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Politics-business interaction paths

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Politics-Business Interaction Paths

Marianna Belloc
Ugo Pagano

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Politics-Business Interaction Paths

Abstract

Most pre-crisis explanations of the various corporate governance systems have considered the separation between ownership and control to be an advantage of the Anglo-American economies. They have also attributed the failure of other countries to achieve these efficient arrangements to their different legal and/or electoral systems. In this paper we compare this view with the co-evolution approach based on the hypothesis that politics and corporate governance influence each other, generating complex interactions of financial and labour market institutions. Countries cluster along different complementary politics-business interaction paths and there is no reason to expect, or to device policies for, their convergence to a single model of corporate governance. We argue that this hypothesis provides a more convincing explanation of the past histories of major capitalist economies and can suggest some useful possible scenarios of their future institutional development. Bayesian model comparison suggests that the co-evolution approach turns out at least as influential as the competing theories in explaining shareholder and worker protection determination.

JEL Code: G32, G34, J50, K22, P10.

Keywords: employment protection, corporate governance, ownership concentration, Bayesian model estimation, Bayesian model comparison.

Marianna Belloc
Department of Economics
Sapienza University of Rome
Italy - Rome
marianna.belloc@uniroma1.it

Ugo Pagano
Department of Economics
University of Siena
Piazza S. Francesco 7
Italy - 53100 Siena
pagano@unisi.it

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1. Introduction

The current crisis has marked a new end of the end of history in corporate governance[1]. Before, the crisis, like the earlier successes achieved by Japan and Germany, the recent success of the American economy and the revival of the British economy had attracted the attention of many economists and policy makers. The legal origins approach (La Porta et al., 1998, 1999) claimed that the Anglo-American success was rooted in the different common law and civil law traditions characterizing these countries well before the advent of capitalism. In common law systems, private owners, including the minority shareholders of contemporary large firms, could be better protected. Another approach (Pagano and Volpin, 2005) had emphasized that the non-proportional electoral systems, prevalent in the Anglo-American countries, favored shareholders-friendly political coalitions. Legal and electoral reforms were advocated to change what was once upon a time an American exception into the general rule to be followed by all countries.

"American exceptionalism" has long been a puzzle for social scientists. However, the nature of the problem has somewhat changed over time. Becht and De Long (2005) have observed that a century ago academics like Werner Sombart were intrigued by the exceptional nature of the United States in that it did not have socialism, while today academics are concerned about a different form of American exceptionalism: the negligible role of block holding in the United States.

Mark Roe (2003)'s contribution suggests an interesting link between the past "non-socialism" and the recent "non-block-holding" American puzzles: a tradition of very weak social democracy could explain the negligible role of block holding. According to Roe (2003), the higher the degree of social democracy (and, in particular, the strength of employees' rights), the stronger the tendency of employers to organize themselves into concentrated forms of corporate ownership with one or few major block holders. Figure 1 plots the residuals obtained from the regression of the labour protection index and of the ownership concentration index over log per capita GDP for 47 countries.[2] As is apparent from the fitted regression line, there is a significant positive cross-country correlation between the degree of protection of workers' rights and the degree of corporate ownership concentration, even once the cross-country differences in per capita GDP have been considered. According to this figure, American exceptionalism is an extreme case of a general relation linking employee job protection with the degree of separation between ownership and control. In order to explain the positive relation between protection of workers' rights and corporate ownership concentration, Roe (2003) suggests that there is a causality

[1] Hansmann and Kraakman (2004) have even described convergence to the Anglo-American model as the "end of history of corporate governance". Other authors (see, for instance, Morck et al., 2005, and James, 2006) have argued that a variety of arrangements exist in modern capitalist economies, and that family groups are the prevailing form of organization in some countries. Bebchuk and Roe (2004) have emphasized the path-dependent nature of corporate governance.

[2] The data source for the labour protection index (which includes protection of labour and employment laws plus protection of collective relations laws) is Botero et al. (2004); GDP per capita in 2000 is from World Bank (2004); the ownership concentration index is from La Porta et al. (2006). See paragraph 3.3 for a more detailed description of the variables.

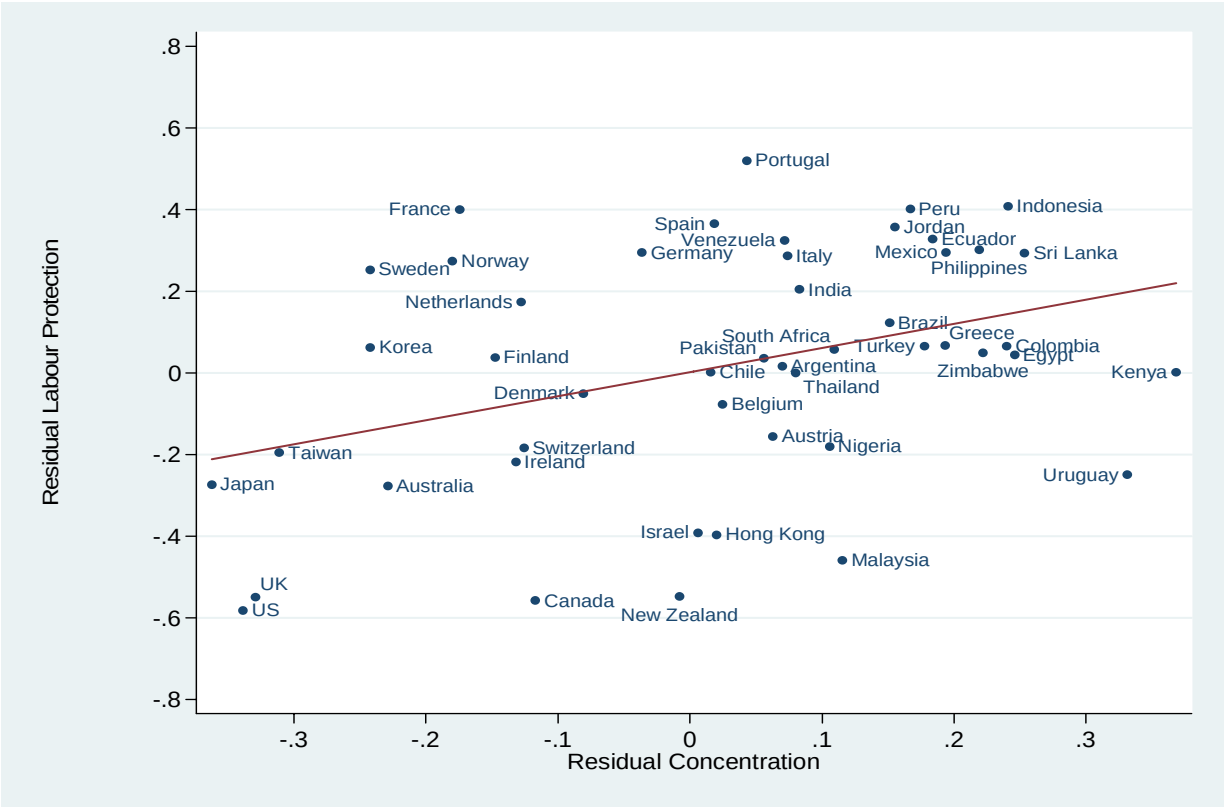

Figure 1. Partial regression plot of labour protection index and ownership concentration (independent variable is per capita log GDP). Coef. = 0.5916 (p-value = 0.006).

relation running from employees' political rights to corporate governance forms.[3] One form of American exceptionalism (no socialism) has influenced the other (little block holding).

Belloc and Pagano (2005, 2009) have argued that the relationship is more complex because the causation operates in two opposite directions. Forms of corporate governance, such as the degree of separation between ownership and control, influence the strength of workers' organization. When there is no separation between ownership and control, employees are more likely to seek protection against interference by the dominant block holders and their social circle, including their relatives and friends, who may otherwise monopolize the best jobs in the company. Thus, while employees' rights may prevent the separation between ownership and control, conversely the existence of powerful block holders may favour some sort of "social democratic reaction" and, in particular, a high degree of union activity. This two-way relationship entails multiple co-evolution paths between ownership concentration and workers' organization: a certain degree of centralization of one side's interests may

[3] Roe (2003) presents evidence that countries characterized by stronger job protection and employees' political rights (stronger "social democracy") tend to have more concentrated corporate ownership forms. The causality relation is, however, not tested by the author. In similar vein, Mueller and Philippon (2007) argue that (family) concentrated ownership is relatively more common in countries where labour relations are hostile, while dispersed ownership is prevalent in countries characterized by cooperative labour relations. They also offer coherent empirical evidence using survey-based measures of the quality of labour relations and ownership structures data for 30 countries.

easily induce a corresponding concentration of the other side's interests (this view will be referred to hereafter as the *co-evolution approach*). As in an arms race, the interactions between business and politics can produce different degrees of organization in the owners' and workers' interests (Belloc and Pagano, 2009). In similar vein, Gelter (2009) argues that, seeking to re-balance the power of the weaker part, legislations lead to multiple configurations of the economy. Typically they couple weak shareholder with weak stakeholder legal rights and strong shareholder with strong stakeholder rights. Also in this perspective, there is no evident criterion to rank these two local optima.[4]

Unlike the co-evolution approach, the other two approaches (the *legal origins* and the *electoral systems approaches*) make a ranking among the different systems of corporate governance, suggesting consequent measures for public policies. In one case the separation between ownership and control and the determination of employment protection are explained on the basis of "better" corporate laws which stem from different legal origins; in the other non-proportional electoral systems, prevailing in the Anglo-American world, provide better protection for minority shareholders. The latter two routes, which are sharply different from the co-evolution approach, have been taken by a great deal of the recent literature.

The legal origin approach of La Porta et al. (1999, 2006) offer overwhelming evidence that legal traditions help explain cross-country variations in ownership concentration: widely-held firms are more common in countries characterized by a high degree of shareholder protection, while family-controlled and state-controlled firms are more numerous in the economies where shareholder protection is weaker. Moreover, the first subsample is dominated by British law economies, and the second one by French law countries. According to the empirical investigation on the regulation of the labour markets conducted by Botero et al. (2004), not only common law economies tend to regulate the least, while civil law countries the most,[5] but the legal origins theory turns out to explain national labour protection laws better than the political power and efficiency theories. The electoral systems approach of Pagano and Volpin (2005) considers the political simultaneous determinants of shareholder and employment protection. Their findings suggest that the proportionality of the voting system exerts negative effects on the degree of shareholder protection, while has a positive impact on the strictness of the workers' rights legislation. Their results also corroborate the important role played by the legal origins in the determination of the two variables. Given the support that the legal origins and electoral systems approaches have found in previous studies, in the second part of this paper we will assess the empirical validity of the co-evolution approach relative to these existing theories.

The remainder of the paper is organized as follows. In the next section we produce theoretical and historical arguments in support of the co-evolution approach (Roe, 2003; Belloc and Pagano,

[4] Moreover, according to Ecchia, Gelter and Pasotti (2009), the legal protections of minority shareholders and employees influence each other and tend to produce a complex variety of institutional arrangements.

[5] With a different focus but espousing the same theoretical approach, Djankov et al. (2003) show that the degree of procedural formalism of dispute resolution is systematically lower in common than in civil law countries.

2005; 2009; Gelter, 2009; Ecchia, Gelter, and Pasotti 2009). In particular we maintain that the paths of United Kingdom and Switzerland can be explained by the co-evolution approach while they are difficult to conciliate with the legal and electoral systems explanations. In section 3 we report Bayesian estimations and Bayesian model comparison among the various theories of labour protection and ownership concentration determination. We show that the co-evolution approach is preferred in terms of likelihood maximization to the competing approaches. Finally, in the last section, we conclude by briefly considering post-crisis scenarios and some preliminary policy implications of our analysis.

2. Competing theories and alternative historical paths

In his book *Strong Managers, Weak Owners*, Mark Roe (1994, p. 4) observed how, in spite of all the shortcomings today in the spotlight, the separation of ownership and control has allowed skilled managers to run firms and has prevented unskilled descendants from gaining control of firms they would be unable to run well. In similar vein, Chandler (1990) contrasted American and German managerial firms with British family firms at the time of the second industrial revolution, arguing that family control was the cause of England's poor performance.

Managerial hierarchies do not simply entail the usual problem that the interests of the managers must be made consistent with those of the shareholders; they also entail the broader, and somehow opposite, problem that the "family allocation of control" must not interfere with the firm's internal meritocracy and the incentives for good managerial performance. In spite of the well-known agency problems, the separation between ownership and control has had positive effects because it increases the role of competence allocation rules with respect to family connection ones.

The US was ideally suited to developing the meritocratic institutions necessary for the working of managerial hierarchies. It lacked the class divisions that had given rise to the dynastic assignment of many jobs in Europe. The weakness of American "social democracy" was related to the widespread feeling that membership of a lower class was not an insurmountable barrier against the achievement of economic power, and consequently that there was no imperative need to organize unions and other institutions which could tame the economic power of established capitalist dynasties.

The US was typically characterised by politicians who acted on the belief that a full-blown democracy (as well as their own "democratic power") was incompatible with the concentration of economic power. In this respect, a single cultural and political tradition comprised Jefferson's vision of a democracy based on small land owners, Jackson's clash with the power of the Bank of America, and Lincoln's successful war against the slave owning aristocracy of the South (Hofstadter, 1967). At the beginning of the second half of the nineteenth century the US was the only country (perhaps besides

Switzerland[6]) where the landed aristocracy had no important cultural and political role in social life. Because of its anti-aristocratic attitude, the US reacted early to the concentration of economic power which came with the second industrial revolution. The Sherman Act (1890) was the first, and by far the most important, piece of anti-monopoly legislation to be enacted in a modern economy. After Theodore Roosevelt's clashes with big business, Wilson continued the endeavour to set limits on the power of the major block holders. The Clayton Act (1914) ruled that the ownership of substantial stakes in different firms might induce self-dealing and unfair competition and should therefore be supervised by anti-trust authorities. F.D. Roosevelt completed these policies by using taxation to dismantle the pyramids (Randall, 2004) that, in many cases, had enabled a few "economic royalists" to use "other people's money" to impose a "new industrial dictatorship" (Roosevelt quoted by Roe, 1994, p. 40).

While the American absence of social-democratic job protection allowed the radical diversification of asset ownership and the transfer of power from owners to managers, also the reverse was happening: social democratic job protection became weaker because early restrictions were imposed on block holders so that it was more difficult to gain private benefits from partial, but substantial, ownership. Early democratic policies induced dispersed forms of ownership and a separation between ownership and control. This "exceptional" early dispersion of capitalist interests made it less important for workers to concentrate their interests in strong unions and in social democratic parties. The two sides of American "exceptionalism" reinforced each other: there was little socialism because block holding was inhibited; and there was little block holding because a socialist movement of European magnitude and radicalism did not develop.

The two-way causation between politics and business is also evident in those countries where there were marked class barriers, and where dynastic policies played an explicit role in both the political and economic sphere. This typology included England, where the landed aristocracy had transformed itself into an entrepreneurial class and led a revolution against the powers of the crown. It also comprised cases, such as France, where the aristocracy had resisted revolutionary forces with varying degrees of success or, even more problematic ones like Germany, where the emerging

[6] There are remarkable similarities between the historical backgrounds of the US and Switzerland. Both countries are somehow geographically protected by foreign powers, respectively by oceans and mountains, and internally geographically divided by long distances (the US) and by the high altitudes of the Alps (Switzerland) - a geography that has favoured decentralized federalist arrangements in the two countries. Both countries came early to tolerance of religious and ethnic diversity and the "cement of society" was more shared values and lifestyles than ethnic or religious homogeneity. Switzerland too achieved early liberation from feudal relations. Swiss feudal ties were traditionally weak: the peasants were difficult to dominate because they were often far from urban centres on Alpine pastures, and because they had good military training (they often serving as highly sought-after mercenaries throughout Europe). After the defeat of the *Sonderbund* alliance, formed in 1847 by the conservative and Catholic Cantons, the "Swiss Confederation or, more accurately, some twenty-three leading figures in it, drafted a document so suited to the conditions that the Switzerland of 1849 and of 1847 seem to belong to different eras" (Steinberg, 1996, p. 47). Similarly to the US (where the war of secession terminated the political influence of the slave-owning landed aristocracy of the South) Swiss big business had "democratic origins" in the sense that a full blown post-feudal society had already emerged before the second industrial revolution.

bourgeoisie could acquire legitimacy only by imitating the customs and the dynastic ambitions of the Junkers (see Moore, 1973). In these economies, the power of family dynasties upset the values of managerial meritocracy (Morck, 2005 and 2006). Wealth, family connections, the proper accent, social skills and even appropriate table manners interfered with the allocation of jobs based on effort and competence. In these circumstances, social-democratic movements readily emerged as spontaneous reactions against the privileges of the ruling dynasties and were reinforced by the widespread feeling that the "have-nots" had to be defended against the exercise, and often the abuse, of economic power. Faced with the concentration of the power of the wealthy, "social democracy" could only limit and, sometimes, challenge its exercise by organizing a countervailing power. Whilst "social democracy" could scare owners and prevent the separation of ownership and control, the combination of ownership and control created the conditions for various types of "social-democratic" reaction, including unionization and the development of job protection.

Dispersed ownership and a low degree of "social democracy" can be seen as institutional complements to each other, and so too can concentrated ownership and a high degree of "social democracy". One explanation for these complementarity relations can be couched in terms of reciprocal disarmament and armament. Each group can achieve a greater capacity to exercise power by concentrating dispersed interests in centralized agents which are better able to solve free-riding problems (Olson, 1965). As in an arms race game, all levels of armaments may be in equilibrium and define different countervailing balances of power (see Belloc and Pagano, 2009). For instance, the balance of power can remain the same if both owners and workers are dispersed or if both are concentrated. Thus defined are two extreme equilibria, which approximate the US and the countries clustered at the bottom-left corners of Figure 1. The self-reinforcing interactions between dispersed ownership and labour interests generate a *dispersed equilibrium*; similarly, the self-reinforcing interactions between concentrated ownership and centrally organized workers' interests generate a *concentrated equilibrium*.

In both the extreme and intermediate cases, the incentive for one side to concentrate its interests increases with the growing concentration of the other side's interests. In other words, the (dis)armament of one party favours the dis(armament) of the other. However, there are limits to this symmetric representation of the concentration and dispersion of owners' and workers' interests. Ordinary market transactions may concentrate the ownership of capital into the hands of a few owners, and there will be a spontaneous tendency for this to happen whenever it increases profits. By contrast, because of non-slavery and self-ownership, the ownership of labour is necessarily dispersed and the concentration of labour cannot be achieved by means of standard economic contracts. In this case, politics can be used to stop the concentration of capital or to enhance the concentration of labour interests in trade unions.

Since market forces tend to concentrate capital much more easily than labour, in the absence of an early and strong policy, a concentrated equilibrium is likely to arise: the "political" organization

and concentration of workers' interests follows the spontaneous "economic" concentration of capitalist ownership. When political measures are anticipated by spontaneous capitalist concentration, they react to the latter by favouring a comparable concentration of interests on the workers' side. Some degree of social democracy or other arrangements restoring the balance of power between the two parties are thus likely to arise in a democratic society.

The historical conditions under which a *dispersed equilibrium* is likely to come about are rather special, and they have perhaps been approximated only by the US. When the need for large scale companies arose, no other country (with the possible exception of Switzerland) had so many citizens who had massively, and sometimes consciously, exited from dynastic feudal relations. Many of them had done so in search of religious freedom. Moreover, by revolting against British colonial rule, their ancestors had also broken with deference to established family dynasties. Only in America did such a strong ideology against "economic royalists" and "industrial dictatorship" (Roosevelt quoted by Roe, 1994, p. 40) exist before the age of large scale capitalist firms. A key component of this ideology was distaste for the type of concentrated dynastic interests characterising the old continent. Social respect moved from people born wealthy to "self-made" individuals. Thus, the meritocratic ascent of a corporate managerial ladder was far more compatible with American ideology than deferential respect for the concentrated power of the capitalist dynasties. Managers did not have to plot against concentrated owners: they were the unintended beneficiaries of a political struggle against concentrated interests (Roe, 1994). The public company run by managers was the unintended outcome of this struggle, and it prevailed because its internal promotion system was better suited than dynastic succession to the American political conditions and, more generally, to the American way of life. The very special conditions of American history enabled American politics to anticipate the concentration of the owners' interests in the way predicted by our politics-business co-evolution hypothesis: in one case, approximated by a *dispersed equilibrium*, the causation initially operated from politics to forms of business organization.

The historical conditions necessary for a *concentrated equilibrium* were quite commonly in place. In many other countries, some form of concentration of ownership interests went together with the growth of large-scale enterprises, and family dynasties were usually involved in the management of firms and in the appointment of managers. In many cases, financial institutions made the exercise of this power compatible with the needs of large-scale enterprises by making "other people's money" available to the "economic royalists". The limited diversification of risks and the poor incentives for professional managers were (partially) off-set by the acquisition of many important management jobs by the ruling families and by a decrease in the agency problems arising from the separation between ownership and control. The inability of politics to anticipate the "armament of capitalism" subsequently induced a political reaction to arm labour by concentrating and organising its interests. Since, in most countries, politics had been unable to limit the concentration of the ownership interests, the resulting model of corporate governance provoked a "social democratic" political reaction. Thus,

in most European countries the direction of the causation was consistent with the general prediction concerning the achievement of *concentrated equilibria*: politics reacted only belatedly to a model of corporate governance serving the concentrated interests of capitalist dynasties.

Since each type of institutional equilibrium (concentrated or dispersed) tends to exhibit a remarkable degree of stability, the "political origins" of corporate governance - that is, the political conditions existing when big capitalist firms first emerged - are quite important and, in many cases, they have even irreversibly shaped the paths of co-evolution followed by politics and corporate governance. However, in some cases, certain economic and political processes have shifted the economy from one co-evolution path to the other, and during the transition, the organization of corporate governance and labour market institutions has been mismatched.

The UK is a particularly interesting case because it has gone through a long period of institutional mismatch. It has undergone a difficult transition from a politics-business co-evolution path based on well-established family dynasties and well-organized trade unions to a model of "popular capitalism" based on dispersed ownership and weaker unions. In the UK an open aristocracy led the revolt against the King and mutated into an entrepreneurial class. Some form of aristocratic family capitalism had an important role in the first, and mainly British, industrial revolution and preserved its dynastic power at the time of the second industrial revolution. However, by that time, according to Chandler (1990), this type of capitalism had become outdated. The new industries which developed in the second half of the nineteenth century required some form of managerial capitalism. In Chandler's view, this explains the relative decadence of British capitalism at the time of the second industrial revolution.

Early unionization and a deep sense of class division made Britain a case close to that of *concentrated equilibrium*. However, certain forces slowly produced a substantial mutation in the characteristics of British capitalism. The transmission and division of inheritance, coupled with the international role of the City, produced a dispersion of property. For some time the fragmentation of firms' ownership did not involve a comparable loss of centralized control, which remained confined to the usual social and family circles. Indeed, in the 1970s the UK was characterized by a situation of "institutional disequilibrium" where the traditionally well-organized British unions were not matched by a countervailing centralization of firms' ownership. This period coincided with a crisis of the British economy which at times seemed to be leading to "continental solutions", such as pyramids and cross-share holding on the one hand, and "responsible" centralization of union activity on the other (Franks, Mayer and Rossi, 2005). These "continental solutions", however, were opposed by the City. Eventually, the Thatcher government made a sharp move towards a *dispersed* type of institutional equilibrium characterised by strong limitations on union activities and by a (much advertised) popular

shareholding capitalism. These arrangements have not been substantially reversed by the subsequent Labour Party governments[7].

The UK's transition shows how the "political origins" of a certain country exert a long-lasting but not decisive influence on the characteristics of its economic system. They may be eventually reversed by some combination of spontaneous economic processes and conscious government policies. Explanation cannot rely solely on the allegedly permanent effects of "exogenous" origins and should instead focus on the multiple paths of interaction between politics and business. Some co-evolution paths may be upset by sudden shocks and by slow cumulative changes. For limited periods of their histories, some countries may experience painful transitions from one path to another and be out of any sort of "institutional equilibrium". However, if in the long run these co-evolution paths work as "institutional attractors" for a sufficiently large number of countries, relations such as those considered in Figure 1 should be apparent. In this sense, our co-evolution hypothesis is intended to explain the characteristics of alternative systems of corporate governance.

In the next section, we will try to quantify which model can better predict these institutional attractors that are taken at a certain moment of time. However, we wish to point out that the institutional changes that have occurred through time in specific countries can also offer a qualitative test for the different theories and we will conclude this section by trying to show that in this respect the co-evolution approach can offer a more convincing explanation of these changes.

According to legal origins theory, "common law systems" account for the emergence of public companies. This theory puts the US and the UK in the same category, but this does not fit with the fact that until recently the UK had "continental features" and could have easily become completely "continental". British institutions have moved closer to the US model only after the strong policies of Margaret Thatcher – a fact that it is difficult to conciliate with the legal origins theory but fits nicely with the explanation with the co-evolution approach.

Moreover, the co-evolution hypothesis is consistent with the case of Switzerland, which poses a rather difficult problem for the legal origins explanation. In terms of its legal system, Switzerland is clearly part of the continental tradition, and it is difficult to attribute the dispersed nature of ownership of its large firms to different legal origins. By contrast, Switzerland fits very well with the *co-evolution* hypothesis, for it is the only European country where, like in the US, the political role of the landed aristocracy had vanished by the time of the second industrial revolution. Moreover, again like the US, Switzerland had a precocious democratic federal political system with little sense of continental class divisions. Well before England, most Swiss Cantons were able to fulfil the political conditions for a "dispersed equilibrium" and fit the bottom-left corners of Figure 1.

[7] However the British metamorphosis from a regime of strong shareholders and strong stakeholders to one of weak shareholders and weak stakeholders has not gone so far as the single adjective "Anglo-American" model of corporate governance would imply. According to Gelter (2009), British legal arrangements stand in between the European-Continental and the American models.

A similar "historical" objection could be raised against theories that link corporate governance with political electoral systems. With the same electoral system, Britain moved from family capitalism to more managerial forms of corporate governance; and with some complicated, often proportional, electoral rules, Switzerland had a co-evolution path relatively close to that of the US.

The qualitative historical evidence cited in this section provides some support for our hypothesis, but it is far from being conclusive. Each model and each explanation can have its exceptions and shortcomings, and one cannot rely solely on arguments focused on particular historical instances concerning specific countries. In this respect, a quantitative evaluation of the competing models has obvious advantages.

3. Comparing models: a Bayesian approach

3.1 *Empirical strategy and motivation*

In this section we adopt a Bayesian perspective in estimation and model comparison to assess the empirical validity of the co-evolution approach relatively to the other two theories prevailing in the existing literature. Bayesian estimation is implemented by combining data likelihood with prior information to compute the posterior densities (Zellner, 1971). Bayesian model comparison is performed by using the posterior odds ratios (Jeffreys, 1961).[8] According to this approach, all uncertainty (about the model, about variables' selection, and about the unknown parameters) is expressed in terms of probability distributions, and relies on a few simple rules of the probability theory. While a more detailed description of the employed strategy is reported in the Appendix A.1, in the remainder of this subsection we motivate the choice of the Bayesian approach in the present context.

First, as already mentioned in this paper, several recent studies have offered data evidence on alternative explanations for employment protection on the one hand (Botero et al., 2004; Pagano and Volpin, 2005) and for corporate governance on the other (La Porta et al. 1998, 1999, 2006; Mueller and Philippon, 2007; Pagano and Volpin, 2005; Roe, 2003). From this it follows that if one intends to study the *co*-determination of employment protection and ownership concentration without resorting to an arbitrary variable selection procedure, one needs to control for a long list of regressors. When an unquestioned structural theoretical model is not available (as in our case), model uncertainty is crucial. What is required in this context is to investigate the relative importance of one model with respect to another considering all the models that cannot be rejected by the data. The Bayesian methodology allows explicit account to be taken of model uncertainty when implementing model comparisons. Second, we choose Bayesian econometrics because of small sample data limitations. As frequently happens in cross-country analyses, our sample is small (47 data points). In the presence of only few

[8] See also Gelfand and Dey (1994), Geweke (1999) and Pettit and Young (1990).

observations, empirical distributions do not proxy limiting distributions. Furthermore, as shown by James and Stein (1960) and Efron and Morris (1971, 1972), when the number of parameters is large with respect to the number of observations, Bayesian approaches are superior to frequentist approaches in terms of parameter estimates (Gelman and Rubin, 1995; see also Raftery, 1995). If prior information on the parameters of interest is available, it can then be used to select the list of regressors to include in the model, and to assign prior distributions to the corresponding parameters that represent the basis for inference. In the next sub-sections we therefore consider a simultaneous two-equation model for labour protection-and-ownership concentration determination, taking into account the existing theories as well as the co-evolution argument. The specification of the benchmark model as well as that of the models used in the robustness checks are motivated by the most relevant previous empirical studies (Botero et al., 2004; La Porta et al., 2006; Pagano and Volpin, 2005) as explained in the next section.

3.2 *Model specification and data details*

Employing a cross-section sample of 47 economies,[9] we estimate the following simultaneous two-equation model (SEM):

$$\begin{aligned} Labour &= \alpha_1 + \beta_1 Common + \beta_2 Concentr + \beta_3 Prop + \beta_4 Left + \beta_5 Eff\ gov + \beta_6 Log\ gdp + \varepsilon_1 \\ Concentr &= \alpha_2 + \beta_7 Common + \beta_8 Union + \beta_9 Prop + \beta_{10} Sh\ prot + \beta_{11} Eff\ jud + \beta_{12} Log\ gdp + \varepsilon_2, \end{aligned} \quad (1)$$

where the error terms, ε_1 and ε_2, are i.i.d. $N(0,\sigma^2_{1\varepsilon})$ and $N(0,\sigma^2_{2\varepsilon})$, respectively. The dependent variable in the first equation, *Labour* (Botero et al., 2004), is an index between 0 and 1 and measures the protection of labour and employment laws in 1997 including: cost and existence of alternative employment contracts, cost of increasing hours worked, cost of firing workers, and dismissal procedures.[10] The other index usually adopted by the empirical literature for labour protection is the OECD index (OECD, 2009). The latter has a narrower definition with respect to Botero et al.'s variable; it is an indicator of the strictness of regulation on dismissals and the use of temporary contracts based on procedures and costs of dismissing individuals or groups of workers and of hiring workers on fixed-term or temporary work agency contracts. We have chosen to use Botero et al.'s index in our basic specification for two reasons: first, because it is available for the largest number of countries (47 data points); second, because it allows comparability with Botero et al.'s results which represent the most influential evidence on the determinants of the regulation of labour existent in the

[9] Countries included in the sample are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Ecuador, Egypt, Finland, France, Germany, Greece, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kenya, Korea, Malaysia, Mexico, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Peru, Philippines, Portugal, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, UK, US, Uruguay, Venezuela, Zimbabwe.

[10] A critical assessment of the data collected by Botero et al. (2004) and of their econometric approach is offered by Pozen (2007).

present literature. Nonetheless, in the robustness checks, we also use the OECD index, the sample of countries consequently shrinking to 24 economies.

The dependent variable of the second equation, *Concentr* (La Porta et al., 1999), represents an ownership concentration index between 0 and 1 and measures the "common shares owned by the top three shareholders in the ten largest non financial, privately-owned domestic firms in a given country" at the end of 1995 (La Porta et al., 2006: 9). We allow ownership concentration to affect labour regulation: *Concentr* also enters the first equation as an explanatory (albeit endogenous) variable. A positive sign for the related coefficient indicates a political reaction by labour to concentrated corporate governance forms in terms of stronger protection (Belloc and Pagano, 2009). On the other hand, when politics is able to anticipate economic forces, corporate governance forms may react to the concentration of labour interests and strong unionization. We therefore include *Union density* (Botero et al., 2004) as an explanatory variable in the ownership concentration equation. This variable is the union density rate in 1997, and it proxies the degree of workers' rights representation. In the robustness checks we estimate the model also using *Left* (La Porta et al., 2006) in place of *Union density*. *Left* is a measure of the left power, and corresponds to the percentage of years between 1975 and 1995 during which the political orientation of the executive was leftist. The effect of the electoral systems is captured by the variable *Prop* (Pagano and Volpin, 2005) which stands for 1986-1990 average proportionality. The proportionality index equals 3 if 100% of the seats are assigned by proportional rule, equals 2 if the majority of the seats are assigned by proportional rule, 1 if the proportional rule applies to the minority of the seats, and 0 otherwise. Finally the legal theory is represented by the variable *Common* (La Porta et al., 1998) which is a dummy variable for common legal origins.

Control variables used in system estimation are suggested by the empirical literature already mentioned in this paper (see table 1 columns 5 and 6 for detailed references). *Eff government* (Kaufman et al., 2003) is a proxy for government effectiveness in 2000 and takes account of the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies. It ranges between -2.5 and 2.5, with higher values standing for higher government effectiveness. *Eff judiciary* (International Country Risk Guide – Political Risk Services, 1996) measures the efficiency and integrity of the legal environment considering its impact on business. It ranges between 0 and 10 and is calculated between 1980 and 1983. *Shareholder protection* is the 1993-2001 average of the index for anti-director rights (La Porta et al., 1998) updated by Pagano and Volpin (2005). It is obtained by adding 1 when: shareholders are allowed to mail their proxy vote; shareholders are not required to deposit their shares before the general shareholder meeting; cumulative voting or proportional representation of minority shareholders is permitted; there exist mechanisms for protection of oppressed minorities; the minimum percentage of share capital required to convene an extraordinary shareholders meeting is less than or equal to 10 percent; finally,

shareholders are invested with pre-emptive rights that can be waived only by a shareholders meeting. *Log gdp* (La Porta et al., 2006) is the logarithm of per capita GDP in US dollars in 2000. Other variables used in the robustness checks are: the *Union index* (Botero et al., 2004) assesses the statutory protection and power of unions and is computed by averaging seven dummies for respectively: employees' unionization rights, employees' collective bargaining rights, employees' legal duty to bargain with unions, collective contracts extended to third parties by law, closed shops allowed by law, workers' or unions' representation on the Boards of Directors, workers' councils mandatory by law; the *Collective relations index* (Botero et al., 2004) corresponds to a measure of protection of collective relations laws and is computed as the average of the index for labour union power and the index for protection of workers in collective disputes; the *Social security index* (Botero et al., 2004) is obtained as the average of three indexes gauging the level of benefits for respectively: old age, disability and death, sickness and health, and unemployment. The fact that the variables used in the analysis are measured in different reference periods is not an issue here since the cross-section variation largely dominates the variation over time.

Table 1 lists all the variables involved with summary statistics. It also reports the expected sign relatively to each equation and gives a reference to previous data evidence for the suggested relation.

Table 1. Descriptive statistics

Variable	*Mean*	*St.Dev.*	*N. obs.*	*Expected sign*	
				Labour Eq.	*Ownership Eq.*
Labour index	0.4574	0.1846	48	(dependent)	
Concentration	0.4272	0.1385	49	+ (BP09)	(dependent)
Union density	0.2959	0.2233	48	+ (Bot04)	+ (Roe03, BP09)
Common law	0.3542	0.4833	48	- (Bot04)	- (LP06)
Proportionality	0.6473	0.4300	47	+ (PV05)	+ (PV05)
Eff government	0.8006	1.0192	49	+ (Bot04)	
Log gdp	8.7558	1.4749	49	+ (Bot04)	+ (LP06)
Sh prot	3.2766	1.2283	47		- (LP06)
Eff judiciary	7.6665	2.0507	49		- (LP06)
Left power	0.3375	0.2908	49	+ (Bot04)	+ (LP06)
EPL OECD index	2.2697	1.1037	24	(dependent)	
Relations index	0.4410	0.1408	48	(dependent)	
Union index	0.4385	0.2020	48	(dependent)	
Social security index	0.6160	0.1999	48	(dependent)	

Note: Abbreviations in brackets in columns 4 and 5 stand respectively for: BP09 = Belloc and Pagano (2009), Bot04 = Botero et al. (2004), Roe03 = Roe (2003), LP06 = La Porta et al. (2006), PV05 = Pagano and Volpin (2005).

Defining $y = [Labour, Concentr]'$, $x = [1, Common, Union, Prop, Left, Eff\ gov, Sh\ prot, Eff\ jud, Log\ gdp]'$ and $\varepsilon = [\varepsilon_1, \varepsilon_2]'$, model (1) may also be written in compact notation as:

$$\Gamma y = \mathrm{B}x + \varepsilon, \tag{2}$$

where ε is i.i.d. $N(0, \Sigma^{-1} \otimes I_N)$, $\Gamma = \begin{bmatrix} 1 & -\beta_2 \\ 0 & 1 \end{bmatrix}$, $\mathrm{B} = \begin{bmatrix} \alpha_1 & \beta_1 & 0 & \beta_3 & \beta_4 & \beta_5 & 0 & 0 & \beta_6 \\ \alpha_2 & \beta_7 & \beta_8 & \beta_9 & 0 & 0 & \beta_{10} & \beta_{11} & \beta_{12} \end{bmatrix}$ and $\Sigma = \begin{bmatrix} \sigma_{1\varepsilon}^{-2} & 0 \\ 0 & \sigma_{2\varepsilon}^{-2} \end{bmatrix}$ is the precision matrix. Since Γ is an upper triangular matrix (and so is its inverse, Γ^{-1}), the system may be solved recursively and the necessary condition for identification is met. Furthermore, the triangular structure of (2) implies that det(Γ) = 1, and as a consequence its likelihood function is the same as a seemingly unrelated regression (SUR hereafter) model. The structural form of the model can thus be estimated directly using methods developed for SUR models, thereby settling the important prior elicitation and identification issues associated with SEM Bayesian estimation (see van Dijk, 2002; Richard and Steel, 1988; Koop, 2003; Koop and Tobias, 2003; and Koop, Poirer and Tobias, 2004). From (2), the reduced form of model (1) may be written as:

$$y = \Phi x + \eta, \tag{3}$$

where $\Phi = \Gamma^{-1} B$ is the matrix of parameters, and $\eta = \Gamma^{-1}\varepsilon$ is the matrix of error terms. We assume η to be i.i.d. $N(0, H^{-1} \otimes I_N)$, $H = \Gamma^{-1}\Sigma^{-1}\Gamma^{-1}$ being the 2×2 precision matrix. Bayesian inference requires prior information about the unknown parameters Φ and H^{-1}, which are supposed to be independent. The marginal distribution of Φ is Normal (*N*) and such that $\Phi \sim N(\underline{\Pi}, \underline{H}_{\Phi}^{-1})$, while the marginal distribution of *H* is Wishart (*W*) with $\underline{v}$ degrees of freedom and mean equal to $\underline{v}\underline{S}^{-1}$, i.e. $H \sim W(\underline{S}^{-1}, \underline{v})$.

3.3 *Enumeration of priors*

Before turning to the estimation results we need to enumerate our priors, which are summarized in table 2. PRIOR1 is a diffused one where data evidence dominates the posterior outcome. All the parameters are assumed to follow a Normal distribution with mean equal to 0 and standard error equal to 5. The regression coefficients are all set at the point corresponding to no effects on the dependent variables, but the large variance considerably spreads the density around the prior. This is equivalent to saying that we presume ignorance about model parameters. PRIOR2 is informative and reflects expectations about the relation between the variables considered as it is suggested by the three competing theories. Let us start from the first equation (*Labour protection*). The legal origins theory (La Porta et al., 1998, 1999; Djankov et al., 2003) sustains that institutions are shaped by the legal tradition that characterizes the various countries. In particular, the coefficient on *Common* is expected to be negative as documented by Botero et al. (2004): we then assign to the prior mean value -0.5 and to the prior standard deviation value 0.5. The electoral systems approach postulates a positive relation between proportionality of the voting system and strictness of the employment protection legislation,

as supported by data evidence offered by Pagano and Volpin (2005). Thus, the coefficient on *Prop* is set to have prior mean equal to 0.5 and prior standard error equal to 0.5. The co-evolution approach (empirical evidence supplied by Belloc and Pagano, 2009) maintains that stronger concentration of the block holders is likely to provoke a social democratic reaction leading to an increase of the workers' rights protection. This suggests a positive coefficient on the *Concentration* variable so that, again, we set prior mean and prior standard error both equal to 0.5. By contrast, we do not impose any informative prior on the parameters on the control variables, letting the data speak: prior mean is set equal to 0 and prior standard error equal to 5. We proceed in a similar way as regards the second equation (*Ownership concentration*). The legal origins theory maintains that the Anglo-American model has old roots in the common law traditions. Only in common law countries private owners, including the minority shareholders of large firms, could be properly protected, making it possible the separation between ownership and control. According to this view *Common* is expected to have a negative effect on *Concentration*: prior mean is set equal to -0.5 and prior standard error equal to 0.5. As implied by the electoral system approach, the coefficient on *Prop* is, on the contrary, predicted to be positive, so we set the prior mean equal to 0.5, with prior standard deviation equal to 0.5; whereas, as hinted by the co-evolution approach, the coefficient on *Union density*, capturing the influence of labour interest groups, has a positive anticipated sign and, accordingly, the prior mean has an assigned value 0.5, the prior standard deviation being equal to 0.5. Again, we retain strong uncertainty on all the control variables (zero prior means and prior standard errors equal to 5). PRIOR3 further restricts the range within which parameters are allowed to move and, while maintaining the prior means as specified in PRIOR2, sets prior standard errors equal to 0.25 for the coefficients associated to the three competing theories.

Table 2. Priors

Variable	*PRIOR1*	*PRIOR2*	*PRIOR3*
	Labour equation		
Common law	Normal (0, 5)	Normal (-0.5, 0.5)	Normal (-0.5, 0.25)
Concentration	Normal (0, 5)	Normal (0.5, 0.5)	Normal (0.5, 0.25)
Prop	Normal (0, 5)	Normal (0.5, 0.5)	Normal (0.5, 0.25)
All other variables	Normal (0, 5)	Normal (0, 5)	Normal (0, 5)
	Ownership concentration equation		
Common law	Normal (0, 5)	Normal (-0.5, 0.5)	Normal (-0.5, 0.25)
Union density	Normal (0, 5)	Normal (0.5, 0.5)	Normal (0.5, 0.25)
Prop	Normal (0, 5)	Normal (0.5, 0.5)	Normal (0.5, 0.25)
All other variables	Normal (0, 5)	Normal (0, 5)	Normal (0, 5)
$H \sim W(0_{2\times 2}, \underline{2})$			

Finally, we always maintain uninformative priors on the relevant parameters for $H(\underline{S}^{-1}, \underline{v})$ which is assumed to be distributed as a Wishart with two degrees of freedom (equal to the number of equations)

and zero mean for each element of the matrix, i.e. $H \sim W(0_{2\times 2}, 2)$. The reason for this choice is that more informative priors are considered too restrictive by the relevant literature (see in particular Dreze and Richard, 1983). Information on the three priors is summarized in table 2.

3.4 *Estimation results*

Our two-simultaneous equation model is estimated using the Gibbs sampler (Gelfand and Smith, 1990; Tanner, 1993). This is a method for posterior simulation widely adopted in linear regression model settings. We take 55,000 replications, with 5,000 burn-in replications discarded and the remaining 50,000 retained to compute the posterior features of interest.

Table 3 presents our estimation output. As will be seen, the results from respectively PRIOR1, PRIOR2 and PRIOR3 are very similar, suggesting that data information is predominant.[11] All signs are as expected and, from a frequentist perspective, the posterior means of the regression coefficients (reported in columns 2, 6 and 10 respectively for the three priors, with posterior standard errors in brackets) always fall within the highest posterior density interval[12] (HPDI) at least at the 5% confidence level (listed in columns 3, 7 and 11). We can observe that the three competing approaches all find support from the data. The found negative effect of the common law dummy on both workers' and block holders' interests concentration corroborates the predictions of the legal origins theory; the positive effect of the proportionality of the voting system variable on both ownership concentration and labour protection is consistent with the electoral systems approach; finally, the positive effect of the ownership concentration on labour protection and that of the unionization rate on ownership concentration confirm the expectations suggested by the co-evolution approach. The estimated parameters on the control variables, on which we have retained uninformative priors, also present sensible signs. In the labour equation, the positive and significant value of the parameter on the left power variable is consistent with the view put forward by Olson (1965, 1993) and empirically documented by Botero et al. (2004) that institutions transfer resources to individuals that are endowed with political power; accordingly workers rights are predicted to be protected by stricter regulation when the government has a leftist orientation. The efficiency theory (North, 1981; Demsetz, 1967) maintains that governments select labour market interventions to cure market failures so to maximize social welfare: richer countries are then expected to regulate less as they have fewer market failures to heal. Accordingly, we find that the logarithm of the per capita GDP has a negative impact on the strictness of labour protection. Finally, our data evidence reasonably suggests that countries characterized by more effective governments have less protective employment and collective relations laws. With regard to the ownership equation, we find that the three control variables, the shareholder protection, the efficiency of the judiciary system and the logarithm of the per capita GDP, all have a

[11] Estimated prior and posterior densities relative to PRIOR3 are reported in Appendix B available from the authors upon request.

[12] See Koop (2003), pp. 43-45.

Table 3: Posterior results

	Prior 1 (uninformative)				*Prior 2 (informative)*				*Prior 3 (informative)*			
Coefficient	*Post mean (post se)*	*HPDI 95%*	*NSE*	*CD*	*Post mean (post se)*	*HPDI 95%*	*NSE*	*CD*	*Post mean (post se)*	*HPDI 95%*	*NSE*	*CD*
						Labour equation						
Constant	-0.2875 (0.7568)	[-1.6146 0.7349]	0.0232	0.0658	0.0632 (0.4807)	[-0.7659 0.7981]	0.0071	0.6160	0.1946 (0.4024)	[-0.4832 0.8382]	0.0052	0.6680
Common	-0.1068 (0.1041)	[-0.2548 0.0786]	0.0018	-0.0423	-0.1361 (0.0785)	[-0.2561 -0.0004]	0.0006	-0.9052	-0.1465 (0.0707)	[-0.2578 -0.0267]	0.0005	0.1883
Concentr	1.4104 (0.8110)	[0.3432 2.8416]	0.0270	-0.0251	0.9994 (0.4611)	[0.2976 1.7989]	0.0082	-0.7411	0.8496 (0.3583)	[0.2736 1.4518]	0.0058	-0.4859
Prop	0.1346 (0.1034)	[-0.0410 0.2930]	0.0010	-0.7243	0.1474 (0.0825)	[0.0098 0.2802]	0.0004	0.7865	0.1527 (0.0763)	[0.0260 0.2762]	0.0003	0.1491
Left power	0.1079 (0.0729)	[-0.0115 0.2281]	0.0004	-0.1075	0.1108 (0.0723)	[-0.0067 0.2307]	0.0004	1.0297	0.1110 (0.0719)	[-0.0065 0.2298]	0.0004	0.0111
Eff gov	0.1008 (0.0440)	[0.0279 0.1727]	0.0002	-0.2034	0.0984 (0.0442)	[0.0255 0.1712]	0.0002	-1.0955	0.0977 (0.0439)	[0.0250 0.1696]	0.0002	0.9300
Log gdp	-0.0108 (0.0519)	[-0.0878 0.0788]	0.0012	-0.0755	-0.0283 (0.0407)	[-0.0926 0.0407]	0.0004	-0.4268	-0.0352 (0.0376)	[-0.0961 0.0275]	0.0003	-0.9516
						Ownership concentration equation						
Constant	0.9101 (0.1160)	[0.7197 1.1010]	0.0005	-0.3381	0.9148 (0.1180)	[0.7209 1.1086]	0.0005	-0.4491	0.9159 (0.1187)	[0.7228 1.1108]	0.0004	0.5832
Common	-0.0325 (0.0449)	[-0.1058 0.0420]	0.0003	-0.0132	-0.0273 (0.0450)	[-0.1010 0.0468]	0.0002	0.5565	-0.0262 (0.0453)	[-0.1003 0.0486]	0.0002	-1.3166
Union dens	0.0756 (0.0665)	[-0.0306 0.1844]	0.0007	-0.2373	0.0860 (0.0730)	[-0.0331 0.2055]	0.0005	-1.8850	0.0917 (0.0754)	[-0.0317 0.2159]	0.0003	0.0541
Prop	0.0049 (0.0482)	[-0.0748 0.0836]	0.0003	0.6872	0.0016 (0.0484)	[-0.0787 0.0808]	0.0002	-0.2474	0.0001 (0.0485)	[-0.0798 0.0793]	0.0002	-0.7071
Sh prot	-0.0179 (0.0104)	[-0.0365 -0.0028]	0.0001	-0.1996	-0.0206 (0.0109)	[-0.0393 -0.0037]	0.0001	-1.3641	-0.0215 (0.0112)	[-0.0405 -0.0037]	0.0001	0.4195
Eff jud	-0.0174 (0.0090)	[-0.0328 -0.0043]	0.0001	0.0909	-0.0199 (0.0094)	[-0.0357 -0.0051]	0.0001	-0.2616	-0.0207 (0.0097)	[-0.0370 -0.0050]	0.0001	0.3621
Log gdp	-0.0298 (0.0160)	[-0.0555 -0.0030]	0.0001	0.1555	-0.0276 (0.0165)	[-0.0544 -0.0002]	0.0001	1.1426	-0.0268 (0.0168)	[-0.0539 0.0010]	0.0001	-0.4286

NOTE: Total number of retained replications is 50,000, number of burn-in replications is 5,000.

negative effect on ownership concentration, consistently with results provided by La Porta et al. (2006).

Turning to the diagnostics, assessing the accuracy of the numerical approximations is essential in order to present reliable results with the Gibbs sampler. Following Geweke (1992), we report the numerical standard errors (*NSE*) for the approximations of the point estimates, and the convergence diagnostics (*CD*).[13] As will be noticed, the computed *NSE* (listed in columns 4, 8 and 12) are very small relative to posterior standard deviations of all the parameters (reported in brackets in column 2) and indicate a high degree of accuracy despite the limited number of observations. The *CD*, which test the difference between the point estimates based on the first 10,000 replications (after the burn-in replications) and that based on the last 10,000, are shown in columns 5, 9 and 13. As will be seen, the values obtained for the *CD* statistics are always smaller than the critical values from the standard Normal statistical table.

3.5 *Model comparisons*

Model comparison is implemented by Bayes factors.[14] First, we compare nested models: for each of the three theories considered, we compare the full model (M_0) with an abridged model where the coefficient representing theory i is set to have zero prior mean and zero prior standard error (M_{-i}). This is equivalent to saying that we constrain the associated variable to have no effect on the dependent variable, thereby challenging the relevance of our informative priors and the relevance of the corresponding theory. More in detail, we proceed as follows. We compute the posterior log-likelihood of the full model, $p(Y|M_0)$, the posterior log-likelihood of the abridged model, $p(Y|M_{-i})$, and then take the ratio between the two, obtaining the Bayes' factor: $B_i = p(Y|M_0)/p(Y|M_{-i})$. $B_i > 1$ indicates that the full model is more likely than the abridged model in explaining the data: thus the theory representing model i is supported by the evidence. By contrast, $B_i < 1$ suggests that the abridged model is preferable to the full model in terms of (log-)likelihood maximization, so that the theory considered is to be discarded.

Our results are shown in table 4 (columns 2, 3 and 4), and are commented on below relying on the *rule of thumb* suggested by Jeffreys (1961).[15] As one can notice, the three approaches all find support from the data, which is always stronger when *PRIOR3* is considered. Interestingly, the ownership concentration variable in the labour equation presents a Bayes factor in its favor larger than 200. This furnishes decisive support for the associated co-evolution theory.

Second, we perform non-nested model comparisons by running pairwise "horse races" between the three theories considered. Let us denote the full model by M_0, the abridged model without the effect suggested by theory i by M_{-i}, and the abridged model without the effect proposed by theory j by M_{-j}. Comparisons are then implemented simply computing the ratio of the two Bayes factors between the

[13] See Appendix A.3 for technical details and Koop (2003), pp. 66-68, for a more general treatment.

[14] See Appendix A.2 for technical details, Koop (2003), pp. 38-43, for a more general treatment, and Gawande (1998) for a paper adopting a similar methodology (but with a completely different focus).

[15] (*i*) $1 < B_{ij} < 3.16$: the evidence slightly supports M_i. (*ii*) $3.16 < B_{ij} < 10$: the evidence moderately supports M_i. (*iii*) $10 < B_{ij} < 100$: the evidence strongly supports M_i. (*iv*) $100 < B_{ij}$: the evidence decisively supports M_i.

full and abridged models, M_{-i} and M_{-j}, obtaining $B_{ij} = B_i / B_j = p(Y \mid M_{-i}) / p(Y \mid M_{-j})$. If $B_{ij} > 1$, we can conclude that M_{-j} (model without effect for theory *j*) is more likely than M_{-i} (model without effect for theory *i*) given the data, providing that theory *i* is a better explanation of the data than theory *j*. Note that this should not be interpreted as decisive proof of the validity of one model against another, but rather as a measure of relative support.

As regards the first equation we compare the abridged model for each theory (from time to time denoted by M_{-j}) with the model with no ownership concentration effect (M_{-i}). As will be noticed in table 4 (columns 6, 7 and 8), the latter is always dismissed by the Bayes factor test. The experiment thus indicates that the concentration variable is more influential than the proxy for common law and that for the proportionality of the electoral system in the determination of workers rights. With regard to the ownership concentration equation, we instead compare the various abridged models (from time to time denoted by M_{-j}) with the model where the "social democracy" effect is assumed not to work (M_{-i}). We find that Roe's argument is preferred by the data against the legal origins and the electoral systems approaches although the value of the Bayes factor only suggests slight evidence against the former.

Table 4. Model comparisons

Nested model comparison				*Non-nested model comparison*			
Models compared: Full versus	*PRIOR1*	*PRIOR2*	*PRIOR3*	*Models compared: Co-evolution versus*	*PRIOR1*	*PRIOR2*	*PRIOR3*
Labour equation							
Legal origins	3.2578	19.4947	32.3401	*Legal origins*	68.4207	18.3843	11.0804
Co-evolution	222.9011	358.3966	358.3414	*Co-evolution*	1.0000	1.0000	1.0000
Electoral systems	5.4107	21.8082	32.3308	*Electoral systems*	41.1964	16.4340	11.0836
Ownership concentration equation							
Legal origins	1.2445	2.6393	2.9499	*Legal origins*	2.4374	3.0518	3.0763
Co-evolution	3.0334	8.0547	9.0749	*Co-evolution*	1.0000	1.0000	1.0000
Electoral systems	0.9321	2.4386	2.6901	*Electoral systems*	3.2544	3.3030	3.3734

NOTE: Total number of retained replications is 50,000, number of burn-in replications is 5,000.

3.6 *Robustness checks*

In this section we gauge the robustness of our previous conclusions. Since the three priors yield very consistent results, we only report the estimation output relative to PRIOR3.

First, following La Porta et al. (2006), we replace *Union density* with the proxy for left power as regressor in the ownership concentration equation. This variable captures the negative effect of "social democracy" on corporate ownership dispersion, as suggested by Roe (2003). We set prior mean of *Left*

power equal to 0.5 and prior standard deviation equal to 0.25. The results are given in table 5, from which it will be seen that our qualitative conclusions are substantially unaltered.

Table 5: Robustness checks – Left power as proxy for social democracy (PRIOR3)

Coeff.	*P. mean (p. se)*	*HPDI 95%*	*NSE*	*CD*	*Coeff.*	*P.mean (p. se)*	*HPDI 95%*	*NSE*	*CD*
Const	0.2711 (0.4055)	[-0.4173 0.9153]	0.0041	-0.6112	*Const*	0.8643 (0.1191)	[0.6681 1.0588]	0.0005	-0.4281
Comm	-0.1418 (0.0717)	[-0.2532 -0.0187]	0.0005	1.1468	*Comm*	-0.0299 (0.0453)	[-0.1047 0.0443]	0.0002	-0.8790
Conc	0.7966 (0.3737)	[0.1981 1.4248]	0.0053	0.8381	*Left power*	0.0772 (0.0646)	[-0.0273 0.1837]	0.0003	-0.5448
Prop	0.1644 (0.0755)	[0.0402 0.2874]	0.0003	-0.7201	*Prop*	0.0022 (0.0473)	[-0.0769 0.0795]	0.0002	-0.9135
Left power	0.0530 (0.1039)	[-0.1228 0.2173]	0.0006	-0.1788	*Sh prot*	-0.0252 (0.0110)	[-0.0437 -0.0075]	0.0001	1.0760
Eff gov	0.0994 (0.0447)	[0.0254 0.1725]	0.0003	1.1012	*Eff jud*	-0.0197 (0.0098)	[-0.0360 -0.0042]	0.0001	0.2199
Log gdp	-0.0400 (0.0377)	[-0.1009 0.0231]	0.0002	0.1873	*Log gdp*	-0.0203 (0.0169)	[-0.0478 0.0078]	0.0001	0.0830

NOTE: Total number of retained replications is 50,000, number of burn-in replications is 5,000.

Second, we check for the sensitivity of our results to the choice of the labour protection index as a measure of workers' rights protection. Botero et al. (2004) provide several measures for such a variable: the *Relation index*, the *Union index*, and the *Social security index*. We estimate our SEMs by adopting the three indexes one after the other as the dependent variable in the first equation (output is reported in table 6). Again, our main results are broadly consistent with the basic estimation, the only difference being relative to the left power variable and the log per capita GDP whose coefficients in the labour equation turns out respectively negative and positive, but very small, when the union index and the collective relations index are used.

Third, it may be argued that the index for shareholder protection rights representation is endogenous (La Porta et al., 2006). To deal with this possible objection, we estimate the three-equation SEM reported below:

$$\begin{aligned} Labour &= \alpha_1 + \beta_1 Common + \beta_2 Concentr + \beta_3 Prop + \beta_4 Left + \beta_5 Eff\ gov + \beta_6 Log\ gdp + \varepsilon_1 \\ Concentr &= \alpha_2 + \beta_7 Union + \beta_8 Sh\ prot + \beta_9 Eff\ jud + \beta_{10} Log\ gdp + \varepsilon_2 \\ Sh\ prot &= \alpha_3 + \beta_{11} Common + \beta_{12} Eff\ jud + \beta_{13} Prop + \beta_{14} Log\ gdp + \varepsilon_3 \end{aligned} \tag{4}$$

In the model specification we follow La Porta et al. (2006) who used common law as an instrument for shareholders' protection excluded from the ownership concentration equation. This specification also provides a more proper representation of the model proposed by Pagano and Volpin (2005) who focus on the simultaneous determination of labour protection and shareholders' protection (not of ownership concentration). Previous evidence (La Porta et al., 1999; Pagano and Volpin, 2005) suggest the

Table 6: Robustness checks – Alternative proxies for labour protection (PRIOR3)

	Union index				*Collective relations index*				*Social security index*			
Coeff.	*P. mean (p. se)*	*HPDI 95%*	*NSE*	*CD*	*P. mean (p. se)*	*HPDI 95%*	*NSE*	*CD*	*P. mean (p. se)*	*HPDI 95%*	*NSE*	*CD*
						Labour equation						
Constant	-0.2874 (0.4594)	[-1.0528 0.4555]	0.0050	-0.2848	-0.2594 (0.3888)	[-0.9168 0.3595]	0.0057	0.5686	-0.6884 (0.5347)	[-1.5811 0.1764]	0.0083	-0.4934
Common	-0.1521 (0.0730)	[-0.2674 -0.0280]	0.0006	0.9481	-0.0607 (0.0532)	[-0.1432 0.0297]	0.0005	-0.2783	0.0042 (0.0722)	[-0.1098 0.1252]	0.0007	0.1993
Concentr	0.6335 (0.4146)	[-0.0429 1.3166]	0.0057	0.2160	0.4002 (0.3795)	[-0.2000 1.0407]	0.0067	-0.5071	0.2534 (0.5143)	[-0.5793 1.1068]	0.0094	0.5308
Prop	0.1256 (0.0778)	[-0.0030 0.2520]	0.0003	0.1928	0.1291 (0.0555)	[0.0362 0.2179]	0.0003	0.4734	0.0670 (0.0753)	[-0.0571 0.1906]	0.0005	-0.4287
Left	-0.0043 (0.0842)	[-0.1428 0.1339]	0.0004	-0.4849	-0.0188 (0.0617)	[-0.1201 0.0822]	0.0003	0.3621	0.0401 (0.0886)	[-0.1049 0.1860]	0.0004	-0.0436
Eff gov	-0.0640 (0.0515)	[-0.1486 0.0206]	0.0002	0.7747	-0.0871 (0.0383)	[-0.1501 -0.0241]	0.0002	0.3723	-0.0580 (0.0548)	[-0.1475 0.0323]	0.0002	0.0389
Log gdp	0.0508 (0.0427)	[-0.0183 0.1214]	0.0003	0.1991	0.0593 (0.0326)	[0.0068 0.1133]	0.0003	-0.6897	0.1327 (0.0457)	[0.0583 0.2088]	0.0005	0.4335
						Ownership concentration equation						
Constant	0.9114 (0.1203)	[0.7129 1.1089]	0.0006	1.6488	0.9009 (0.1189)	[0.7054 1.0959]	0.0005	-0.1441	0.8999 (0.1219)	[0.6993 1.1003]	0.0006	-1.2714
Common	-0.0407 (0.0466)	[-0.1174 0.0357]	0.0002	-0.7347	-0.0400 (0.0469)	[-0.1170 0.0373]	0.0002	0.8259	-0.0497 (0.0490)	[-0.1305 0.0299]	0.0003	-0.2207
Union	0.0966 (0.0922)	[-0.0578 0.2439]	0.0006	0.1188	0.0219 (0.0908)	[-0.1276 0.1718]	0.0005	0.0730	0.0295 (0.1054)	[-0.1478 0.1994]	0.0009	0.0668
Prop	0.0046 (0.0495)	[-0.0774 0.0857]	0.0002	-0.5707	0.0188 (0.0494)	[-0.0620 0.0997]	0.0002	0.3687	0.0206 (0.0505)	[-0.0622 0.1038]	0.0003	1.4367
Sh prot	-0.0121 (0.0132)	[-0.0343 0.0088]	0.0001	-0.5666	-0.0147 (0.0139)	[-0.0381 0.0075]	0.0001	-0.2553	-0.0091 (0.0187)	[-0.0406 0.0208]	0.0002	0.7886
Eff jud	-0.0176 (0.0114)	[-0.0362 0.0012]	0.0001	-0.6763	-0.0126 (0.0119)	[-0.0319 0.0073]	0.0001	-0.6214	-0.0106 (0.0129)	[-0.0314 0.0107]	0.0001	-0.6360
Log gdp	-0.0322 (0.0178)	[-0.0612 -0.0030]	0.0001	-0.2060	-0.0331 (0.0181)	[-0.0628 -0.0034]	0.0001	0.5242	-0.0367 (0.0187)	[-0.0674 -0.0060]	0.0001	0.3352

NOTE: Total number of retained replications is 50,000, number of burn-in replications is 5,000.

following informative priors for the shareholder protection equation in PRIOR3 (mean, standard error): *Common* (0.5, 0.25), *Prop* (-0.5, 0.25), *Eff jud* (0.5, 0.25), *Log gdp* (0.5, 0.25). The econometric results are set out in table 7. The posterior estimates are consistent with expectations, with the only exception of the coefficient on the government effectiveness variable in the first equation that is now positive. All the other parameters' signs are as expected and the values always fall within the 5% HPDI.

Table 7: Robustness checks – Endogenous shareholder protection (PRIOR3)

Coeff.	*P.mean (p. se)*	*HPDI 95%*	*NSE*	*CD*
		Labour equation		
Constant	0.3502 (0.4112)	[-0.3483 1.0034]	0.0061	-0.0648
Common	-0.1939 (0.0503)	[-0.2769 -0.1117]	0.0003	1.4493
Concentration	0.7609 (0.3853)	[0.1418 1.4063]	0.0073	0.1482
Prop	0.1613 (0.0545)	[0.0722 0.2513]	0.0003	0.2821
Left power	0.1290 (0.0711)	[0.0129 0.2466]	0.0004	-0.2231
Eff gov	0.1069 (0.0434)	[0.0357 0.1784]	0.0002	0.1946
Log gdp	-0.0484 (0.0373)	[-0.1084 0.0138]	0.0003	-0.1270
		Ownership concentration equation		
Constant	0.8531 (0.1153)	[0.6632 1.0414]	0.0005	-0.8560
Union	0.0974 (0.0720)	[-0.0195 0.2163]	0.0003	-0.0967
Sh prot	-0.0034 (0.0167)	[-0.0301 0.0243]	0.0002	-0.3261
Eff jud	-0.0247 (0.0101)	[-0.0417 -0.0088]	0.0001	-0.3940
Log gdp	-0.0238 (0.0155)	[-0.0493 0.0015]	0.0001	1.3855
		Shareholder protection equation		
Constant	1.1955 (0.9117)	[-0.3111 2.6903]	0.0033	0.9443
Common	1.1815 (0.3263)	[0.6433 1.7214]	0.0016	-0.3125
Prop	-0.6248 (0.3022)	[-1.1200 -0.1267]	0.0013	-0.6204
Eff jud	0.0276 (0.1088)	[-0.1502 0.2089]	0.0006	0.0885
Log gdp	0.1788 (0.1480)	[-0.0665 0.4209]	0.0006	-0.3859

NOTE: Total number of retained replications is 50,000, number of burn-in replications is 5,000.

Finally, as anticipated in section 3.2, we substitute Botero et al.'s index for employment protection, with the OECD index (OECD, 2009). In this case the sectional sample covers only OECD countries and number of the economies included shrinks to 24. As will be observed in table 8, again all the previous conclusions about the three competing theories remain unchanged. Regarding the control variables, it is however worth noting that, in the labour equation, the government effectiveness and the log per capita GDP have now a positive sign contrarily to previous findings.

Table 8: Robustness checks – EPL OECD index (PRIOR3)

Coeff.	*P.mean (p. se)*	*HPDI 95%*	*NSE*	*CD*
		Labour concentration equation		
Constant	-1.2747 (1.4205)	[-3.5978 1.0584]	0.0062	0.2369
Common	-0.7444 (0.2855)	[-1.2157 -0.2737]	0.0011	-0.2527
Concentration	0.5805 (0.4917)	[-0.2340 1.3846]	0.0024	0.4042
Prop	0.7976 (0.3138)	[0.2817 1.3118]	0.0011	-1.1776
Left power	0.5765 (0.5181)	[-0.2752 1.4250]	0.0024	0.4920
Eff gov	0.3223 (0.2770)	[-0.1280 0.7786]	0.0012	1.6243
Log gdp	0.1631 (0.1831)	[-0.1385 0.4637]	0.0008	-0.4974
		Ownership concentration equation		
Constant	0.9026 (0.1199)	[0.7048 1.0987]	0.0005	-0.4590
Common	-0.0348 (0.0486)	[-0.1148 0.0456]	0.0002	-0.7641
Union dens	0.0105 (0.1004)	[-0.1528 0.1756]	0.0004	-0.3647
Prop	0.0214 (0.0499)	[-0.0598 0.1029]	0.0002	-0.6007
Sh prot	-0.0203 (0.0159)	[-0.0464 0.0059]	0.0001	0.1172
Eff jud	-0.0129 (0.0138)	[-0.0355 0.0098]	0.0001	0.7661
Log gdp	-0.0311 (0.0198)	[-0.0633 0.0015]	0.0001	-0.0265

NOTE: Total number of retained replications is 50,000, number of burn-in replications is 5,000.

4. Concluding remarks

In this paper we have compared three different approaches to shareholders' and workers' interests protection: the legal, the political and the co-evolution approach. After illustrating the three competing views in a comparative perspective and discussing historical evidence supporting the co-evolution explanation, we have used Bayesian econometrics to test and contrast the three approaches on an empirical ground. In particular, we have gauged the empirical relevance of the co-evolution approach relatively to the other two theories that have received substantial empirical support and strong emphasis in the recent literature. We have concluded that the co-evolution argument cannot be ignored in the present debate: while the three theories all found support from the data, the co-evolution approach turns out at least as influential as the competing approaches in explaining shareholder and worker protection determination. We believe that this finding has important policy implications that we briefly consider in what follows.

The approaches focusing on legal and electoral systems contained a clear policy implication: one should reform these systems to allow the coming of a particular final and efficient variety of capitalism which was already prevailing in the United States and the United Kingdom. The co-evolution approach had no simple prescription and was rather warning about the dangers of hybridising economic systems which had co-evolved complementary institutions.

In the co-evolution framework, American populism (keep capitalistic dynasties under control!) and European social democracy (create workers' counter-power to powerful capitalist families!) were interpreted as two very different political strategies sharing a common purpose: both made the concentration of power associated with large-scale production compatible with democracy and safeguarded the human capital investment of non-owners.

In terms of a narrower concept of economic efficiency, each form of business organization requires many complementary institutions. For this reason, disequilibrium situations, such as those encountered by Britain in its transition from one politics-business co-evolution path to another, are likely to be particularly painful. Once a particular set of business institutions has been established, a country may often find a path to the accumulation of human and material capital that is better suited to those institutions. The complementarities among political power relations, business institutions and economic resources may make changes very difficult to accomplish, even when they are in the direction of more promising development paths. Moreover, in a globally integrated economic environment, each country may specialize in those sectors where it enjoys a comparative institutional advantage and extend the economic role of its specific institutions (Pagano, 2007; Belloc and Bowles, 2009; Costinot, 2009; Levchenko, 2007; Nunn, 2007). Such productive and institutional specialization may make change even more difficult.

Only if the potential complementarities are taken into account, some combination of coherent policies may be beneficial. By contrast, one-sided measures, which import only one characteristic of a particular system of corporate governance, may decrease economic efficiency and push the system

towards a fitness valley of inconsistent attributes. And they may even upset the country-specific balance between economic power and political democracy.

Part of the crisis can indeed be blamed on the hybridization of different systems. To mention few examples German banks invested in risky securities of foreign and severed their symbiotic relations with local firms and their employees. The Glass Steagall act, which marked an important systemic difference between the marked based dispersed American system and German universal banking, was repealed. Most regulations, which guaranteed the workings and the competitiveness of American financial markets, were dismantled while the institutions, such as the German codetermination system, which balanced the concentrated employers power were weakened.

In the present crisis, the pre-hybridization recent past arrangements are likely to be powerful attractors and may offer the key for understanding possible scenarios and their policy implications. There are however many obvious limitations for reading future event through the lenses of the past. In the first place, at least one country, England, has a non-remote past different from its recent arrangements (only in the simplifications of many theories, this recent history made her a permanent member of the so-called "Anglo-Saxon model"). In this case, the power past attractor is particularly doubtful. Secondly, the crisis is genuinely a global one where international arrangements have played an important role[16] and limit the diversification of countries according to their past attractors. For this reason, many institutional arrangements must be negotiated at international level. Finally, in spite of the perseverance through many decades of national politics-business interaction paths, history is never repeating itself. The future is also a product of our (mis)conceptions. Each paper (including the present one) is a very tiny addition to their enormous stock but a sufficient reminder of its unpredictability.

Appendix A

A.1 Estimation

In this appendix we briefly review the econometric approach adopted (for a more detailed textbook treatment see, for instance, Koop, 2003, on which we draw in our exposition below). Assume we have a matrix of data $Y = [y, x]$ and a vector of parameters $\theta = [\theta_1, \theta_2, .. \theta_k, ...]$ and want to learn about the parameters θ given the data Y. We can apply Bayes' theorem, which states that:

$$p(\theta \mid Y) = \frac{p(Y \mid \theta) \times p(\theta)}{p(Y)}. \tag{A1}$$

$p(Y)$ is the marginal density of the observations included in Y. $p(\theta)$ is the prior density: it summarizes our beliefs about θ before analysing the data, Y, and is subjectively determined by the researcher. $p(Y \mid \theta)$ is the likelihood function which gives the joint data density value conditionally to the

[16] Global rights such as IPR set limits to this diversity. They set also limits to the quantities and to the typologies of investments and may be one of the causes of the current crisis (Pagano and Rossi, 2009).

maximum-likelihood estimate of θ. Finally, the posterior density, $p(\theta | Y)$, combines the latter two pieces of information and expresses our knowledge about θ after looking at the data. The mean of the posterior density may be utilized as a point estimate, that is

$$E(\theta_k \mid Y) = \int \theta_k \, p(\theta \mid Y) d\theta, \tag{A2}$$

and the posterior standard deviation may be interpreted as a measure of the degree of uncertainty of the point estimate, that is

$$\begin{aligned} &St.Dev. = \sqrt{E(\theta_k^2 \mid Y) - [E(\theta_k \mid Y)]^2} \\ &\text{where} \quad E(\theta_k^2 \mid Y) = \int \theta_k^2 \, p(\theta \mid Y) d\theta. \end{aligned} \tag{A3}$$

Except special cases, (A2) does not present an analytical derivation. We must consequently resort to sampling algorithms (such as the Gibbs sampling and the Metropolist-Hastings algorithm).

A.2 Model comparison

Bayesian model comparison is performed by using the posterior odds ratios. Suppose that there exist n plausible theories to explain data $Y = [y, x]$, and that each of them can be summarized by a statistical model M_i with $i = 1,2\ldots n$, which depends on parameters θ_i. The posterior density, the prior density and the likelihood function now turn out to depend on what model is being used. Accordingly (A1) becomes:

$$p(\theta_i \mid Y, M_i) = \frac{p(Y \mid \theta_i, M_i) \times p(\theta_i, M_i)}{p(Y, M_i)}. \tag{A4}$$

We are interested in determining which model is more likely to be (preferred in terms of likelihood maximization) given the data Y. By Bayes' theorem, we can also write:

$$p(M_i \mid Y) = \frac{p(Y \mid M_i) \times p(M_i)}{p(Y \mid M_i) \times p(M_i) + p(Y \mid M_j) \times p(M_j)} \tag{A5}$$

where $i \neq j$, and $p(Y \mid M_i) = \int p(Y \mid \theta_i, M_i) p(\theta_i \mid M_i) d\theta_i$ is called marginal probability of the data given M_i. Expression (A5) defines the posterior probability that M_i is correct (under the assumption that either M_i or M_j is correct, i.e. $p(M_i \mid Y) + p(M_j \mid Y) = 1$). An expression analogous to (A5) can be derived relatively to M_j, $p(M_j \mid Y)$. The ratio between $p(M_i \mid Y)$ and $p(M_j \mid Y)$ gives the posterior odds ratio,

$$PO_{ij} = \frac{p(M_i \mid Y)}{p(M_j \mid Y)} = \frac{p(Y \mid M_i)}{p(Y \mid M_j)} \frac{p(M_i)}{p(M_j)}, \tag{A6}$$

which states the extent to which the data support M_i relatively to model M_j. The first fraction on the right hand side of equation (A6) is the Bayes' factor, B_{ij}, while the second fraction is the prior odds

ratio. In the absence of prior beliefs supporting one model against the other, the prior odds ratio is equal to one, and the Bayes' factor coincides with the posterior odds ratio, which turns out to be

$$PO_{ij} = B_{ij} = \frac{p(Y \mid M_i)}{p(Y \mid M_j)}. \tag{A7}$$

If B_{ij} is larger than unity, we can say that model i is more likely than model j in explaining Y. If, on the contrary, B_{ij} is smaller than unity, model M_j is suggested to be more likely than M_i.

A.3 Diagnostic tests

Following Geweke (1992), we compute numerical standard errors ($N\hat{S}E$) for the approximations of the point estimates, $E(\theta_k \mid Y)$. The $N\hat{S}E$ is given by $\hat{\sigma}_g / \sqrt{S}$, where $\hat{\sigma}_g$ is the estimated standard error of the importance function, $g(\theta)$, conditional to Y, and S is the number of replications of the Gibbs sampler (for more details see Geweke, 1992, and Koop, 2003). A second diagnostic test suggested by Geweke (1992) is the convergence diagnostic (*CD*). This compares the estimated $E(\theta_k \mid Y)$ based on the first S_A replications (after the burn-in replications) and that based on the last S_B replications. If the two estimates turn out to be significantly different, this means that not enough replications have been used by the sampler. The relevant statistics is given by $(\hat{g}_{S_A} - \hat{g}_{S_B}) / (N\hat{S}E_{S_A} + N\hat{S}E_{S_B})$, where $\hat{g}_{S_A}$ and $\hat{g}_{S_B}$ are the estimates of $E(\theta_k \mid Y)$ based on respectively the first S_A and the last S_B replications, and $N\hat{S}E_{S_A}$ and $N\hat{S}E_{S_B}$ are the corresponding computed numerical standard errors. The *CD* statistics is distributed as a standard Normal.

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Appendix B: Estimated prior and posterior densities - Prior3

(Dashed lines denote priors, solid lines denote posteriors)

Fig B.1: *Estimated prior and posterior densities for* β_1

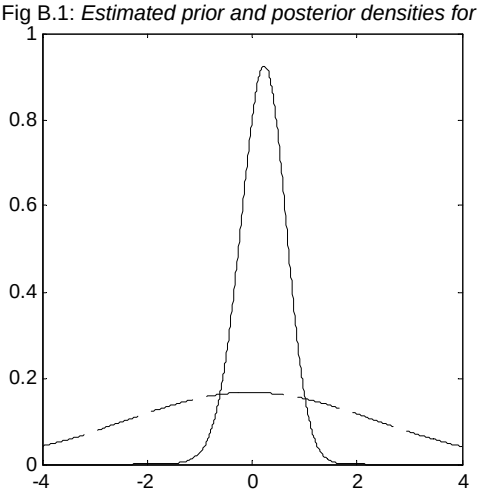


Fig B.2: *Estimated prior and posterior densities for* β_2

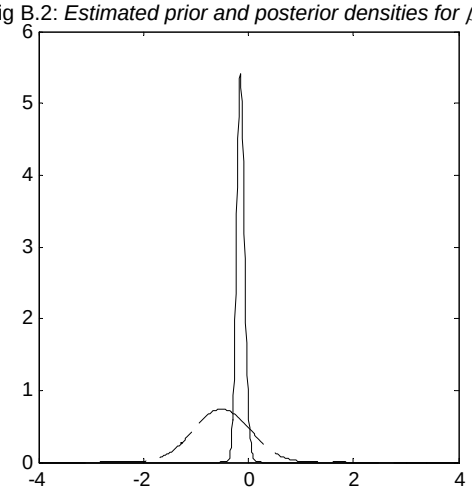


Fig B.3: *Estimated prior and posterior densities for* β_3

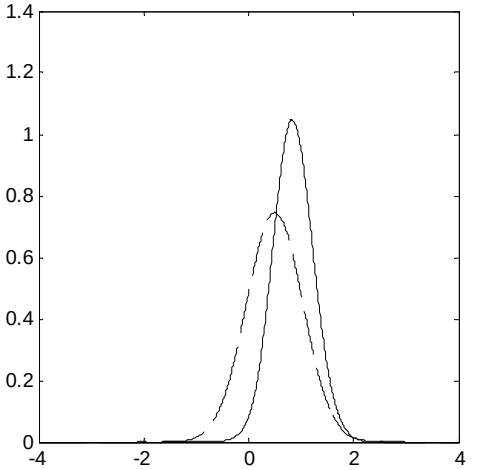


Fig B.4: *Estimated prior and posterior densities for* β_4

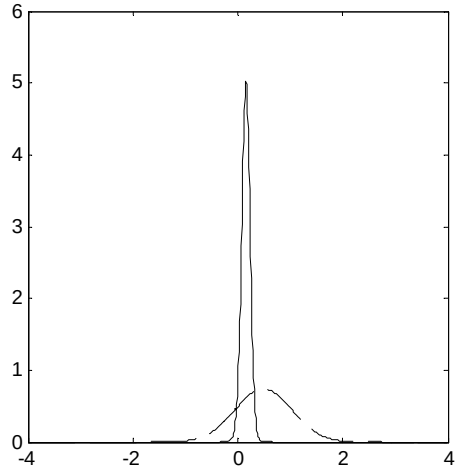


Fig B.5: *Estimated prior and posterior densities for* β_5

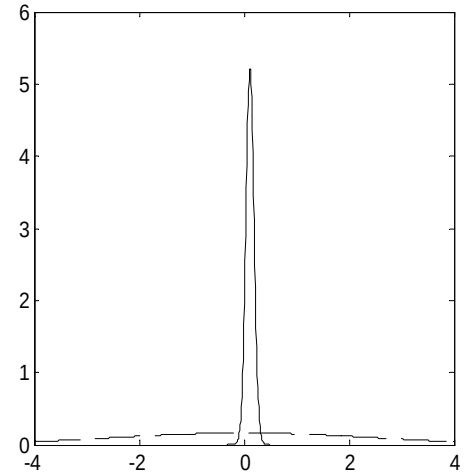


Fig B.6: *Estimated prior and posterior densities for* β_6

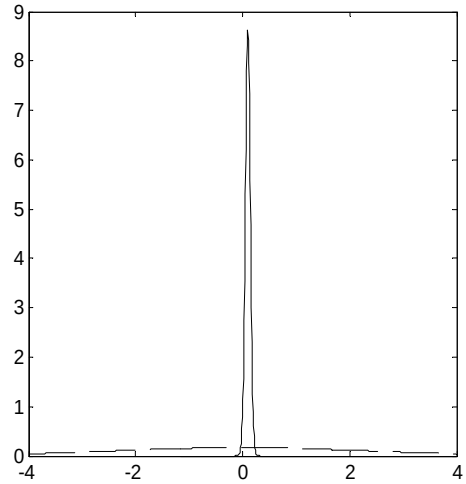


Fig B.7: *Estimated prior and posterior densities for* β_7

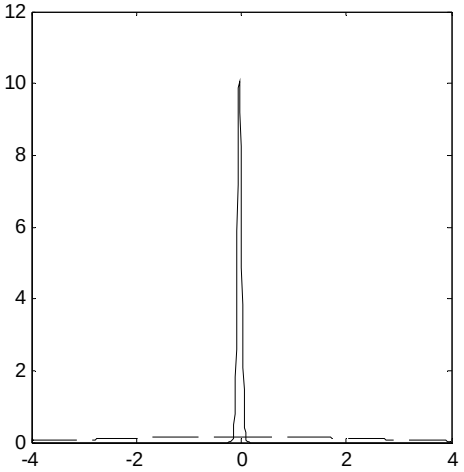


Fig B.8: *Estimated prior and posterior densities for* β_8

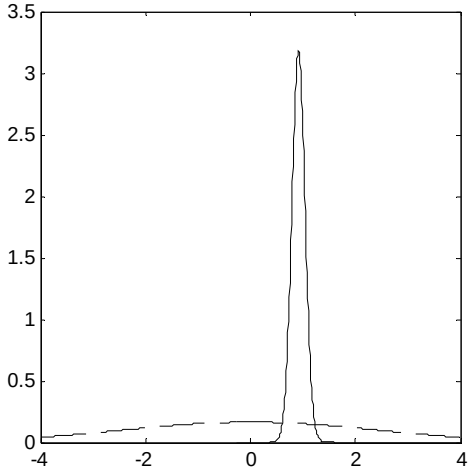


Fig B.9: *Estimated prior and posterior densities for* β_9

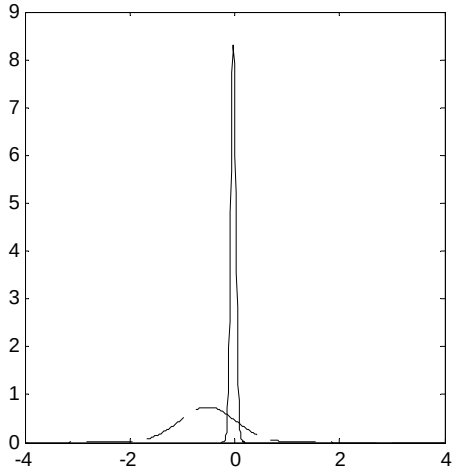


Fig B.10: *Estimated prior and posterior densities for* β_{10}

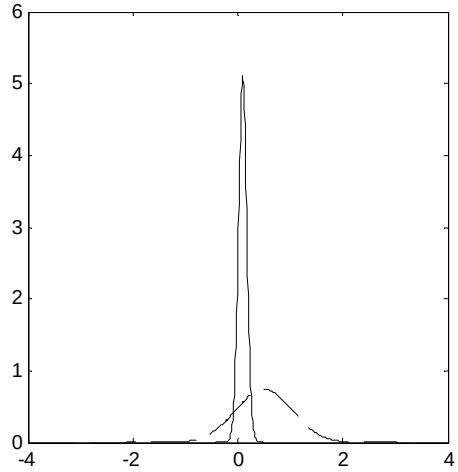


Fig B.11: *Estimated prior and posterior densities for* β_{11}

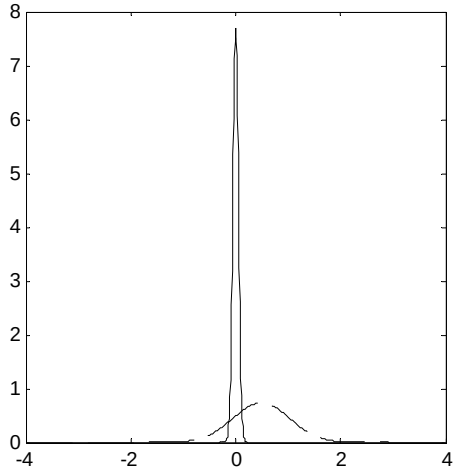


Fig B.12: *Estimated prior and posterior densities for* β_{12}

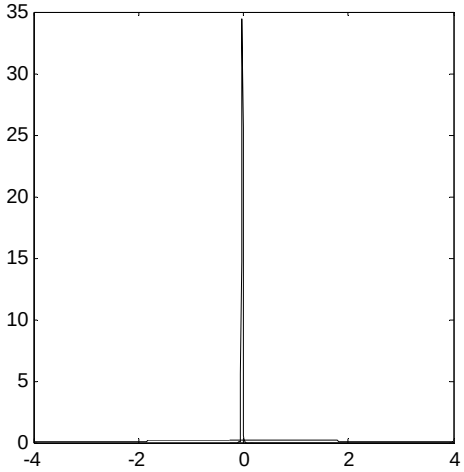


Fig B.13: *Estimated prior and posterior densities for* β_{13}

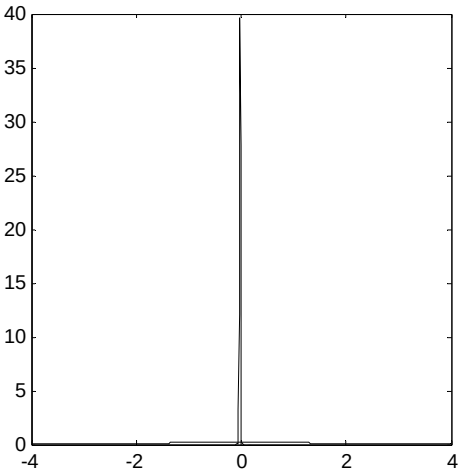
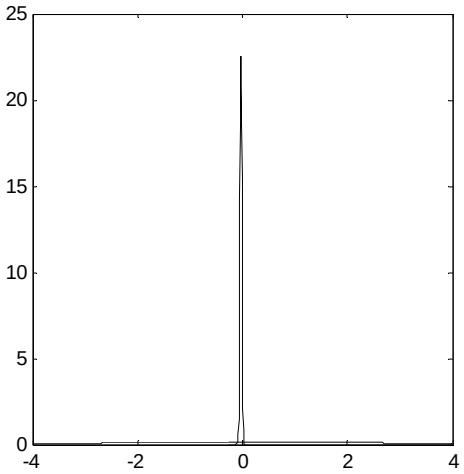


Fig B.14: *Estimated prior and posterior densities for* β_{14}



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