Open or Closed? Software for Development:

The Politics of Software

Policy in Brazil and Argentina

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1 Introduction

1.1 Software & Development

Why in some developing countries does policy favour the use of free and open source software (FOSS) whilst favouring proprietary software in others? Given that FOSS can present better value than ‘closed source’ proprietary software, as attested by the switch to FOSS from proprietary software in commercial enterprise (cf. Softex, 2005) and in governments in developed countries (cf. BBC, 2009; CSIS, 2008), why would some developing countries, as net importers of software, favour use of proprietary software?

In my research I will provide a framework for understanding cross-national variation in software policy which I will apply to two countries in Latin America. Through an analysis of the political economy surrounding software in these countries, I will explain software policy outcomes by examining actors’ interests and resources, the opportunities that exist for association between them, and the strategies they employ in pursuit of their interests.

As FOSS emerged as a technically viable alternative to market dominant proprietary software around the turn of the millennium (Weber, 2000), policies promoting FOSS drew ire from powerful US software firms (Festa, 2001). Through a range of strategies these firms pressured governments around the world to avoid adopting such policies (BBC, 2002; d'Empaire, 2002; Reuters, 2004; Casadesus-Masanell & Ghemawat, 2006:7), often with successful results (Chan 2004; Marwaha 2009). Yet
despite these efforts, governments in some developing countries have proceeded to adopt policies which promote the use of FOSS, a move which is perhaps surprising given the relatively weak position of these governments vis-à-vis their opponents.

In view of this puzzle, further to explaining cross-national variation in software policy, my research will also be concerned with explaining how governments came to adopt policies favouring FOSS.

The research holds development relevance for its focus on issues that affect the socio-economic benefits to be derived from software, a good that is fundamental to processes of technological upgrading and economic development (Gallagher & Porzecanski, 2008). Central to industrial manufacture (Schware, 1992; Evans, 1995) and the information economy (Ó Riain, 2004; Singsangob, 2003), software offers perhaps greater development opportunities than any other contemporary technology given its critical role in modern production and service provision.

Software has become increasingly significant to development as knowledge has grown more important to the generation of wealth (Castells, 1996). As its importance has risen, knowledge has become vital to power in the international system, underpinning not only economic strength but also coercive capacity (Strange, 1994). The ascendance of knowledge has been accompanied by an attendant rise in efforts to protect knowledge through property rights (Coriat & Orsi, 2002; Landes & Posner, 2004; Evans, 1997). With production of information based goods dominated by the US and other developed nations, these countries have headed efforts to protect
knowledge, interpreting intellectual property (IP) as private property and raising
levels of IP protection (IPP).

Championing their interpretation of IP as the means to harness the economic potential
of knowledge (Chang, 2002), developed countries have pressed for stronger IPP to be
implemented in developing countries (Sum, 2003). But whilst strong IPP benefits IP
owners, it raises the costs of knowledge for users, stifling knowledge transfer and
follow-on innovation. Where IPP protects developed countries’ competitiveness in
knowledge based industries, it negatively affects net importers of knowledge based
goods in the developing world, contributing to a ‘digital divide’ between the global
North and South (Shaw, 2009).

Because of the significance that ICT holds for wealth creation, the way in which
property rights are applied to ICT has major ramifications for welfare distribution
within and between developed and developing countries, as well as rates of
innovation and economic growth (Weber & Bussell, 2005). Property rights in ICT
thus represent one of the principle determinants of the balance of power between
North and South, facilitating the maintenance of economic and political power
asymmetries that favour the North. Although the North’s superior power advantage
suggests its continued dominance over the South, these dynamics are by no means
predetermined due to the potential of technological change to precipitate economic,
social and political transformation (Boas & Dunning, 2005).

Despite the constraints IP places on flows of informational goods and knowledge
from North to South, innovations in IP, made possible through technological change,
offer new opportunities for developing countries to bridge the digital divide. The most radical of these innovations concerns FOSS, software licensed under terms that invert the notion of IP as private property, allowing the unrestricted use, reproduction, distribution and adaptation of computer programmes (Rodriguez, 2005; St. Laurant, 2004). In comparison to its proprietary counterpart, FOSS may not only be cheaper, assisting ICT democratisation (Weerawarana & Weeratunga, 2004), by facilitating knowledge transfer it also permits follow on innovation (Softex, 2005; Weber, 2003). Moreover, by allowing access to the source code of computer programmes, FOSS offers users greater control over technology, a factor which enhances the autonomy of developing countries to develop technology suited to local needs.

Whilst FOSS may provide valuable opportunities for development, the extent to which developing countries will realise these opportunities is likely to be contingent upon politics. Market dynamics balanced heavily in favour of proprietary software (cf. Evans & Reddy, 2003:80; Comino & Manenti, 2005), FOSS’ prevalence will be contingent upon the relative power and willingness of its supporters to promote it. Interests will matter to actors’ power by affecting opportunities for mobilisation, as will resources, including control over different facets of technology (cf. Sassen, 2000; De Landa, 2001; Herrera, 2002). The state will play a key role in determining whether FOSS becomes more widely used because it can affect software use through legislation (Evans, 2005). Generally representing the largest IT user in developing countries, the state may also influence software use through procurement choices (Weerawarana & Weeratunga, 2004). By affecting the interests of the actors that surround software, software policy is at the heart of a political conflict embodying the broader struggle over IPP in ICT.
As politics will determine the extent to which developing countries might benefit from software, understanding of these politics is essential. In addressing these politics, my research will contribute to understanding on a theme of central importance to the study of development. The velocity of technological development necessitating current knowledge to make sense of unfolding power dynamics, my research will provide an up to date view on a struggle that has the potential to radically re-shape power relations between developed and developing countries.

In the rest of this section I will discuss existing academic literature on the politics surrounding software policy in developing countries, drawing attention to the limitations of this work and making suggestions as to how these limitations might be addressed. Section 2 will describe in greater detail the outcome the research aims to explain, defining how software policy is to be operationalised and the range of potential variation in this variable. Section 3 will focus on how the research questions will be approached, advancing a set of causal factors thought to matter in explaining cross-national variation in software policy. In the case of each factor, justifications will be advanced as to why the factor is thought to matter, followed by a description of the processes by which the factor might affect policy, including interactions between different factors. In section 4, I will attend to how I will go about observing the processes described in the research hypotheses. This section will explain the research design, discuss the cases selected for study, consider data collection and analysis, and provide a ballpark timetable for executing the research.
1.2 Existing Knowledge

Notwithstanding the importance of the topic, the politics of software policy in developing countries has received relatively little direct academic attention. Although a number of scholars have addressed the political economy of software in developing countries (Wade, 2002; Sum, 2003; Weber, 2003; May, 2006), discussion has been general rather than focused on policy. Those few scholars who have concentrated specifically on examining the politics surrounding software policy itself have offered explanations that are incomplete.

For example, Schoonmaker (2007; 2009) discusses the discursive dimensions of the politics surrounding software policy in Brazil, but not actors’ capacities or the strategies actors employ to obtain their preferred policy objectives. In focusing upon the motives of policy advocates, Schoonmaker fails to explain how these advocates came to mobilise the authoritative power necessary for their policies to receive the backing of the Brazilian government.

Addressing actors’ strategies for pursuing policy objectives, Kapczynski (2008) argues that framing offers a more convincing explanation for the adoption of FOSS promotion policies than structural and material factors. However, the examples upon which Kapczynski’s argument is based suggest that if framing works, it is because of, rather than in spite of, material factors, her description of the coalitions surrounding FOSS acknowledging the inclusion of corporations (Ibid.:831), actors that may help overcome the costs of collective action through their material resources. Whilst framing may be significant to explanations of politics, it is insufficient as an
explanation in itself because its effectiveness will likely be contingent upon actors’ material interests and capacities (Drahos, 2008).

For explanations of the politics of software policy to be complete, they must not only account for why a particular policy was chosen out of the possible policy options that existed (Gourevitch, 1986:54). Explanations must also consider actors’ resources and material interests, the axes along which alliances may be built or divisions drawn, as well as the strategies actors employ in pursuit of their interests. Moreover, it is not sufficient to acknowledge the factors that affect policy outcomes, explanations must also describe how factors lead to outcomes. Complete explanations require that the processes by which factors affect policy outcomes be understood, a requirement that calls for a focus on the identification and explication of causal mechanisms.

In relation to software policy itself, another issue with the work discussed above, especially that of Schoomaker, is that the meaning of the word policy is left undefined. This leads to ambiguity over whether ‘policy’ means legislation carrying authoritative sanction or initiatives, instigated independently by state institutions without legislative endorsement. This distinction is important. Only laws carry authoritative sanction, and thus force, meaning they are likely to have a greater impact than initiatives lacking formalisation in law. With relation to politics, legislation also embodies a decisive political outcome, the ratification of laws being contingent upon the mobilisation of authoritative power (Gourevitch, 1986:54). Whilst initiatives may reflect political influence, they stem from power delegated by authority and control of resources already committed by government. If study of the politics surrounding
software policy is to be meaningful, policy must be defined as legislation, for only legislation carries substantive implications and rests fully on political support.

If what is meant by policy is unclear, a further issue with the above accounts is that whilst both evoke articulate policy promotion of FOSS, no attention is given to policy implementation. The releasing of funds and resources and the provision of enforcement not only affect the impact a policy will have (cf. Shadlen et al. 2005), they also reflect political commitment to a policy. Policy implementation therefore represents a necessary consideration for political analysis of software policy, if such analysis is to be thorough.

The lack of attention afforded to policy implementation in the above accounts is indicative of a scarcity of quality empirical knowledge pertaining to the realities of software policy in developing countries. This scarcity affects discussion of these policies in academic literature generally, as signalled by frequent citation of anecdotal information from press and Internet sources (cf. Weber & Bussell, 2005:76) and even reliance on such sources instead of other primary sources such as interviews (cf. Schoonmaker, 2009; 2007).

In view of the gap in knowledge on the politics of software policy in developing countries, a gap that is accompanied by a paucity of knowledge on policy itself, there appears to be a strong need for field-based research in this area. My research will directly address the issues identified with the existing literature, contributing at the same time empirical knowledge on an important topic upon which little information exists.
2 Defining Software Policy & Policy Variation

2.1 Defining Policy

For the reasons discussed in the previous section, policy will be defined as legislation within the research. Legislation relating to software may be adopted in a number of policy areas including public procurement, social policy and industrial development. The research will be specifically concerned with explaining legislation pertaining to the terms under which software is licensed.

2.2 Defining Policy Variation

To identify policy variation across countries and associate it with implications for software use and variation in potential causal factors, variation must first be defined. This task may be fulfilled by constructing a typology of software policy.

Figure 1, below, provides a typology of software policy that captures variation considered significant to software use, based on academic discussion on this subject (Evans & Reddy, 2003; Hahn, 2003; Weber, 2003; Weerawarana & Weeratunga, 2004; Comino & Manenti, 2005; Softex, 2005). On the x-axis, ‘political intervention’ refers to the agency a policy adopts with regard to promoting software. On the y-axis, ‘software type/licensing scheme’ refers to the type of software a policy promotes, or the conditions under which such software is licensed. The numbers within the grid represent examples of policies, each holding distinctive implications for software use.
Further to the variation considered in the typology, the research will also be concerned with explaining variation pertaining to policy implementation. Such variation will be defined in terms of whether resources are released for policy implementation, the extent to which a policy is enforced and issues relating to policy efficacy.
Figure 1: Typology of Software Policies

LEGEND: Examples of Software Policy

1. No formal policy
2. Education / publicity featuring only proprietary software
3. Advisory policy, advising use of proprietary software only
4. Prevent use of non-proprietary software (e.g. prohibit use of FOSS in public sector through ruling; de facto prevention on use of FOSS in public sector or government project through deployment of proprietary software)
5. Education / publicity featuring both software types
6. Advisory policy, advising consideration of both software types
7. Require both software types to be considered in public procurement process
8. Education / publicity featuring only FOSS
9. Advisory policy, advising use of FOSS only
10. Prevent use of non-FOSS (e.g. mandated use of FOSS in public sector; R&D on software licensed under FOSS terms)
3 Explaining Variation in Software Policy

Whilst existing explanations of the politics of software policy in developing countries may be incomplete, hypothetical explanations may be derived from wider theoretical and empirical study within the social sciences. These explanations focus on the processes by which causal factors may affect policy outcomes.

3.1 Costs & Benefits of Using Different Software Types

Put simply, economics matter to software policy because software policy matters to economics. By affecting software use, software policy holds ramifications for economic development, and thus a state’s welfare and power. Assuming policy reflects the desire to maximise absolute welfare, policy will favour the type of software that yields the greatest surplus. In the case of developing countries this software will generally be FOSS as these countries are net importers of proprietary software; switching from proprietary software to FOSS may reduce import bills whilst generating greater economic activity (Weerawarana & Weeratunga 2004).

On the demand side, although issues of technological path dependency may affect costs of switching software (cf. Pierson, 2000), FOSS can offer users significant savings over proprietary software by eliminating licensing fees, removing vendor lock-in, and reducing hardware, upgrade and maintenance costs (cf. Teknologi-Rådet, 2002; Wheeler, 2002; Vinicius, 2007; Lungo & Kaasbøl, 2007). Savings on licensing fees will be larger in developing countries than in developed countries; as licensing fees tend to reflect values in developed countries, the lower purchasing power of users...
in developing countries means licensing costs as a share of the total cost of IT
ownership are considerably greater (May, 2006). Where software is used in the
public sector or government projects, policy should favour FOSS if it works out
significantly cheaper than proprietary software, such that savings exceed switching
costs.

On the supply side, the structure of the software sector and the wider economy will
determine which type of software offers greater economic benefit. In developing
countries the software sector is likely to comprise a small share of GDP (cf. ENEI,
2009; INEGI, 2010), and marketing and distribution of imported proprietary software
will likely comprise a significant share of the sector on the basis that imports of this
type of software will exceed exports (cf. ABES, 2007). Use of FOSS may stimulate
software production, create demand for local provision of software services and offer
greater opportunities for innovation through knowledge transfer (Softex, 2005; Pisano,
2006). Outside the software sector, greater use of FOSS may stimulate activity linked
to hardware production (Schoonmaker, 2009), FOSS’ lower costs and faster
development life-cycles making it conducive to selling cheaper and more reliable
hardware (Capek, et al. 2005; Samuelson, 2006; Campbell-Kelly & Garcia-Swartz,
2009). Whilst FOSS may threaten proprietary software imports, it is unlikely to
present the same threat to locally produced proprietary software due to the market
segments served by local producers (cf. Softex, 2005). Although greater use of FOSS
threatens businesses based around proprietary software imports, the potential upshot
is new enterprise that will promote technical upgrading. As greater use of FOSS in
developing countries is likely to yield a positive, rather than negative, impact on
national welfare, if policy seeks to maximise absolute welfare, it will favour FOSS rather than proprietary software.

Whilst policy might be expected to reflect the relative costs and incentives of using different types of software, this assumes policymaking is based on perfect information and not subject to political distortion. Informational imperfections are particularly acute with relation to software. Firstly, the complex nature of technology bestows disproportionate power in the hands of the specialist vis-à-vis the layman. Secondly, general awareness of alternatives to proprietary software is low due to the domination of proprietary software in core market segments, and the fact that whilst proprietary software is heavily advertised, FOSS is generally unadvertised (Comino & Manenti, 2005). Such informational imperfections produce power asymmetries, allowing the knowledgeable to shape the preferences of the unaware (Hay, 2002:178). The knowledge available to those involved in the policymaking process will therefore have an important bearing on policy. If knowledge is lacking, the greater prevalence of proprietary software increases the likelihood that policymakers will seek the advice of proprietary software suppliers, suppliers who will be in a strong position to shape preferences and influence policy to serve their material interests.

### 3.2 Material Interests

Material interests (referred to henceforth as interests), matter to software policy because they affect actors’ preferences and actors’ capacities to pressure government (Gourevitch 1986). Interests stem from the economic activities in which actors participate (Hall, 1997). The relative importance of economic activities within the wider economy, their organisation and the resources they yield, all affect the relative
power of the actors that participate in them (Gourevitch, 1986; Levi, 1997). The size of the benefits that derive from an activity and the extent to which free-riders can be excluded from gaining access to these benefits affect the incentives for collective action and thus actors’ capacity to organise (Olson, 1965; 1982). Whilst little incentive for organisation will exist where interests are diffuse and benefits low, the contrary will be the case where interests are concentrated and benefits large (Ibid.). Interests also affect the ability of actors to organise across economic activities, providing opportunities for actors to increase their power through coalition formation where interests align. The aggregation of interests that occurs through association encompasses a range of organisations that includes political parties, industry bodies, and civil society organisations (CSOs).

Because proprietary software provides firms with acute and exclusive benefits, there are strong incentives for firms based around proprietary software to organise, explaining the formation of software business associations. Suppliers of proprietary software will likely comprise a significant share of the software industry in developing countries and include the largest players in the sector due to the fact that imports will heavily outweigh local production (cf. Datamonitor, 2008). Therefore, the preferences of sectoral associations will likely favour proprietary software, not only because the majority of firms will be based around proprietary software, but also because these firms will include the largest players in the sector. Large firms not only command superior resources, increasing capacities to lobby and pressure government, within an organisation largely composed of small firms, smaller firms will free-ride, allowing large firms greater influence in shaping group preferences (Hart, 2004). In addition to resources, the capacity of actors to pressure government, and thus their
propensity to affect policy, will also be contingent upon quality of organisation (Durand & Silva, 1997; Schneider, 2004). Sharing interests in strong IPP with other sectors such as media, pharmaceuticals and biotechnology, suppliers of proprietary software may enter into coalitions which further increase their capacities.

Mobilisation around FOSS is likely to be less prevalent than mobilisation around proprietary software, not least because low public awareness of FOSS reduces the likelihood of mobilisation. Moreover, the non-rivalrous and non-excludable characteristics of FOSS mean benefits are low and interests diffuse; incentives for mobilisation are therefore low. Although some activists and commercial actors such as hardware producers may mobilise around FOSS to form CSOs (Eimer, 2008), the general public is likely to perceive little reason to mobilise around a good to which they already have access. The likelihood of mobilisation is diminished further by the fact that as a group, software developers generally express indifference to politics (Coleman, 2004). Outside the resources that hardware firms might provide, the resources available to actors associated with FOSS are likely to be small, reducing their capacities. Furthermore, whilst interests in FOSS align with wider themes such as ‘access to knowledge’ (Kapczynski, 2008), coalitions are likely to be weakened by differences over ideological and pragmatic concerns amongst and between commercial and non-commercial actors (Perkins, 1999; Best, 2003; Evans & Reddy, 2003; Hahn, 2003; De Laat, 2005; Coleman & Golub, 2008; McInerney, 2009).

Grossman & Helpman (1994:833) argue, that “politicians respond to the incentives they face, trading off the financial and other support that comes from heeding … interest groups’ demands against the alienation of voters that may result in from the
policy implementation of socially costly policies”. If this is the case, public indifference toward FOSS and the fact that between actors mobilised around proprietary software and FOSS, power will accrue disproportionately to the former, politicians will favour proprietary software.

Although presenting equal opportunities for aggregation of interests around proprietary software, political parties may be particularly important in explaining mobilisation around FOSS by offering otherwise scarce opportunities for overcoming the free-rider costs of collective action. Political parties’ receptiveness to different software types is likely to rest on a party’s ideological disposition. The extent to which political parties will allow actors to influence policy will be contingent upon party structure and whether a party holds public office. These factors will be discussed below.

3.3 International Dynamics

International factors with a bearing on policy may be divided into two types, one that concerns economics and another that emphasises the coercive dimensions of power in the international system (Gourevitch, 1978; 1986). The first matters because conditions in the international economy affect conditions in the national economy and thus domestic actors’ interests and capacities (Milner, 1999). The second matters because a state’s relative power in the international system affects its autonomy to pursue its preferred policy choices.

A country’s power relative to the US is likely to be of particular importance in shaping software policy. As the world’s largest producer of proprietary software
(Carmel, 1997), the US will prefer that other countries pursue policies that favour the interests of US proprietary software firms; as the most powerful state in the international system, the US has the capacity to coerce other states into following its preferences (Schoonmaker, 2002).

A state’s power vis-à-vis the US will influence its policy choices by affecting the costs of pursuing policies at odds with US preferences. Relatively weak states might increase their power by pursuing ties with other states, thereby balancing US influence (Hurrell, 1996; Dominguez & de Castro, 2001). Alternatively, a relatively weak state might choose to ‘bandwagon’ with the US, pursing policies congruent with US preferences with a view to gaining concessions or benefits from the US (Ibid.). Where balancing is more likely to coincide with policy positions favourable to FOSS, bandwagonning is more likely to be accompanied by policies favourable to proprietary software.

Because the US represents an important export market for many countries, restricting access to this market offers a powerful means for coercing other countries into pursuing policies congruent with US preferences (Sell, 1995). Allowing US actors to request the US Trade Representative examine practices in third countries deemed detrimental to US commercial interests, Section 301 of the US Trade Act represents one of the mechanisms by which US sanctions may be triggered (Ibid.). The US may also influence policies in third countries through negotiations on bilateral trade or investment treaties. Where a country seeks such a treaty with the US, the US may attach conditions to agreement, stipulating the adoption of polices congruent with US preferences in the opposite country (Drahos, 2001).
The welfare concerns of exporters in developing countries provide a motive for these actors to press their national governments to follow policies congruent with US preferences in order to avert the imposition of US sanctions (Schoonmaker, 1992; Bastos, 1994). By affecting the welfare of constituencies unrelated to the policies for which US sanctions may be applied, sanctions may also “activate agnostics”, prompting constituencies to actively oppose policies to which they were previously indifferent (Shadlen, 2008:8). Trade dependence on the US is thus likely to affect the policy choices governments make, with consequences for the type of software policy favours.

Multilateral obligations are another factor that might affect policies in developing countries. Under the WTO’s Agreement on Trade Related Aspects of Intellectual Property Rights, member countries have obligations to adopt minimum standards in IPP (Drahos, 1997).

Encompassing some of the world’s largest corporations, US software companies may not only influence software policy in developing countries by mobilising the US government via lobbying or Section 301 (Schoonmaker, 1995), possessing resources that make them powerful actors in their own right, they may also do so by lobbying governments in developing countries directly or through international trade associations (cf. BBC, 2002). Association between local business associations, their international equivalents and US software firms will significantly enhance the capacities of the local associations. However, the superior resources and size of
external actors vis-à-vis their local partners will likely result in the former heavily influencing the preferences and actions of the latter.

3.4 Ideological Disposition

Ideas and ideology matter to software policy because preferences and actions are based not only upon material interests, but also upon the beliefs and values through which actors interpret the world (Hall, 1997; Sell & Prakash, 2002; Hart, 2004). Incumbent politicians’ ideological disposition, what Murillo (2002) terms “political bias”, has an important bearing upon policy by affecting how policy issues are interpreted, and whether and how to act upon them. By affecting voter behaviour, political bias also affects policy choices through public opinion, prompting politicians to adopt policies that minimise voter alienation or garner voter support to maximise their chances of re-election.

Whilst the political right might favour public sector use of FOSS to cut fiscal expenditure (cf. Adelstein, 2004), the right are also more likely to favour proprietary software due to the importance private property rights hold within liberal beliefs as a requisite for innovation (Harvey, 2007). Whilst there is nothing inherently anti-capitalist in FOSS, its challenge to established understandings of IP can lead to perceptions that it is anti-market (Perkins, 1999). Coupled with informational imperfections, these perceptions will likely lead business friendly governments to favour proprietary software.

Because FOSS offers governments a means of externalising the benefits of software to the wider population (Lessig, 2002) and addressing issues of inequality (Silveira,
2004), FOSS is likely to appeal to politicians on the political left. Anti-market connotations may also work to endear FOSS to the political left.

Nationalism may affect software policy due to US’ dominance in the supply of proprietary software. Economic nationalism or anti-US sentiment provide motives for the promotion of FOSS (cf. Festa, 2001). Conversely, the perception that “foreign is better” (Weerawarana & Weeratunga, 2004:25), or alignment with the US (Cohen, 2009), might result in government favouring proprietary software. The capacity of proprietary software firms to set public preferences is also important, conferred through a combination of knowledge asymmetries and aggressive marketing and advertising.

By affecting preferences on the desirability or purpose of intervening in the market, economic perspectives will affect whether, and how, governments decide to promote software through policy. Whilst economic perspectives take a variety of forms (Johnson, 1982; Gourevitch, 1986), these will be divided here into just two types, *laissez-faire* versus ‘interventionist’, due to the limited space available. Under the former, software policy is likely to be ‘passive’ as characterised in Figure 1, above. Where state intervention in the market is deemed appropriate for reasons of economic nationalism or to attain development goals, policy is more likely to reflect stronger ‘political intervention’, tending to fall between the middle and right of the x-axis in Figure 1.

The degree to which preferences toward promoting different software types reflect political ideology, will likely be contingent upon the relative economic benefits to be
gained through use of each type, in relation to underlying economic conditions (apart from other political considerations).

Ideas may also affect policy by influencing the actions of state officials who may mobilise the state from within (Adler, 1986; Evans, 1986). The capacity of these actors to influence software policy in this way will depend on the structure of the state itself.

3.5 Institutions & State Structure

Affecting the aggregation of interests and access to resources, institutions and state structure matter to software policy because they mediate action, providing both opportunities and obstacles to actors seeking to influence policy (March & Olsen, 1984; Hall, 1997; Peters, 1999). Gourevitch (1986:61) observes that “[t]he structure of the state, its rules and institutions, can … have a very substantial effect on [policy] outcomes”, because, “societal forces and representative associations must act through the state to attain policy objectives”. Institutions and the state encompassing types of government, party systems, bureaucratic structure, electoral rules, and the policymaking process, the hypotheses advanced here explain just a few of the ways in which institutions and state structure might affect software policy.

Policy choices will be affected by types of government, constitutions and congressional rules, the separation of powers and distributions of seats amongst parties or party factions. These factors affect the capacity of incumbents to translate partisan preferences into legislation. Electoral rules and party systems matter to
policy because they affect the extent to which incumbents rely upon, and thus respond to, public opinion in order to maintain power.

Policy will be affected by wider state-society relations, characterised by the extent of the state’s “autonomy” vis-à-vis society and its “embeddedness” within society, referring to the strength and extensity of connections between state and non-state actors (Evans, 1995). Where state-society linkages dictate which non-state actors might influence policy (Schneider, 2004), state autonomy will mediate actors’ capacities to influence policy through state-society linkages.

The existence and quality of democracy has a bearing on state autonomy, as touched upon above. However, autonomy stems also from the character of the state bureaucracy (cf. Evans, 1995; Evans & Rauch, 1999). Evans (1995) argues that higher levels of bureaucratic competence and corporate coherence reduce the capacity of non-state actors to capture the state. These bureaucratic characteristics will affect the influence actors such as firms, business associations and FOSS activists might gain over policy through interaction with the state, for example, through formal involvement in the policymaking process. Whilst bureaucratic characteristics will not affect non-state actors’ influence over policy via lobbying political parties, they will affect these actors’ capacities to shape policy from within the state.

By aggregating interests, the state, may represent another of the few opportunities for FOSS activists to overcome the free-rider costs of mobilisation. By conferring access to state resources, state employment may allow activists to affect policy by rallying mobilisation both outside and within the state (Abers & Keck, 2009). Weir &
Skocpol (1985:118) observe that, “states may be sites of autonomous official action, not reducible to any social-group pressures or preferences”; although such agency stems from the personalities involved, “the organizations and tactics through which variously situated groups can (or cannot) influence policy processes are partially shaped by the structures of government within which groups must operate.”

State IT managers may play a crucial role in shaping software policy through their positions. They may organise collective action through the state. As specialists commanding authority within the state they may influence the preferences of politicians. The significance of the public sector as a software user in developing countries means control over the state’s IT infrastructure will hold strategic importance for the actors arrayed around software.

Whether FOSS supporting bureaucrats attain their posts through partisan affiliation or not, ties between them and incumbent parties, by combining control of state resources with levers on authoritative power, will likely catalyse their capacity to shape software policy.
4 Methodology

4.1 Research Design

Whilst a number of hypotheses are advanced above on the processes by which causal factors affect outcomes in software policy, these hypotheses are general and they require refinement before they can be tested. The research design is thus orientated toward developing rather than testing these hypotheses.

Taking into account the research focus on identifying causal mechanisms, the research has been designed to uncover such mechanisms rather than to discover the regularity with which mechanisms occur. Stress is placed upon ascertaining how causal factors matter under certain conditions as opposed to establishing the extent to which factors matter generally.

A small-N comparative approach based on case studies has been chosen as a research methodology as it offers a number of advantages for addressing the research aims. Case studies allow phenomena to be investigated in detail and in depth, an advantage where emphasis is placed upon discovering the connections between different variables (cf. Mahoney, 2007; Brady, 2008). Moreover, case studies permit observation of the way in which variables are connected, facilitating not only the identification of the mechanisms that connect causes with effects but also understanding of how these mechanisms operate (cf. George & Bennett, 2005; Mahoney & Goertz, 2006; Mahoney, 2007).
Within-case analysis allows the gathering of what Brady, *et al.* (2006:355) term “causal process observations” or “CPOs”, “insight[s] or piece[s] of data that provide … information about context, process or mechanism”. In combination with a method George & Bennett (2005:205) refer to as “process tracing”, such observations can be used to elucidate the “intervening casual process – the causal chain and causal mechanism – between an independent variable (or variables) and the outcome of the dependent variable” (Ibid.:206).

Case studies are also useful for developing hypotheses and theory. Qualitative methods possess advantages for discovering new variables; for example, interviews may throw up factors of which a researcher was previously unaware (George & Bennett, 2005). Process tracing provides a means of discovering and investigating multiple causal possibilities within cases (Ibid.). By allowing many hypotheses to be tested, case studies may help to narrow the causal factors that are significant in generating an outcome (Gerring, 2006).

Finally, case studies provide advantages for conceptualising policies and political phenomena which are difficult to measure, allowing comparisons which are “analytically equivalent” (Locke & Thelan, 1998, quoted in George & Bennet, 2005:19).

The trade off of using a small-N comparative methodology is that findings are contingent upon the conditions that exist in the cases under investigation. This means case studies are only able to inform ‘contingent’ or ‘partial’ as opposed to universal generalisations (George & Bennett, 2005; Lijphart, 1971). This limitation is not a
major issue here, as the object of the research is to develop hypotheses that can be later tested in other contexts or across a wider universe. If the research aspires to make generalisations, these apply only to contexts similar to those under study.

Because case study research necessarily involves few cases, the control of variables constitutes greater challenges than might be the case under large-N statistical research (Lijphart, 1971). Offering a solution to this problem, Lijphart (1971:687) explains that “[w]hile the total number of variables cannot be reduced, by using comparable cases in which many variables are constant, one can reduce considerably the number of operative variables and study their relationships under controlled conditions”. Reducing the number of ‘operative’ variables across cases simplifies the task of establishing causal relationships as possible combinations between variables are correspondingly diminished. However, controlling for several variables will likely mean an attendant reduction in the cases that can be compared.

In view of the emphasis on theory development and the issue of control, the research will adopt a ‘most-similar’ case selection method, selecting two cases which are similar on the factors which are assumed to affect software policy but where policy outcomes vary unexpectedly (cf. Gerring, 2006:131). The factors which are similar represent a vector of control variables; the research seeks to explain the contrasting outcomes on the dependent variable by exposing variation on some independent variable(s), variation that may or may not exist in the control vector.

Whilst selecting on the dependent variable is associated with issues of selection bias, potentially leading to under-, or over-estimation of the significance of independent
variables (Collier & Mahoney, 1996), this issue is not of direct concern here as the objective of the research is to ascertain how variables operate under certain conditions rather than to generalise across the wider universe. Selection of cases where there is no variance on independent variables means the research can make no claims as to whether any causal mechanisms discovered in the course of the research operate in the same way under conditions where values on these variables are different (Collier & Mahoney, 1996:74). However, such an issue is inherent to all small-N research designs, as already noted. The limitations that arise from selecting cases with no variance on the independent variables are a trade off for the reduction of variation on causal factors. Whilst selecting on the dependent variable may be problematic under certain circumstances, it is appropriate so far as research is concerned with explaining variation across the population under examination (Geddes, 1990:132).

Where the ‘most similar’ case selection method is employed to test associations between independent and dependent variables via comparison, it is impossible, through this method alone, to prove whether observed co-variation between variables will necessarily occur in other instances, or rule out spurious or alternative associations due to the difficulties of controlling all independent variables. Whilst the first issue relates to representativeness which has already been addressed, process-tracing provides a means of tackling the second (George & Bennett, 2005:159). By identifying causation by following “sequential processes” rather than through putative causal relationships on the basis of “correlations … across cases” (Ibid:13), process tracing is not subject to the issue of spurious association as relationships are determined through connections between cause(s) and effect.
4.2 Case selection

When selecting cases, focusing upon countries located in a single geographical area or region may assist in the control of independent variables (Lijphart, 1971). The case selection process focused upon Latin America as this region not only contained countries characterised by similarities in areas hypothesised to matter to software policy, but also patterns of cross-national policy variation that included promotion of FOSS (cf. CSIS, 2008), and hence opportunities for comparisons that would allow study of how FOSS promotion policies came to be adopted or thwarted. The case studies of Brazil and Argentina were chosen.

In terms of the costs and benefits of using different software types, the software sector accounts for around 0.7% of GDP in both countries (Chudnovsky & López, 2005:64; Botelho, et al. 2002:13). With software sectors of a similar size, the costs and benefits of using FOSS versus proprietary software will be similar in both countries. Moreover, as net importers of software (Dorn, 2003; Mannila, 2005), both countries may benefit from greater use of FOSS.

With regard to the organisation of interests, in both countries, the organisation of business interests is considered to lack coherence (Durand & Silva, 1997; Schneider, 2004), an issue which, if applicable to the software sector, will affect the ability of actors associated with proprietary software to pressure government. CSOs supporting the promotion of FOSS are also active in both countries (Teza, 2000; Dorn, 2003), suggesting at least some pressure for government to support use of FOSS.
In terms of stature on the international stage, whilst Brazil is the more powerful of the pair, as the two the largest countries in South America and as members of MERCOSUR, Brazil and Argentina possess similar positions within the international system as well as vis-à-vis the US (Tulchin, 1996; Klom, 2003; de Cruz, et al. 1993). Both countries are capable of resisting powerful actors in the international system, as demonstrated by Brazil’s successful stand against the US government over the cost of US produced AIDs drugs, a conflict in which the US backed down (Nunn, et al. 2009) and Argentina’s tough stance in renegotiating its international debt with the IMF, in which it won out (Benton, 2009; Levitsky, 2008). This capacity to resist external pressure suggests that both countries should be capable of promoting FOSS in the face of opposition from US software firms and the US government.

In relation to state structure, both countries possess federal, presidential systems of government. Democracy also suffers from similar issues in both, for example weak party systems (Levitsky & Murillo, 2008; Santos & Vilarouca, 2008). Non-state actors should therefore face similar opportunities and obstacles to pressure government in both countries.

Finally, governments in both countries have been left of centre for most of the past decade. Since 2003, Brazil has been governed by President Lula of the Partido dos Trabalhadores (PT) (Flynn, 2005), whilst leftists, Néstor Kirchner, followed by his wife, Cristina Fernández, have held power in Argentina (Levitsky, 2008). Leaders in both countries governing from positions of strength, the ideological disposition of these administrations when considered alongside other factors, suggest conditions congenial to the political promotion of FOSS.
However, whilst the Brazilian government has gained international attention for its promotion of FOSS (Benson, 2005; Kingstone, 2005), adopting policies characteristic of type 9 in figure 1, the Argentine government has expressed a preference for neutrality on the issue of software licensing, although having adopted no formal policy, its position reflects type 1 (Mannila, 2005; Wegbrait, 2009). If it is unclear why software policy varies across these two countries, most puzzling, if incumbent politicians’ political bias matters to software policy outcomes, out of Argentina and Brazil, active FOSS promotion would have seemed more likely to have occurred in the former than in the latter. Although government in both countries has been left of centre, Argentina’s leaders’ interventionist policies and populist, nationalist politics, evinced by Kirchner’s anti-US rhetoric and alignment with Venezuela’s Hugo Chávez (Corrales, 2008; Panizza, 2005), appear congruent with active FOSS promotion, whilst Lula’s caution not to alienate international business interests and jeopardise economic stability through progressive policies (Samuels, 2008), suggest a position in which neutrality on the issue of software is fitting.

4.3 Data Collection & Analysis

Interviews will form a principle source of primary data. In order to provide scope for cross examination and attain greater objectivity, in each country, between 30 and 50 interviews will be conducted with key informants from government and the public sector, industry and civil society, representing a range of contrasting positions on software licensing. Whilst inadequate as a source of reliable data in itself, print and Internet journalism will be used as a means of corroborating information gained from other sources.
The observations gathered through data collection will be triangulated with one another for substantiation. Process tracing will be utilised to establish connections between variables.

Observation of outcomes in software policy is facilitated by the fact that laws are documented and follow formal processes. Enacted laws and policy proposals will be studied along with records of voting on legislation. Policy implementation will be observed through interviews and documentary sources such as government literature, implementation guides and reports, public expenditure figures and commentary from the press.

Government statistics bureaus and business associations will be contacted to obtain data on production and trade, allowing assessment of the economic implications of using different software types across different sectors, including the software sector, and national economies as a whole. The costs of using and switching software within the public sector will be informed through interviews with those responsible for administering IT infrastructure within the state, along with figures on public expenditure.

Understanding of actors’ material interests, resources and the general dynamics of collective action will be informed by speaking with actors from the private and third sectors. Private sector actors will include firms operating in different segments of the software and wider technology sectors and also business associations. Civil society actors will include CSOs and activists connected with FOSS and consumer interests.
Interviews with technical and legal experts will be used to decipher technological and legal issues affecting actors’ interests, capacities and strategies. Interviews will be supplemented with economic data, journalism and documents such as reports published by private and third sector actors.

To inform understanding of interactions between national and international actors, telephone interviews will be conducted with representatives of US software and technology firms as well as business associations and FOSS supporting CSOs operating at an international level. Economic power vis-à-vis the US may be inferred through trade balances and international capital flows, data that is contained in national accounts.

The affect of ideological disposition upon software politics may be investigated through interviews and triangulated with press reporting and academic literature.

Understanding of the state, its institutions and the policymaking process will be informed through interviews with high level officials who play, or have played, a key role in shaping policy in the areas of industry and trade, science and technology, intellectual property and social policy. Managers of the public-sector IT infrastructure will be interviewed to gain insight into their role in shaping software policy. A range of documents including org-charts, process documents, reports and other publications will be sought to corroborate interview sources.
### 4.4 Research Timeline

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