is a program wherein consumers can buy a PC running Windows (regular edition) for a down-payment of approximately half the price of a regular PC. The consumer then pays off the second half of the PC through the purchase of prepaid time cards (the total cost is significantly above that of a non-FlexGo PC so the second "half" winds up being well more than half). In this way, payments are not on a set schedule. Instead, the consumer purchases more time on their PC whenever they can. If they cannot afford another time card, the PC will stop working (Microsoft is quick to note that it is the distributor and not Microsoft itself that will "turn off" the un-recharged PC) until the time when another card can be purchased. Once the consumer has purchased the requisite amount of timecards, the PC is theirs to keep.

Both Windows Starter Edition and FlexGo are, in our opinion, part of Microsoft's Linux-competitive strategy: a strategy that mixes differentiation with price reduction to

produce versions of the Windows operating system that are more affordable to the public and therefore competitive with F/OSS. These two products, while maintaining a particularly strong presence in Brazil^v, are not Brazil-specific. They are, instead, global products that appear to be part of a global strategy. We can see from Microsoft's annual report that global governmental efforts to shift to or promote F/OSS are a legitimate global concern for Microsoft. It is difficult in this case to separate Microsoft's global strategy against F/OSS initiatives from Microsoft Brazil's strategy. While clear losses of business in the public business-to-business sector can be linked directly to F/OSS policy, changes in global strategy have a less direct link. In terms of altering Microsoft's strategy, it appears that Brazilian F/OSS policy may function more as a signifier of a global trend than as a direct stimulus in and of itself. Rather than serving as a direct impetus for change, this migration may have simply added in a very significant attention-getting way to a landscape already becoming filled with open source – related obstacles to Microsoft's business plan.

Microsoft's recent announcement of collaboration with Novell, a F/OSS developing company, could throw a new strategy into the mix. Depending on how it pans out, this partnership could represent Microsoft's intentions to profit from the F/OSS market after years of championing the proprietary software model. (*Microsoft and Novell Announce Broad Collaboration on Windows and Linux Interoperability and Support*, 2006). By collaborating with a company which can offer F/OSS-related services, Microsoft attempts to offer flexibility to 'mix and match a hybrid stack of proprietary and

open source' (Weiss & Enck, 2006)' to its customers who otherwise may have been exclusive users of F/OSS. This recent development will need to be closely watched.

We will now move to a look at Brazil's F/OSS policy on the ground from another perspective: that of two IT MNCs that benefit from widespread adoption of open source software. In stark contrast to Microsoft's boast of "cooperating" with the Brazilian government on the PC Conectado program, both IBM and Sun have partnered with the Brazilian government in multiple ways in support of F/OSS.

Sun Microsystems

In terms of specific opportunities, Sun Microsystems has encountered many as a result of F/OSS policy in recent years. Sun has received multiple contracts related to the public sector migration to F/OSS. For instance, Sun has received multiple contracts to train public employees post-migration (L. Maluf, email interview, November 22, 2006). In January 2005, for instance, the Brazilian postal service signed a contract with Sun Microsystems to replace Microsoft office suite with Sun's OpenOffice (Bloomberg, 2005), while state-owned Banco do Brasil migrated from Windows XP to OpenOffice later that same year (*Banco do Brasil, a successful case on the OpenOffice.org migration*, 2006).

When asked about the concrete effects of the acceleration of F/OSS policy on the IT landscape in Brazil, Luiz Maluf, Director of Sales and Operations at Sun Brazil, focused less on individual opportunities such as these and more on what he says has been increased opportunities for growth for Sun in Brazil, created by greater quality human capital and stronger governmental support for research and development. This newly

supported R&D has occurred at private companies (both MNCs and SMEs) as federal procurement policies invest more into F/OSS, in institutions of higher education, and in society at large. Human capital and R & D are, of course, quite inter-related. Particularly in the case of F/OSS, support for one will tend to lead to results in the other. Sun itself has been particularly proactive in working to facilitate human capital through education. The F/OSS-centered company recently sponsored a course for 500 Brazilian students at the National Institute of Information Technology in conjunction with the federal Brazilian government (S. Amadeu, email interview, November 12, 2006), supporting both the development of R&D at a federal educational institution and the cultivation of human capital in Brazilian society at large. Similarly, In June 2006, Sun Microsystems agreed on partnership with the Brazilian government in developing open source operational system, such as OpenSolaris and GNU/Linux and supporting software developing community (European Communities, 2006).

It is important to remember that R&D for F/OSS does not occur solely through governmental support and top-down corporate management. Sun, like other MNCs working in F/OSS, benefits from software development occurring within global networks of open source programmers – whose ranks may soon be joined by the very students that were educated in the Sun-sponsored class at the NIIT. Sun, for instance, recently initiated OpenSolaris, an open source community devoted to working on Sun’s Solaris operating system.^{vi} Shortly after the launch of the OpenSolaris community, Sun formed a Brazil-specific sub-community which has been quite active. “We are amazingly surprised for the sound Java^{vii} literacy created in the country,” Maluf reported. “Overall,

Brazil has the third largest Java community worldwide after China and USA.

Proportionally to the population, Brazil has more Java engineers than India. Only in two Java groups, there are 37,000 Java Systems engineers and the estimated number of these technicians... range from 89 to 100 thousand” (Maluf, email interview, November 22, 2006). These all point to concrete growth and opportunities for Sun in Brazil.

Maluf’s responses to questions about Brazil’s F/OSS policy reflect the many opportunities that Sun Brazil has experienced, and point to a drive by Sun towards partnering with the federal government to facilitate the development of local human capital in Brazil. This drive to facilitate human capital, of course, benefits Sun as local development communities are enhanced and also benefits the IT industry as a whole if more programmers are indeed created. To sum, Maluf cited the concrete changes as governmental agency migrations to F/OSS, private sector migrations to F/OSS, “continuous availability of human resources with in-depth expertise and low cost,” and further support from the government for R&D. While opportunities arising through governmental agency migrations to F/OSS can clearly be tied to governmental policy, other benefits Sun has seen have a less direct connection to Brazil’s highly publicized F/OSS policy. Opportunities arising through the cited instance of increased private sector migrations to F/OSS, in particular, are an instance where there is no direct link between specific policy and changing realities.

When a government chooses to alter the market through corrections only in the public sector, as Brazil has done with F/OSS, the spillover to private sector and the entire market can take place in one of two ways. The first is through overall development of the

sector through increased support for R & D, and encouraging companies to devote increased resources to F/OSS, for both the public and private sector. This increases the quality of F/OSS resources in the country, which has happened in the Brazilian case. The second method for spillover to occur is that which we have seen affecting Microsoft: the function of the policy may be more to add to a global open source trend, rather than to its specific local function. In other words, the policy functions to create an environment across both sectors that are friendly to F/OSS in general.

Maluf answered this quandary – how private sector migrations can be tied to F/OSS policy aimed at the public sector – by emphasizing that a federal policy also aligns previously disconnected efforts towards a defined goal. No matter the varied shapes F/OSS policy could take, Sun is happy to exist in a landscape defined by one at all, as this guarantees consistency and commitment at the very least. Any governmental assistance in F/OSS benefits and strengthens the open source community from Sun's point of view. Maluf cites very recent interoperability guidelines put forth by the Brazilian government as one of the most important aspects of F/OSS policy. When the Brazilian government began a drive towards F/OSS policy, Sun chose to put a lot of energy into partnering closely with the government and developing local capabilities on the ground for the public and private sectors in Brazil as a result. The company has experienced benefits both in terms of specific local opportunities and in terms of a national drive for R & D and growth in employees.

IBM

Like Sun, IBM has clear benefits from policies promoting F/OSS. IBM has also experienced opportunities in Brazil in the migration of public agencies to F/OSS similar to those of Sun. For instance, IBM secured a contract with Banco do Brasil in 2005 with its decision to choose IBM over Microsoft's NT. The contract was worth \$400 million (Computer Business Review, 2005), while, in December 2004, IBM announced partnership with Sao Paulo state government in training its government professionals on the use of open source software (European Communities, 2004). Cezar Taurion, Manager of New Applied Technologies at IBM Brazil, cites increased Linux adoption in the public sector – as well as the private sector – as a noticeable area of recent opportunity for the company in selling more of both IBM hardware and software (personal communication, November 8, 2006).

Like Sun, IBM Brazil has not stopped at capitalizing on increased local opportunity in migrating governmental agencies, however. In the past few years, IBM has opened two important software development facilities in Brazil: a branch of the Linux Technical Center (LTC) and a branch of IBM's HIPOD facilities. The LTC is a global group of programmers employed by IBM to develop open source software for worldwide use. The recently opened Brazilian branch employs 50 – 60 people (C. Taurion, email interview, November 16, 2006). HIPOD (short for high-performance on-demand solutions) facilities (of which there are only six worldwide) are even more high-profile and focus on providing some of IBM's largest customers with large-scale computing solutions. This focus on local Brazilian R&D and Brazilian employees could be considered a testament to IBM's faith in the quality of Brazilian programmers. Clearly,

Brazil is considered very important in IBM's growth strategy. In its 2006 annual report, IBM cited Brazil as the country experiencing highest levels of growth: IBM currently has 12,000 employees in Brazil, and Taurion predicts that this number could soar to 20,000 in the next four years (email interview, November 16, 2006).

Also like Sun, IBM experienced many specific local opportunities and has also seen national opportunities related to R & D and high quality human capital and has partnered with the government in encouraging such opportunities. In September 2004, for example, IBM signed a contract with Brazil government in setting up a Knowledge and Technology Center at the University of Brazil, a joint effort with government to promote Linux and other OSS (Loftus, 2004). Unlike Maluf of Sun, Taurion is not quick to relate these national level opportunities – or even a substantial amount of local level opportunities – to governmental F/OSS policy. Saying “there [is] not a direct link between this growth strategy and Brazilian Open Source policies,” he points in another direction to locate main triggers for IBM's devotion of more resources to R&D in Brazil (email interview, November 16, 2006). For one, Taurion notes that Brazil is considered by global IBM to be a “high potential country,” partly in relation to the widely publicized BRIC development strategy^{viii} and points to outsourcing and off-shoring practices from other countries as a main driver of growth in IBM's operations in Brazil. He does, however, mention the strong Brazilian programmer community as one reason projects are “outsourced” to IBM Brazil. While, as mentioned previously, much of this strength may stem from Brazil's history of strength in and support for IT, with roots in the market

reserve policies of the 1970s and 1980s, these educational and development programs cannot be discarded as a contributing source.

Although IBM Brazil has experienced local opportunities and national growth similar to those of Sun Brazil, Taurion sees more rhetoric than actual commitment by Brazil government in accelerating F/OSS implementations, saying “The gradual adoption of F/OSS is really a issue. Unfortunately, we saw a lot of words, few actions. We'll hope that in [the] next [few] years the situation will change, mainly because some "ideologists" lost their positions in government's agencies... (C. Taurion, email interview, November 21, 2006).” Yet even if the policy is, as Taurion suggests, over-gradual and even toothless, there is no question it has at least created concrete local opportunities for companies like IBM and Sun, while creating obstacles for proprietary MNCs such as Microsoft.

Discussion

We set out in this paper to examine a series of research questions related to Brazil's highly publicized F/OSS policy. In attempting to analyze how a switch to F/OSS policy changes and restructures the business landscape for IT MNCs and the new strategies that this changeover brings about, we looked at the experiences of three IT MNCs in Brazil. For each company, we looked at specific opportunities or obstacles that can be associated with Brazil's operationalization of F/OSS and how these specific opportunities have affected each MNC's strategy in Brazil.

Increased utilization of F/OSS as a direct result of policy in Brazil is clear. Worldwide Linux adoption by governments and public sector institutions has been on average 38% growth per year during the last five years (Rose, 2002), whereas Linux adoption by governments in Brazil grew at over 180% per year during the past two years (S. Amadeu, email communication, November 8, 2006). This comparative statistic shows substantial results of the Brazilian government's operationalization of F/OSS policy. These results were important for individual MNCs in creating specific local obstacles and opportunities for them. These were most clearly visible in the public business-to-business sector, where a large number of public agency migrations took business from Microsoft and created opportunities for companies like Sun and IBM in installation, training, and support of F/OSS systems.

Both IBM and Sun also saw concrete growth in their Brazilian operations in the same timeframe that Brazil's F/OSS policy was gaining strength. IBM had explosive growth, particularly in numbers of employees, and has been chosen as the site for high profile IBM development facilities. Sun, too, has seen growth in JAVA and OpenSolaris programming communities in Brazil. While there is no direct link, the connection between this national growth in human resources and F/OSS policy cannot be discounted. The link between F/OSS policy and increased human capital functions in many ways.

To begin with, any increased income gained through public agencies that have switched to F/OSS contribute to F/OSS companies having more resources to spend on education and development of human capital. Additionally, besides pushing F/OSS migrations through in public agencies, the federal committee initially overseen by Sergio

Amadeu also devoted resources to education. This was facilitated by partnerships with corporations such as Sun and IBM, including Sun's partnership with the government in offering courses at ITI and IBM's Knowledge and Technology Center at the University of Brazil. Efforts such as these have contributed to improving the quality of R &D through educating potential software developers. Lastly, F/OSS development communities are self-propagating. When Brazil committed to supporting F/OSS, national momentum in the spread of F/OSS throughout Brazil increased. In this way, way in which the government operationalized their F/OSS policy can matter less than the fact that F/OSS is being supported at all.

As was found in our interviews with executives at IT MNCs and the former head of ITI, governmental promotion of F/OSS policy not only unleashed a number of specific local opportunities and national level opportunities, but it also altered the playing field and affected the strategies of major players in the IT industry. Sun and IBM both focused on partnering with the federal government in training and education of potential users and potential developers. Microsoft, on the other hand, has had to go into a more defensive mode, utilizing strategies of differentiation and price reduction, and unveiling new products meant to attract a lower end consumer market. Microsoft has also attempted partnership with the government, although to little avail.

Table 1 presents a summary of how each MNC reacted in every business category. The bolded elements refer to specific opportunities each corporation encountered in Brazil as a result of this policy, while those in regular type refer to global level strategies that might be traced back to F/OSS policy to some extent. This is not meant to be a

summary of each corporation's global strategy regarding F/OSS, but rather an illustration of those global strategies that are most important in the Brazilian market, post-F/OSS policy. The table breaks down each company's obstacles, opportunities, and reactions in order to more easily see where a MNC based on proprietary software and MNCs based on F/OSS might compete and collide in an IT industry beginning to tilt further towards F/OSS. As we can see, the business-to-business market is the area most affected by F/OSS policy. It is unclear how Microsoft's increased efforts in business-to-consumer sales will pan out.

In this study, we set out to answer a series of research questions. We conclude that, in Brazil, MNCs experienced specific obstacles and opportunities that were direct results of F/OSS policy: gaining or losing business in the public sector. For the two F/OSS companies we studied in Brazil, we can also relate increased corporate focus on human resources, as well as reports of increased numbers of and quality of human resources in Brazil in a number of ways, both directly and indirectly to F/OSS policy. While F/OSS companies have devoted more resources and attention to human resources in Brazil, Microsoft has altered its strategies, which, for Microsoft, occurs not on a national but rather on a global level. Rather than a response to specific Brazilian policy, Microsoft's efforts to differentiate itself and promote products such as FlexGo and Windows Starter Edition are part of a global strategy in competing with F/OSS. Microsoft itself cited the efforts of "governments worldwide to mandate the use of open source software in their purchase and deployment of software products" (Microsoft Annual Report, 2006) as a main driver of the risk Microsoft faces from F/OSS

competition. Whether utilizing preferential mandatory procurement policy as Venezuela and some local Brazilian governments have, or utilizing inclusive procurement policy, as the federal Brazilian government has, what is clear is that the network of F/OSS policies around the world serves as a global force affecting the strategies of a global corporation. Added together with dozens of other countries creating similar F/OSS opportunities, it appears that country level F/OSS initiatives are changing the landscape for global IT MNCs. We conclude that one of the main functions of Brazilian government F/OSS policy is in contributing to the many local windows of opportunity that make up the global strategy. Brazil's contribution to changing the landscape for IT MNCs lies in part in adding a particularly loud voice to a worldwide chorus for F/OSS switchover.

In order to have a full scale picture of governmental migration toward F/OSS and its resulting impacts on commercial players, future research needs to study a wide variety of different governmental F/OSS policy. This study is limited in that it focused on one country. Parts of MNCs reactions are locally driven, but, as we see in our study, some other parts are global decisions made in their headquarters. Posing the same set of questions to other countries with F/OSS policy will contribute to a worldwide picture of F/OSS policy and will allow researchers to compare different types of F/OSS policy implementation and their impacts. Since this study has been done at a time when F/OSS policy is still in its infant stage, further work is also needed in near future to assess longer-term consequences.

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Table 1. *Opportunities for major IT MNCs with Advent of F/OSS: Focus on Brazil*

Note: **Bold** is Brazil-specific F/OSS strategy, while unbolded text refers to general global strategy

	Software			Hardware		Service
	B2C	B2B	Sales to computer manufacturers (OEM)	B2C	B2B	
IBM	Design: LTC, HIPOD	No direct financial gain, but usage in public and private sectors. Design: LTC, HIPOD, Knowledge and Technology Center	None, but designed through: LTC, HIPOD, among others	N/A	more opportunities with private and public companies.	Increased opportunities with private and public companies Also, contracts to train govt employees
Sun	Designed by: OpenSolaris	No direct financial gain, but more usage in public and private sectors Design: OpenSolaris	None, but designed by: OpenSolaris, JAVA community, among others	N/A	more opportunities with private and public companies.	Increased opportunities with private and public companies Also, contracts to train govt employees
Microsoft	FlexGo,	Losing battle here, especially for state agencies. Strategy = differentiation, price reduction	Windows Starter Edition	FlexGo computers are sold via distributors, with Windows on them	Losing battle here, especially for state agencies. Strategy = differentiation, price reduction	recent acquisition of Novell may include Microsoft in this market for F/OSS

ⁱ Group Vice President, Worldwide Sales, Marketing and Services Group

ⁱⁱ The strategy, Johnson reported, is to emphasize and communicate differentiation from F/OSS based on assertions of superior reliability, lower cost of ownership over time, higher levels of IP indemnification, and superior security standards (2006).

ⁱⁱⁱ While the operating system did not debut in Brazil, Brazil was one of the first places in which it was deployed.

^{iv} The PC Connectado program offers tax reliefs in order to offer low-cost PCs to first-time computer users in the country.

^v It is worth noting that Microsoft chose Brazil as the country in which to do its first trial run of FlexGo.

^{vi} The vast majority of the community's members are not employees of or otherwise associated with Sun.

^{vii} Java is a programming language developed by Sun Microsystems and is implemented by Sun as well as companies such as IBM, Diebold, EDS, Oracle, and Accenture.

^{viii} Developed by one financial market analyst, the concept of BRIC suggests that growth strategies for IT corporations worldwide should focus on Brazil, Russia, India, and China because of their large populations and growing potential.