The Global Diffusion of Regulatory Agencies:
Channels of Transfer and Stages of Diffusion

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Abstract

The autonomous regulatory agency has recently become *the* 'appropriate model' of governance across countries and sectors. The dynamics of this process is captured in our data set, which covers the creation of agencies in 48 countries and 16 sectors since the 1920s. Adopting a diffusion approach to explain this broad process of institutional change, we explore the role of countries and sectors as sources of institutional transfer at different stages of the diffusion process. We demonstrate how the restructuring of national bureaucracies unfolds via four different channels of institutional transfer. Our results challenge theoretical approaches that overemphasize the national dimension in global diffusion and are insensitive to the stages of the diffusion process. Further advance in study of diffusion depends, we assert, on the ability to apply both cross-sectoral and cross-national analysis to the same research design and to incorporate channels of transfer with different causal mechanisms for different stages of the diffusion process.

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The autonomous regulatory agency has recently become *the* 'appropriate' model of governance in capitalist economies. Our data set, which captures the creation of agencies in 16 sectors and 48 countries over 88 years (1920–2007), reveals the dynamics of the spread of these new organizations. It offers the first comprehensive overview of the global surge in the popularity of the regulatory agency as an alternative to the traditional bureaucratic organization of government.[1] What we found goes well beyond our initial expectations and what was known and appreciated in the literature. The process of 'regulatory agencification' has indeed exploded and in this process regulation has become a distinct and salient function in the institutions of policy making. Regulatory agencies are not new; nonetheless their adoption in recent decades as a best practice suggests a reorganization of modern bureaucracy and a new division of power between politicians and bureaucrats within the modern administrative state. The number of new agencies that were set up grew up from fewer than five new agencies per year until the 1980s, to more than 20 new agencies per year from the 1990s to 2002 (reaching peaks of more than 30 new agencies per year between 1996 and 2001). We identified agencies in about 73 per cent of all the cases under study at the end of 2007 (see Figure 1). This paper presents the data on these widespread changes and disaggregates the sectoral, national and temporal patterns of their diffusion. With the rise of neo-liberalism and expectations of state contraction, many have assumed that deregulation would also lead to *de*-bureaucratization. However, our evidence on the scope of the creation of regulatory agencies suggests *re*-bureaucratization and, consequently, expansion in the regulatory capacities of the state.

FIGURE 1 ABOUT HERE

If regulatory agencies are part and parcel of the process of *re*-bureaucratization of the state and if regulation, rather than service delivery, becomes so central to our system of governance, how should we approach the study of the forces that propel their proliferation? Studies of regulatory agencification have so far focused on a limited number of countries, sectors and regions. With a few notable exceptions (i.e., Polillo and Guillén, 2005; Gilardi, 2008), these studies do not adopt a diffusion perspective. We suggest that diffusion is an important element to add to the literature on regulatory agencification, and we therefore situate our analysis within this literature (Scholte, 2000**;** Guillén, 2001; Simmons and Elkins, 2004; Coen and Thatcher, 2007). Yet our theoretical and analytical frameworks avoid two major shortcomings of other diffusion studies. First, the diffusion studies that we are aware of examine diffusion as a process that is transmitted only from one *country* to another, and thus ignore sectoral units of analysis. By contrast, this paper distinguishes between four channels of institutional transfer: within the same sector across different countries (Sectoral Transfer), within the same country across different sectors (National Transfer), from other significant countries (Intergovernmental Transfer) and from other significant sectors (Supranational Transfer). Better understanding of the channels of transfer may allow us to better understand the mechanisms of transfer. Second, most of the studies of diffusion average correlations across all stages of the diffusion process, using a statistical model that ignores the different dynamics involved in each stage of the process. By contrast, this paper examines correlates of diffusion at different stages of the process, suggesting, in line with the theory of diffusion, that causality differs in different stages. While we employ the 'usual suspects' of comparative

politics, this paper's major concern is with interpreting the effects of different channels at different stages of diffusion.

The first section of the paper offers a theoretical framework that builds on insights from the literature on regulatory agencies, diffusion and institutional transfer. Section 2 sets out our working hypotheses. Section 3 presents the data gathered, defines the relevant variables, and sets out our methodological approach. Section 4 presents the findings, tests our hypotheses against them, and offers an interpretive analysis of the results. Section 5 concludes.

I. Channels of transfer and the spread of regulatory agencies

As noted, our data set on the creation of regulatory agencies is wide and unique in covering variations across 48 countries (Latin America and all OECD countries) and 16 sectors (ranging from financial and utilities via competition to social; see Appendix for the complete list). While some important regions and nations (most Asian and African countries) are not covered, we offer what is still the widest existing overview of the emergence and diffusion of new regulatory agencies in the 20th century. The extent of this change and its impact on our understanding of bureaucratic behaviour is yet to be recognized and fully discussed in the literature. When we break down these aggregate figures between regions and different types of sectors, variations and similarities become clear. Latin American countries and OECD countries have a similar experience of the creation of regulatory agencies up to the late 1990s. In the 2000s, however, the rate of creation of new agencies in Latin American countries has declined when compared with that in the OECD (Figure 2a).

FIGURE 2 ABOUT HERE

The paper distinguishes between four 'families of sectors', namely, financial, utilities, social regulation and competition. As can be seen in Figure 2b, whereas financial sectors started to create regulatory agencies in the 1920s, competition agencies became popular in the 1950s. Social regulation agencies and utilities agencies started to spread widely few decades after the financial agencies. The early start of agencification in finance is also manifested in a very high level of regulatory agencies at the end of the period (over 95 per cent compared with 73 per cent for utilities, 53 per cent for social regulation and 85 per cent for competition).

As said, the spread of regulatory agencies is studied here from a diffusion perspective. The way scholars have conceptualized and operationalized diffusion varies considerably (Rogers, 2003; Biggs, 2005; Strang, 1991a; Brooks, 2005; Brune and Guisinger, 2006; Simmons and Elkins, 2004; Polillo and Guillén, 2005). Yet most scholars seem to converge on the view that diffusion is defined by the process of adoption rather than the similarity of outcomes. Indeed, diffusion as a process should be separated from the outcomes that it may or may not produce. We focus not on the observed results but on the endogenous processes that lead groups to converge on ideas, practices and institutions. Diffusion, we claim, is an increasingly significant phenomenon in our interconnected world. Ideas, institutions and people travel faster and more frequently than ever before (Lazer, 2005). Accordingly, diffusion is defined here as the process whereby information on the creation of new institutions is communicated through certain channels over time among the members of a social system in an uncoordinated manner, and prior adoptions of an innovation affect the probability of adoption for some of the remaining non-adopters in the population.[2] We assess the diffusion perspective against the alternative explanation whereby change is the result of a similar, yet independent or coordinated, response to external conditions (often called the prerequisite or structural explanation; see: Collier and Messick, 1975; Braun and Gilardi, 2006).

The clustering of our data suggests that the spread of regulatory agencies varies across time, countries and sectors. We draw on two comparative approaches – the national patterns approach (NPA) and the policy sector approach (PSA) – to explore the channels of institutional transfer (Levi-Faur, 2006). Using survival analysis we ask and estimate how the establishment of regulatory agencies in nations and sectors varies over time and with the previous decisions of significant others to adopt such institutions. In other words, we assess the influence of previous events of agency creation, in various channels of transfer, on decisions to create a new regulatory agency. The NPA suggests that political processes and outcomes are shaped by a country's unique national and historically determined characteristics. It also expects that a national policy community will enjoy effective control over domestic political processes. The strength, aims and operational procedures of this national policy community and the national institutions that shape its structure and preferences are assumed to differ across countries. Thus, the national transfer (NT) channel will operate through the national-level community of policymakers and on the basis of its propensity to adapt similar institutional designs for diverse sectors within the country (on the role of national administrative traditions for the case of regulatory agencies, see Yesilkagit and Christensen, 2009; Yackee and Yackee, 2009). To the extent that national policy communities also communicate across national borders, cross-national sources of influence may be identified. Intergovernmental transfer (IGT) conceptualizes this influence as a channel of diffusion from country to country (on the diffusion of market-oriented reforms, see Henisz, Zelner and Guillen, 2005). Our expectation is that each national community will be sensitive to aggregate changes in other countries, which are most likely to be their significant others (that is, countries that have intense political, economic or cultural contacts).

The PSA, meanwhile, emphasizes the specific characteristics of distinct policy sectors; hence the multiplicity of political patterns in any one country (Freeman, 1986, 486; Atkinson and Coleman, 1989), as well as the emergence of transnational regulatory regimes within particular sectors (Braithwaite and Drahos, 2000; Lehmkuhl, 2008). Patterns of diffusion that point to the adoption of regulatory agencies across all countries in a particular sector serve as primary evidence in support of this approach. More specifically, this approach predicts two significant channels of institutional transfer: first, sectoral transfer (ST), which is diffusion via actors operating at transnational level at the same sector (for example, the creation of electricity regulatory agencies influenced by prior creations of electricity regulatory agencies in other countries); and second, supranational transfer (SNT), which is diffusion from one sector to another one (for example, the creation of electricity regulatory agencies influenced by prior creations in the telecom sector). We suggest that information is diffused more strongly across sectors than across nations, in other words that sectors and sectoral interdependencies matter more than interdependencies among nations. To capture the effects of these four channels of institutional transfer, we identify the differential impacts of the creation of new agencies in the same country, in the same sector, in other countries, and in other sectors on the probabilities of the creation of a new regulatory agency (see Table 1). Note that while other scholars have concentrated on the study of mechanisms of diffusion (such as coercion, competition, learning, imitation), they usually do not consider different channels of transfer (cf. Wejnert, 2002)[3].

TABLE 1 ABOUT HERE

Following Rogers (2003), we distinguish three major stages in the diffusion of regulatory agencies, together producing the well-known S-curve: (a) the incubation period, when the rate of adoption is very low; (b) the take-off period, when the rate of adoption dramatically increases; and (c) the saturation period, when the rate of adoption decreases but the absolute number of adopters still increases. We expect the channels of institutional transfer to vary in their progress through the three stages. For example, it is clear from Figure 2 that the process of the spread of these agencies was initiated in certain sectors (finance in particular) and countries (the US in particular). Hence, the ST and NT channels might be correspondingly more useful in explaining how the process of diffusion starts. As said, the observations about variations in the stages of institutional transfer allow us to depart from the 'homogenization assumptions' that are implicit in many, if not most, models of diffusion.

II. Hypotheses

Our hypotheses focus on how the diffusion process unfolds rather than why diffusion of regulatory agencies occurs in the first place. Our null hypothesis (H0) suggests that diffusion occurs only through national and intergovernmental channels of transfer (NT and IGT). H1 examines the validity of the PSA by looking at the impact of sectoral and supranational channels of diffusion. H2 suggests that sectoral-based channels are stronger than national and intergovernmental channels. H3 presents patterns of variations in the channels of diffusion at different stages of the process.

(H0) ***Diffusion occurs only through national channels of transfer***

Derived from the NPA and following the conventions of most diffusion studies, H0 suggests that diffusion of regulation agencies occurs within each country, from one sector to another (NT) and via intergovernmental policy networks from one country to another (IGT).

(H1) ***Diffusion occurs also through sectoral channels of transfer***

Derived from the PSA, H1 suggests that sectors matter. Institutional transfer is expected to occur within the boundaries of the sectoral networks over and beyond national boundaries within each sector (ST) and from one sector to another in supranational forms of transfer (SNT).

(H2) ***Sectoral processes of transfer are stronger than national processes***

H2 allows us to compare the strength of sectoral channels (ST and SNT) with that of national channels (NT and IGT) and to assess the relative validity of the PSA and NPA perspectives.

(H3) The importance of channels varies over different stages of the diffusion process

H3 suggests that the influence of the four channels of institutional transfer varies at the three different stages of the diffusion process. We expect ST and NT channels to have significant influence at the early stages of the diffusion process, and SNT and IGT channels to be more influential at later stages. Thus, institutional innovations are expected to emerge and diffuse within particular national or sectoral policy communities.

III. Data and methods

Given the nature of our data, namely, annual records of sector–country units, we treat time as a discrete variable; and the dependent variable is the creation of a regulatory agencies. Hence our data set is a pool of cross-sections of countries and sectors with a time dimension. We assume that agencies can be established only once for each sector–country unit (see the Appendix for details of sources). Since our primary interest is in modelling the probabilities of the creation of regulatory agencies as it unfolds in time, we employ Event History Analysis

(EHA) (Berry and Berry, 1999; Box-Steffensmeier and Jones, 1997). When the time spells are observed at discrete times, logistic regression is recommended with a time-independent variable to calculate the logged odds of establishing a regulatory agency. To account for time dependency we use natural cubic splines. The time dimension of the analysis allows us to calculate annual hazard rates, that is, the probability that an event will occur at a particular time for a particular unit, given that the unit is at risk at that time.[4] We have also tested semi-parametric models (Cox regression) to account for proportional hazards, and results do not change substantively. Since the proportion of events at any time is relatively low, we have also tested an implementation of a 'rare events' approach, but results do not vary significantly.[5] Finally, the model includes some spatial econometric techniques, which allow some independent variables to include weighting matrices.[6]

Dependent variable

The creation of a regulatory agency is documented when an institution with a separate organizational identity from a ministry is established, pending a determination that its main functions of the agency are regulatory. The dependent variable *Creation of a regulatory agency* is coded '1' for the year in which the event occurs, '0' for all years before and censored after the year of the event, and, in the case of non-creation, remains '0' through all the period. At least one positive case was identified in all the countries and sectors selected. When an agency is established, the size of the risk set – the remaining units without agency – decreases. We estimate the probability of having a regulatory agency, and this is measured by the hazard rate, that is, the probability that a sector–country unit will experience the event of interest during a particular period (that is, the year of agency creation), on the condition that no regulatory agency exists previously in that unit.

Diffusion variables

The analysis includes different variables that capture the channel's strength. The variables take the value of the difference between the number of regulatory agencies observed at each 'individual' (country or sector) and its mean. This allows us to assess the number of agencies created by a country (or sector) relative to the number of agencies that the rest of the countries (or sectors) have. A value of minus two (– 2) for the national transfer variable implies that the specific unit of analysis (in this case, a country) has 2 regulatory agencies fewer than the mean of the sample in a concrete year. A value of plus 5 in the sectoral transfer variable implies that the observed unit (in this case, a sector) has 5 more agencies than the mean of all the sectors for that specific year.

The variable national transfer (NT) is the ratio between the number of regulatory agencies (*RA*) that exists at time $t - 1$ in country *c* and the mean of the number of regulatory agencies created in all countries (*C*) up to the previous year. This allows us to calculate the relative position of country *c* in the creation of agencies at time *t*.

$$(1)\quad NT_{tc} = \frac{RA_{ct-1}}{\overline{RA}_{Ct-1}}$$

The variable sectoral transfer (ST) is the ratio between the number of regulatory agencies created up to time $t - 1$ in sector *s*, and the mean of the number of regulatory agencies created in all sectors (*S*) up to the previous year. This allows us to calculate the relative position of sector *s* in the creation of agencies at time *t*.

$$(2)\quad ST_{ts} = \frac{RA_{st-1}}{\overline{RA}_{St-1}}$$

The *intergovernmental transfer* (IGT) variables reflect the relative number of regulatory agencies in each of the other countries weighted by the strength of the relationship between them. This allows us to examine which intergovernmental connections had been most active in facilitating the diffusion of regulatory agencies. To construct the IGT channel variables we calculate first the ratios between the number of regulatory agencies created by each of the countries *C* at time *t* – 1 and the mean of regulatory agencies created in all countries up to the previous year. We then weight those ratios with several measures of countries' relationships (*w*) to estimate the overall influence of other countries on the decision of one country to create a regulatory agency (IGT_{ctw}). We do this for all countries except the country under observation (hence, we get a matrix *Wc* of dimensions C*C with zeros on the diagonal):

$$(3)\quad IGT_{tcw} = \frac{RA_{Ct-1}}{\overline{RA}_{Ct-1}} * Wc_{w}$$

Multiplying this matrix by the different weighting parameters (Wc), we estimate each particular IGT_w variable (which will be the specific ρ_i value). For the weighting matrix we apply four proximity measures. For cultural proximity, we identify any coincidence of an official language ($Wc_{language}$). To measure economic proximity, we take into account trade relations among countries, considering that contacts may be closer among pairs of countries having more economic relations – insofar as we are considering the creation of institutions devoted to regulating markets. We use the percentage of the exports that country *c* sends to other countries for each year between 1966 and 2007. This allows us to calculate the relative influence that 'other' countries have on the country under observation by establishing the proportion of the total exports each 'other' country receives for our country case. Thus, we have a matrix of trade interdependence for all countries included in our sample, for each year

(Wc_{trade}). Finally, we also assess the effects of membership of some international organizations (EU, OECD) in promoting regulatory institutional reforms in the public sector (intergovernmental policy networks) taking into account the year when the country joined the organizations. Here, too, we include matrixes for each year ($Wc_{OCDE,}$ Wc_{EU}).

The *supranational transfer* (SNT) variables are weighted by type of sector in order to assess whether sectoral similarities within families of sectors have been more active in facilitating the global diffusion of regulatory agencies. In this sense, we include two rough measures of structural similarities among sectors: first, a dichotomized weight matrix, assuming that influence may be exerted only within sectors in the same area (utilities, competition, finance or social), but not from sectors in other areas (Ws_{dicho}); and second, a more balanced weight matrix, considering maximum similarity among those agencies that are in the same area (value 1), medium similarity between utilities, competition and finance areas (value 2/3), and minimum similarity between social and all the other sectors (value 1/3). The rationale of this second weight is the expectation that proximate sectors would have more influence on the creation of new agencies; but distant ones could also have exerted some influence (Ws_{weight}).

The SNT variable reflects how the relative number of agencies in each of the other sectors affects the probability of the creation of a new agency in a country–sector unit. These effects are different depending on the type of sector with which it has been compared. To identify this effect we first calculate the ratios between the number of regulatory agencies created at time $t - 1$ in each of the sectors S different from the original s and the mean of regulatory agencies created in each of these sectors up to the previous year, and then weight those ratios according to the degree of proximity among sectors (SNT_{stw}). We do this for all sectors

except the sector under observation (hence, we get a matrix *Ws* of dimensions S*S with zeros on the diagonal).

$$(4)\quad SNT_{tsw} = \frac{RA_{St-1}}{RA_{St-1}} * Ws_{w}$$

This matrix includes the different weighting parameters related to supranational transfer (Ws_{dicho}; Ws_{weight}) in order to estimate each particular SNT_{stw} variable.

Since all these diffusion variables are created using the number of creations of agencies relative to each particular mean, we have been careful to control for possible sources of collinearity. Hence, we have tested each of the models reported with the Variance Inflation Factor (VIF) test for all variables; none of them has appeared to be higher than 10, which is the standard threshold for this test. Multicollinearity annoyances, then, do not bias the results.

Domestic variables

We examine three control variables that capture some of the most important sources of variation at the domestic level that may influence the decision to create a regulatory agency. First, we observe countries' economic wealth, using the variable *GDP per capita*, including observations for all the years considered in our analysis. We expect that wealthier countries are more prone to agencification, in order to deal with more complex markets. Second, in order to assess the effect of the political characteristics of the countries, we use the variable *veto player* as an indicator of the degree of constraint on policy change, using data on the number of independent veto points in the political system (executive, legislative, judicial and sub-federal branches of government) and the distribution of political preferences across and within these branches (Henisz, 2000). More veto players may act as functional equivalents of

regulatory agencies (Gilardi, 2008), and reduce pressures to create them. Our third variable, *country size*, is measured via a proxy of its population: we include a measure of the total population for each year and each country in the data set. We expect bigger countries to have larger governments more disposed to create specialized institutions such as regulatory agencies.

The empirical model used, then, is represented by a logistic regression with year dummies representing the annual hazard (α), two parameters for the sector (ST) and national channels (NT) named as β, parameters for the supranational (SNT) and intergovernmental (IGT) channels as ρ, and control variables expressed by θ.

Logit Model for the analysis of regulatory agency diffusion

$$\text{Logit(RA\_Creation)} = \alpha_t * \text{dummy\_for\_each\_year} + \beta * NT_{tc}$$

$$+ \beta * ST_{ts} + \rho_i * IGT_{tc} + \rho_j * SNT_{ts} + \theta * \text{country controls}$$

Stages of diffusion

In order to identify the stages of diffusion, we calculate the change points in the series of data. The change point technique allows us to estimate the points that divide a series of events into different sub-series of different latent rates of event occurrence, looking for maximal difference in Poisson models. Then, we can also estimate the rate of event occurrence at every sub-series to observe differences (Carlin, Gelfand and Smith, 1992; Spirling, 2007). When this model is applied to our data with an estimation of three different change points, we find that the years 1965, 1998 and 2002 represent the relevant points. From 1920 to 1965 the rate of creation is 2.2 agencies per year, from 1966 to 1988 the rate is 4

agencies per year, from 1989 to 2002 the rate of creation rises to 24.3 agencies per year, and finally, in the last stage, from 2003 to 2007, we have a rate of creation of 4.5 agencies per year. On the basis of these results, we identify the incubation stage (1920–88) with two different sub-periods (1920–65 and 1966–88), the take-off stage (1989–2002) and the saturation stage (2003–07). The incubation stage is divided into two sub-periods because data on most of our control variables are not available before the 1960s. We thus run our model on the period of 1966 to 2007. Having identified these periods, in order to be able to estimate the effects of the variables at different stages, we test Hypothesis H3 running the same model for each sub-sample of years[7].

IV. Findings

Our results are presented in Table 2 (model 1-6; H0-H2) and Table 3 (models 6a, 6b and 6c, H3). Model 1 includes the time dimension (and control variables) and identifies the evolution of the baseline hazard of the creation of a regulatory agency across time. The effects of time on the probability of creating an agency – the pattern of the hazard – can be seen in Figure A1 (see Appendix). This figure shows two peaks of agency creation, one in the 1970s and another in the 1990s, reaching the hazard a rate of 4 per cent by then (for the rest of the models the pattern is basically the same). We included in model 1 several control variables with annual data related the country characteristics, *veto payers*, *population* and *GDP per capita*, and find that Veto players and GDP are significant. Thus, in the absence of the channels of transfer, we might assume that the expansion of regulatory agencies is basically related to the wealth of countries, and to their existing institutional structure (more veto players increases the probability of creation of regulatory agencies). However, when we start to introduce diffusion variables in subsequent models, the significance of national characteristics partly disappears (only the veto players variable remains significant). Also,

from model 2 onwards the fittings are significantly better with diffusion variables than without them. So the first conclusion is that, along with a time dimension, the process of RA creation can be explained by some patterns associated with diffusion between countries and sectors.

In model 2, we find variable NT significant and positive: the higher the proportion of agencies already created in a country, the higher is the probability of new agency creation in this country. Model 3 shows also a positive relationship for country membership of the OECD, suggesting that the number of regulatory agencies previously created in other member countries of the OECD is a significant predictor of agency creation in the country under observation (IGT channel). These results are clear but only confirm what the discipline of comparative politics is all about and what other diffusion studies tell us, namely, that nations matter.

TABLE 2 ABOUT HERE

However, we argue that the diffusion of regulatory agencies was propelled by sectoral transfers as well. For this purpose, we have to reject H0 and confirm H1. In this sense, comparison of models 2 and 3 with models 4 and 5 allows us to reject H0, confirming also that sectoral channels of transfer do matter. Models 4 and 5 suggest that the ratio of regulatory agencies in a sector is a significant predictor of the creation of new agencies, while country channels of diffusion remain significant and stable. The variable sectoral transfer (ST) is significant and positive: the higher the proportion of regulatory agencies already created in a sector, the greater is the probability of new agency creation. In addition, the creation of agencies in other sectors is relevant (SNT channel). While in model 4 the variable

SNT_{dicho} is not significant, in model 5 we find that the variable SNT_{thrids} is significant, meaning that a smoothed weight of the number of agencies in other sectors is a predictor of agency diffusion in the sector under study. The higher the number of agencies created in other sectors, the greater is the probability of new agency creation in a sector. Behind these results, however, there is puzzle, which emerges in model 6, when both SNT variables are introduced simultaneously. Both appear to be significant, but the variable SNT_{dicho} has a negative sign, apparently contradicting our diffusion expectations. We return to this issue when we analyze the stages of diffusion.

Our H2 suggests that sectoral channels (ST and SNT) have stronger effects explaining diffusion of regulatory agencies than do national channels (NT and IGT). To confirm this hypothesis, we compare the predicted odds ratio for these variables for the complete period (model 6). Figure 3 represents the differences in the odds that exist when every variable ranges from its minimum value to its maximum. For the entire period, the value for the ST variable (around 40) means that an agency is 40 times more likely to be established in the sector with more agencies than it is in the sector with fewer agencies. In comparison, for the NT variable, it can be said that new agencies are 10 times more likely to be created an agency in the country that has more agencies than in the country that has fewer agencies. We find that the NT variable has lower odds than the ST one, at least more than double; while odds ratios for SNT variables are relatively low (also, some IGT variables are significant at 90 per cent confidence). These results suggest that the within-sector channel of transfer for the diffusion of regulatory agencies has a major role in the process, confirming our hypothesis that the PSA is more useful than the NPA in explaining the global expansion of regulatory agencies.

TABLE 3 ABOUT HERE

Our last hypothesis (H3) on the role of transfer channels over three different stages of the diffusion process is examined in models 6a, 6b and 6c. Findings are presented in Table 3 and also in Figure 3, where the odds ratios of regulatory agency creation for different stages of the diffusion process allow us to compare the effects of different channels, both for the same stage of the diffusion process and over different stages. Our findings suggest that the effect of each channel varies at different stages of the diffusion process. Not all channels of transfer are influential in all stages of the diffusion process; and when they are their influence varies. We present the findings in each of the stages of diffusion.

FIGURE 3 ABOUT HERE

In the incubation period (1966–88) we find that all channels contribute to the spread of agencies (model 6a). The national and the sectoral channels are both significant, with a similar strength. As to the intergovernmental channel, only the variable related to weighted international trade is significant: the higher the proportion of agencies created in other countries and the stronger the trade links existing between them and the country examined, the greater is the probability of new agency creation in this country in this period. In addition, the supranational channel shows that diffusion occurred only within the most similar sectors[8]. As for the domestic variables, model 6a suggests that richer countries (GDP per capita) had a higher probability of agency creation in this period. This model also suggests that neither the number of veto players nor the size of the country was significant for the probability of the creation of regulatory agencies during the first stage of diffusion.

During the take-off period (1989–2002), all channels of institutional transfer also had a simultaneous effect on the creation of agencies (model 6b). As can be seen from Figure 3, the sectoral channel was the strongest. The weighted variables of intergovernmental transfer (if we look significant other countries) suggest that variables related to membership of the OECD and the EU replace trade as the most important proxies of intergovernmental transfer. The strong significance of the OECD confirms the importance of this organization in the growing networks of intergovernmental governance (Mahon and McBride, 2008; Pal and Ireland, 2009). Proxies of supranational transfer are also significant at this stage. Now, unlike the previous stage, a stronger significance is given to the variable that weights also the influence from dissimilar sectors.[9] We also find that veto-players' significance concentrates at this stage. In contrast to the expectations of the veto-players literature, and after diffusion is controlled for, this finding suggests that countries with more veto points are more likely to create regulatory agencies, particularity at the take-off stage[10]. In the saturation period (2003–07) few channels remain active: some intergovernmental transfer variables are significant, as is the national channel. Sharing a common language appears now to be a significant predictor of the creation of new regulatory agencies, and EU membership also remains significant – a result probably related to the enlargement process in the mid-2000s (while the effect of OECD membership disappears). Sectoral and supranational proxies were not found to be significant at this stage.

These findings confirm H2 once again, suggesting that diffusion via sectoral channels is the most effective; however, we can be more precise here, arguing that this influence was at its strongest during the take-off stage. From these observations, we can also confirm the variations in the importance of channels over different stages (H3), and also the expected role of sector and national channels in the early stages, although it was not fully confirmed that

supranational and intergovernmental channels were more active at the later stages. Intergovernmental variables are significant at all stages, while supranational variables are relevant only at the incubation and take-off stages. What is relevant, however, is the changing role of different IGT and SNT variables over the three stages of diffusion, which suggests a shift in actors' motivations across the process of diffusion.

These findings allow us to refine our interpretation of the stages of diffusion by grounding it interpretation in 'the strength of weak ties' theory. This theory distinguishes between cohesive networks that have constant interactions (strong ties) and those that have occasional contacts (weak ties) (Granovetter, 1973). It may help us understand the enormously successful diffusion of regulatory agencies since late 1980s. If we assume that some channels of transfer have more cohesive policy networks than others, it is possible to conjecture that during the incubation stage institutional transfer was embedded in sectoral and national networks with strong ties, with supranational and intergovernmental networks also having some proximity (foreign trade, sector similarity). During the take-off stage, some critical changes emerged. While national and sectoral transfer remained active, the intergovernmental and supranational networks were replaced by others with different characteristics, indicating the activation of networks based on more occasional connections (such as activities related to OECD membership) or influences from sectors with strong dissimilarities. These variables may reflect the existence of highly active weak-ties networks during this period. In the saturation stage, networks based on weak ties cease to be significant, leaving only networks based on strong ties (direct national transfer, institutional adoption due to EU membership). In fact, as the 'strength-of-weak-ties' theory suggests, those networks based on more occasional contacts promote the explosion in the diffusion of regulatory agencies, because they connect agents who share few links. As Rogers argues: 'At least some degree of

heterophily must be present in network links in order for the diffusion of innovations to occur' (2003: 340).

Conclusions

This paper's data reveal for the first time the extensive global diffusion of regulatory agencies and the restructuring of traditional national bureaucracies. Arms' length autonomous regulators are devolved from hierarchical organizations that combine policymaking functions with regulation and public service functions. The old Weberian bureaucracies are changing, and the extent of this change and its impact on our understanding of bureaucratic behaviour, policymaking and state's role is yet to be recognized and fully discussed in the literature. We hope that this paper will alert others to deal with these issues. One way to proceed in the study of this change is see it as part of the legalization of the state and as another manifestation of the juridification of the economy and society (Tate and Vallinder, 1995; Waarden, 2009; Cioffi, 2009). Another way is to treat it as more evidence for the emergence of a new order that increasingly legalize the relations between actors in the capitalist economy. Thus, the sweeping process of regulatory agencification represents a significant change in the organization of the state and a qualitative change in the way capitalist economies are governed (Levi-Faur, 2005; Jordana and Levi-Faur, 2005; Braithwaite, 2008). This restructuring process may well represent the institutionalization of a new global order of regulatory capitalism.

Our ability to demonstrate the importance of institutional transfer in the age of globalization reinforces the conclusions of Polillo and Guillén (2005) and Simmons and Elkins (2004) about the role of other countries in the decision to adopt institutions or policies. Yet we have gone beyond these authors in the sense that in this paper we systematically explore

institutional transfer across different channels, looking at their effects across different stages of diffusion. Thus, our models confirm that all four channels of institutional transfer considered are significant in explaining variations in our dependent variable, namely, the creation of regulatory agencies. On the basis of our findings it is possible to assert that the study of diffusion across countries and sectors, that is, in a multidimensional manner using compound research design, is of great value for understanding political and economic changes in an interdependent world.

Diffusion is therefore not a homogeneous process in the sense that the effects of the institutional transfer variables are not constant over time. This is crucial to understanding the process itself: the pre-eminence of the sectoral channel during the take-off stage, or the changing role of different IGT and SNT variables at each stage, suggests the existence of successive logics of collective action that allow diffusion to succeed. Studies that overlook this heterogeneity may under-specify important dimensions of the diffusion processes and, more generally, important aspects of global political and policy changes. For example, the loss of significance of the foreign trade variable after the incubation stage, despite increasing trade interdependences in the 1990s, suggests that economic globalization was not the key factor in the spread of regulatory agencies at that time. To the contrary, our results reflect the increasing importance of social networks of professionals, regulocrats and epistemic communities, alongside the increasing embeddedness of the national in the global and the global in the national, all making the distinctions between different channels of institutional transfer increasingly important. To determine correctly their relative importance in explaining processes of institutional innovation is a major challenge, and this paper has made a contribution to meeting it.

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Appendix: Data set structure and sources

We collected data on the year of creation of regulatory agencies in 16 sectors and 48 countries for the period 1920–2007. We included in the data set 19 Latin American countries and all 30 OECD countries (Mexico is a member of both groups, and Slovak Republic is available only from 1989 to 2007). Sectors included are: Central Bank, Competition, Electricity, Environment, Financial Services, Food Safety, Gas, Health Services, Insurance, Pensions, Pharmaceutics, Postal Services, Security & Exchange, Telecommunications, Water and Work Safety. As explained in the text, we limited our statistical analysis to the period 1966–2007.

Our unit of analysis is the 768 'country–sector' cases, which may be governed by a regulatory agency. Regulatory agencies have to meet two criteria to be included in the data set: first, they must have an organizational identity, and not be a unit of a larger ministerial department; and second, they must focus on regulatory tasks. No measure of autonomy or independence was considered. The main source for the construction of the database was information posted on the websites of the regulatory authorities. To identify the year of agency legal creation, in most cases the information was drawn directly from the legal provisions for those institutions (laws, decrees, regulations, statutes, etc.). This information was meticulously scrutinized, and also complemented by other sources, to avoid a bias in favour of those agencies that have websites. Other sources include multilateral and international organizations of regulatory agencies, communication with regulators and professionals, and case-oriented secondary literature.

We made it a rule that when a regulatory institution had responsibilities for more than one sector, the same regulatory authority was considered repeatedly for as many sectors as were

applicable. At some point a regulatory agency might have expanded its scope to other sectors after the year of its creation. In that case, we took the year of 'creation' (of a new 'country–sector' case) as the year in which the agency assumed such additional responsibilities. Accordingly, the number of actual regulatory institutions might be smaller than the total number of regulatory authorities identified for each country in the database. On the other side, when several regulatory agencies existed with a 'country–sector' unit, we selected the oldest one for our data set. Finally, it is important to mention that although many mergers, name changes, and restructurings also occurred, no cases of complete closure were identified for the period examined.

Other Data Sources:

Country population (Country size): World Bank, World Development Indicators (www.worldbank.org/data)

Country's veto players (Veto play): W. Henisz Polcon3 database (2000), updated 2005.

Country's wealth (GDP per capita): World Development Indicators, World Bank 2006

Countries' trade links (Trade relations): WTO, International Trade Statistics (http://www.wto.org/english/res_e/statis_e/statis_e.htm)

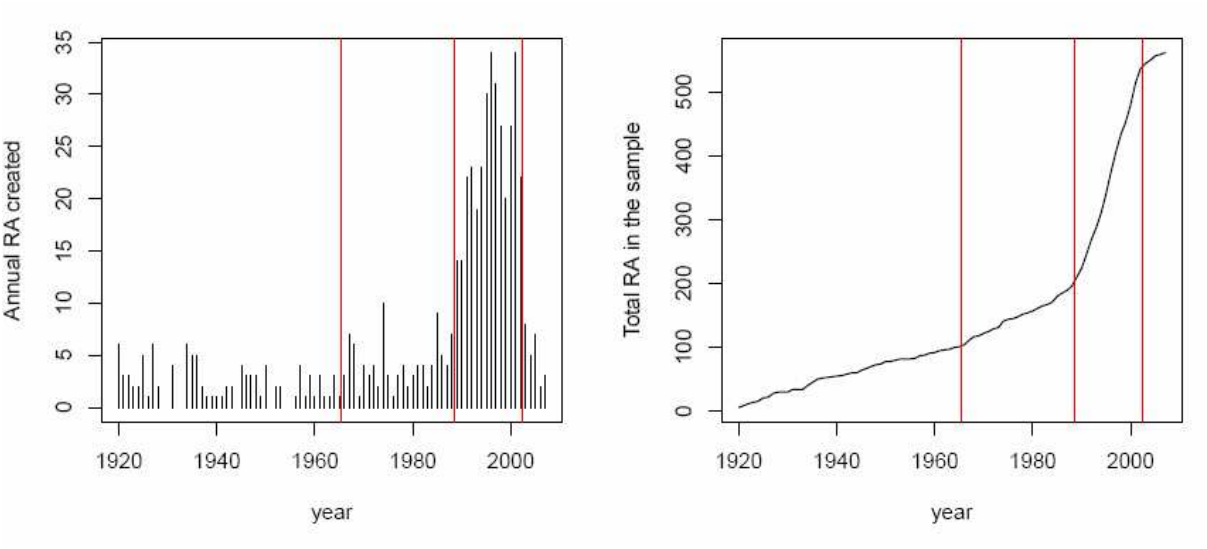


Figure 1: (a) Annual creation of regulatory agencies in the sample. (b) Cumulative annual creation of regulatory agencies (1920–2007). See appendix on data and sources

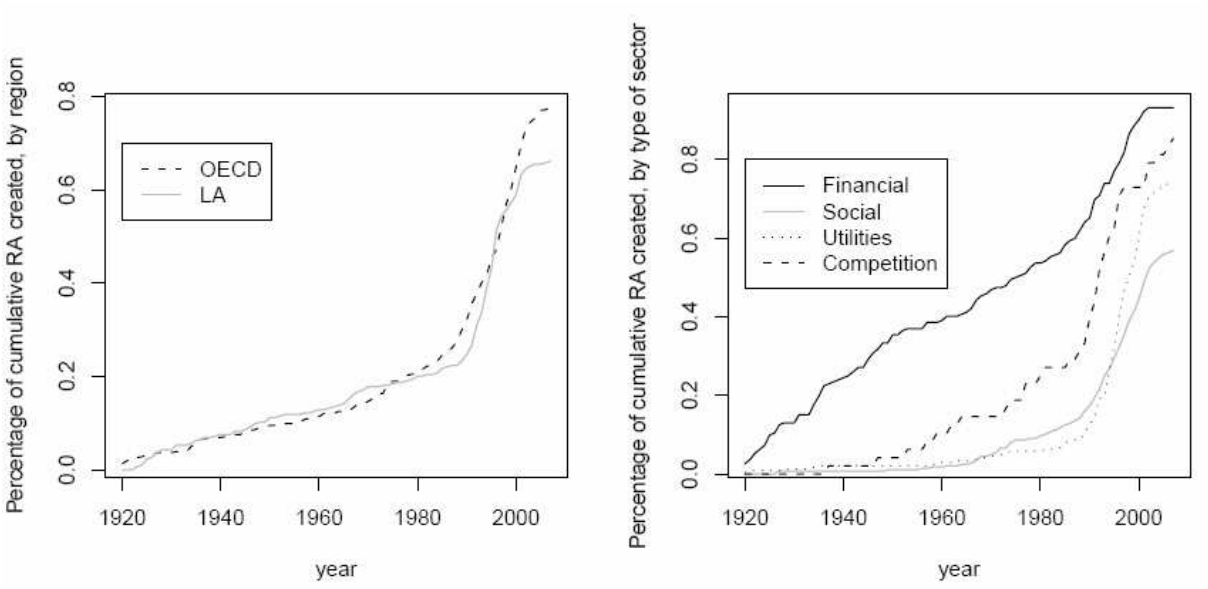
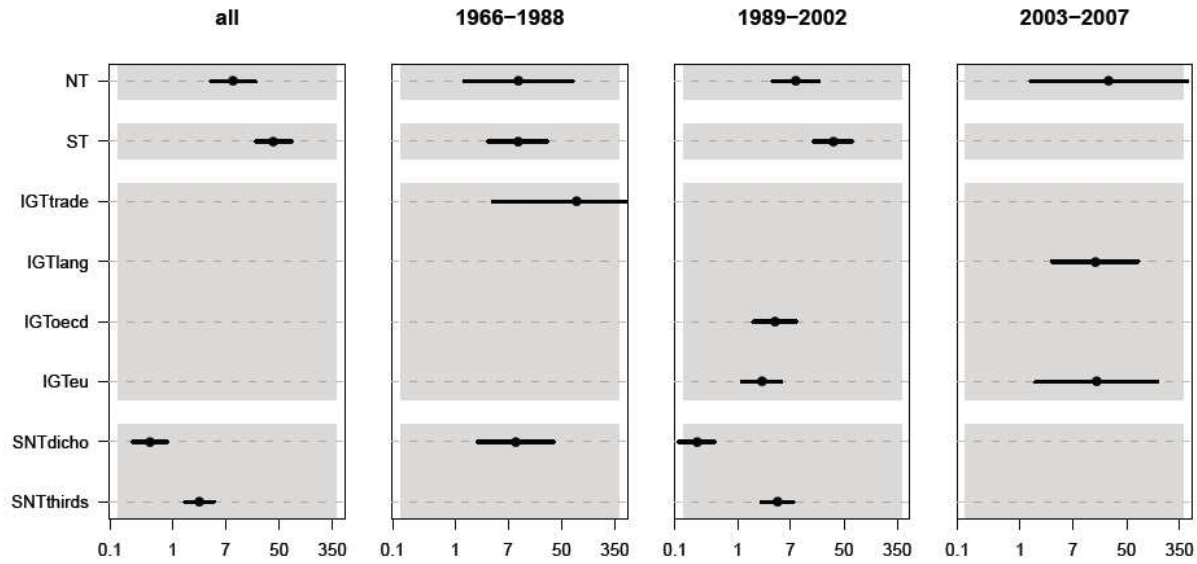


Figure 2: (a) Percentage of the sample with regulatory agencies, by regions (OECD – excluding Mexico – vs Latin America). (b) Percentage of the sample with regulatory agencies, by type of sector (financial, social, utilities and competition). Percentages are used to make the groups comparable, since sub-samples are not identical.

Figure 3: Predicted odds of creating a regulatory agency



Note: Results based on models 6, 6a, 6b and 6c. The odds compare the variables when they go from their minimum 0 to their maximum. Confidence intervals at 95% are shown in bold lines.

Table 1: Channels of institutional transfer

Policy sector approach	National pattern approach
Sector (ST) The decision to establish a regulatory agency is influenced by the number of agencies created in the same sector in other countries up to that year.	**National (NT)** The decision to establish a regulatory agency is influenced by the number of agencies created in the same country in other sectors up to that year.
Supranational (SNT) The decision to establish a regulatory agency is influenced by the number of agencies created in the other sectors up to that year.	**Intergovernmental (IGT)** The decision to establish a regulatory agency is influenced by the number of agencies created in other countries up to that year.

Table 2: The creation of regulatory agencies; logistic regression [1966–2007]

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-7.166 (0.71) ****	-6.397 (0.74)****	-6.208 (0.75)****	-6.338 (0.77) ****	-6.303 (0.77) ****	-6.323 (0.76)****
National Transfer (NT)		0.054 (0.02)**	0.059 (0.02) ***	0.120 (0.02) ****	0.123 (0.02) ****	0.125 (0.02) ****
Sectoral Transfer (ST)				0.066 (0.01) ****	0.063 (0.01) ****	0.069 (0.01) ****
Supranational Transfer (SNTdicho)				-0.004 (0.04)		-0.136 (0.05) ***
Supranational Transfer (SNTthirds)					0.057 (0.02) **	0.121 (0.03) ****
Intergovernmental Transfer (IGTlang)		0.069 (0.05)	0.058 (0.05)	0.013 (0.05)	0.013 (0.05)	0.023 (0.05)
Intergovernmental Transfer (IGTocde)			0.230 (0.13) *	0.234 (0.12) *	0.236 (0.13) *	0.243 (0.13) *
Intergovernmental Transfer (IGTeu)			0.079 (0.09)	0.143 (0.09)	0.141 (0.09)	0.154 (0.09) *
Intergovernmental Transfer (IGTtrade)		-0.025 (0.08)	-0.058 (0.08)	-0.058 (0.08)	-0.059 (0.08)	-0.058 (0.08)
Veto Players	1.010 (0.36) ***	1.011 (0.36) ***	0.988 (0.36) ***	1.198 (0.36) ***	1.222 (0.37)***	1.218 (0.37) ***
Population	0.048 (0.04)	0.023 (0.04)	0.020 (0.04)	0.041 (0.04)	0.043 (0.04)	0.045 (0.04)
GDP per capita	0.131 (0.04) ***	0.072 (0.05)	0.047 (0.05)	0.020 (0.05)	0.010 (0.05)	0.005 (0.05)
R2	0,128	0.130	0,132	0.170	0.172	0,173
Baseline hazard^	Yes (df=4)	Yes (df=4)	Yes (df=4)	Yes (df=4)	Yes (df=4)	Yes (df=4)
N Obs.	20663	20663	20663	20663	20663	20663
AIC	-1013.60	-1031.84	-1041.14	-1351.55	-1364.22	-1376.74

^Baseline hazard calculated with natural cubic splines, with n degrees of freedom (df), not shown here due to space considerations.
**** Significant at 0.999%; *** significant at 0.99%; ** significant at 0.95%; * significant at 0.90%
Note: Clustered data (country–sector); robust standard errors in parenthesis (Huber/White)

Table 3: The creation of regulatory agencies according to the stages of diffusion: logistic regression [1966–2007]

	Model 6a (1966–1988)	Model 6b (1989–2002)	Model 6c (2003–07)
Constant	– 8.636 (1.87) ****	– 15.703 (5.61) ***	– 287.8 (1250.57)
National Transfer (NT)	0.154 (0.07)**	0.130 (0.03) ****	0.311 (0.13) **
Sector Transfer (ST)	0.050 (0.01) ****	0. 070 (0.01) ****	– 0.053 (0.15)
Supranational Transfer (SNTdicho)	0.433 (0.13) ***	– 0.265 (0.06) ****	– 3.776 (2.71)
Supranational Transfer (SNTthirds)	-0.218 (0.11) **	0.186 (0.04) ****	1.703 (1.19)
Intergovernmental Transfer (IGTlang)	0.051 (0.11)	-0.019 (0.06)	0.497 (0.14) ***
Intergovernmental Transfer (IGTocde)	0.242 (1.04)	0.432 (0.12) ****	– 0.383 (0.56)
Intergovernmental Transfer (IGTeu)	– 4.025 (3.39)	0.591 (0.24) **	0.442 (0.18) **
Intergovernmental Transfer (ITGtrade)	1.215 (0.42) ***	– 0.037 (0.08)	0.287 (0.42)
Veto Players	– 0.374 (0.81)	1.397 (0.49) **	– 0.182 (1.67)
Population	0.043 (0.07)	0.049 (0.04)	– 0.061 (0.15)
GDP per capita	0.435 (0.19) **	– 0.076 (0.07)	- 0.008 (0.24)
R2	0.089	0.106	0.224
Baseline hazard^	Yes (df=3)	Yes (df=2)	Yes (df=2)
N Obs.	13706	5885	1072

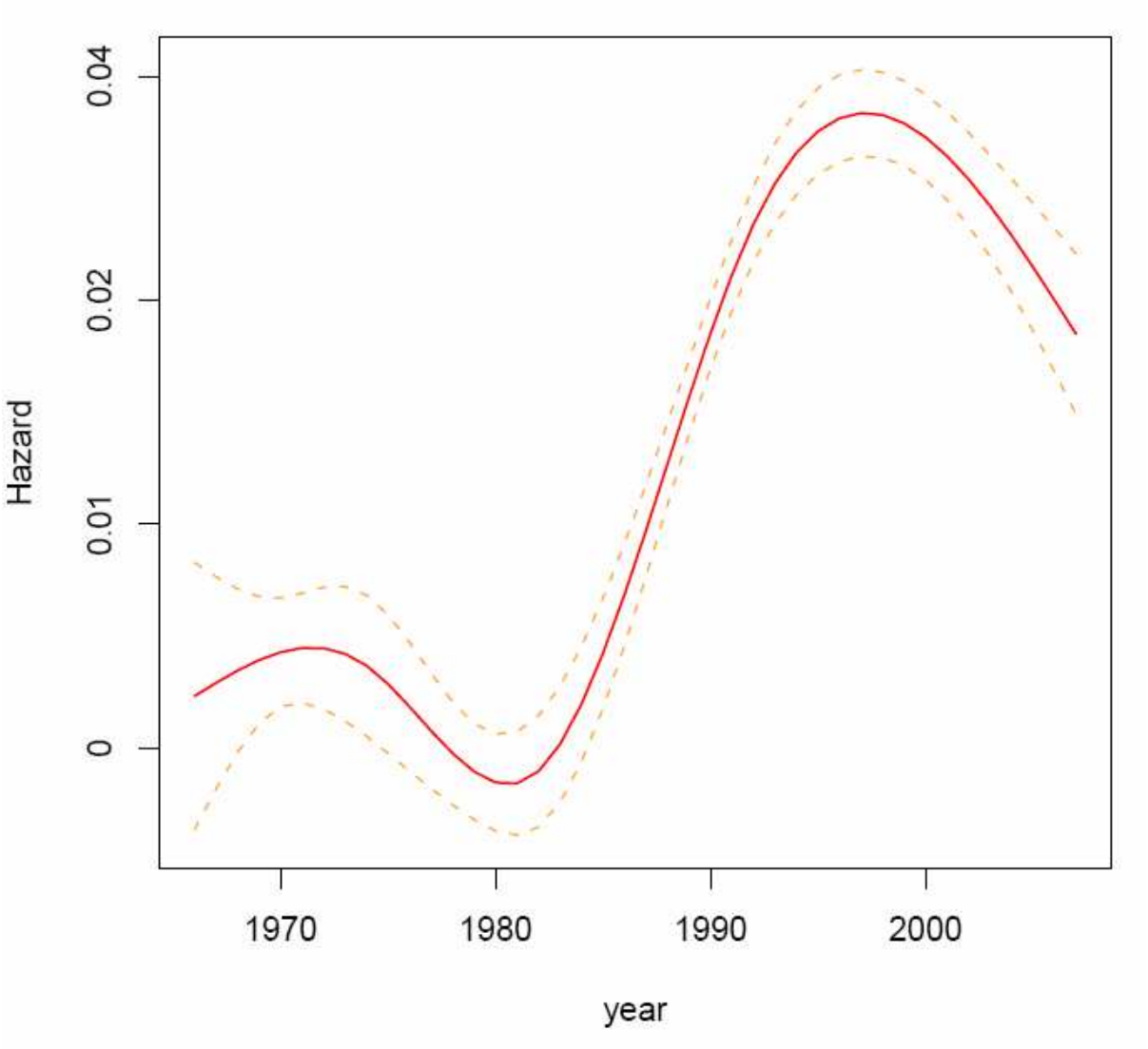
^ Baseline hazard calculated with natural cubic splines, with n degrees of freedom (df) , not shown here due to space considerations.
**** Significant at 0.999%; *** significant at 0.99%; ** significant at 0.95%; * significant at 0.90%
Note: clustered data (country–sector); robust standard errors in parenthesis (Huber/White).

Table A1: Summary Statistics of Variables

	Min.	1st Q.	Median	Mean	3rd Q.	Max.	S Dev
NT	− 6.73	− 1.85	− 0.65	− 0.60	0.58	10.96	2.12
ST	− 18.81	− 7.88	− 5.81	− 4.21	− 2.62	34.75	7.38
IGTtrade	− 6.44	− 0.11	0.05	-0.03	0.18	1.99	0.49
IGTlang	− 3.00	− 0.38	0.00	0.11	0.05	4.57	1.03
IGToecd	− 0.63	0.00	0.00	0.18	0.33	2.76	0.32
IGTeu	− 0.05	0.00	0.00	0.06	0.00	6.33	0.36
SNTdicho	− 2.41	− 0.92	− 0.68	− 0.25	− 0.35	3.68	1.29
SNTthirds	− 4.45	− 1.98	0.61	− 0.25	1.03	3.50	1.94

	Min.	1st Q.	Median	Mean	3rd Q.	Max.	S Dev
GDPcapita	130	1058	2574	6752	8692	103000	9518
Population	197,000	4,616,000	9,765,000	22,520,000	30,570,000	301,300,000	32,342,420
Veto players	0.00	0,15	0.40	0.331	0.481	0.71	0.21

Figure A1: Hazard (1966–2007)



Source: Model 1

[1] We document the year of the establishment of governmental organizations with mainly regulatory functions that are separated from traditional ministerial hierarchies. While these agencies' autonomy varies widely across sectors and countries, they all represent an effort (a) to strengthen the autonomy of professionals and experts in the public policy process; (b) to keep the regulators at arm's length from their political masters; and (c) to separate the responsibility for policymaking from the responsibility for regulation (Majone, 1994; 1997).

[2] This definition draws on both 'thin' quantitative approaches (e.g., Strang, 1991a; 1991b, 325) and 'thick' qualitative approaches (e.g., Rogers, 2003, 5) to the study of diffusion. See also Elkins and Simmons (2005), and Rapport, Levi-Faur and Miodownik (2009).

[3] See Dobbin, Simmons and Garrett (2007) for a review of diffusion mechanisms. For a case of combining channels and mechanisms, see Shipan and Volden (2008); in analysing city-level adoption of anti-smoking policies, they distinguish mechanisms operating in horizontal (city to city) channels of diffusion from vertical (state to city) ones.

[4] This way, only when there is no agency in that unit do we consider that the unit is at risk. The units that already have an agency are excluded from the risk set for subsequent years, leaving fewer units at risk for following years. Agencies established before the range of years selected are excluded from of the risk set, but are used to calculate the number of previously created agencies in specific sectors or countries.

[5] We observe 458 creations in 20,821 observations (the proportion of 1's is 0.022). See King and Zeng (2001a, 2001b) for examples using rare events estimation in international relations.

[6] A matrix of weights is inserted into the data matrices to control interdependencies among the units of analysis (see Beck, Gleditsch and Beardsley, 2006), in the expectation that the strength of the links between the units will contribute to explaining its possible connection (see Francese and Hays, 2007). Coefficients that go with the *intergovernmental* and *supranational transfer* variables are represented by rho(ρ), as commonly found in the literature on spatial econometrics.

[7] We avoid examining the introduction of interactions with a linear 'time' variable, because in that case we would have made the strong assumption that the effects of the explanatory variables are linear over time.

[8] We confirm the positive significance of variable SNT_{dicho} for the first stage when we break down model 4 into three stages; while in breaking down model 5 variable SNT_{thirds} becomes not significant for the first stage (not reported here).

[9] Variable SNT_{dicho} is not significant for the second stage when we break down model 4 into three stages, while in breaking down model 5 variable SNT_{thirds} becomes significant for the second stage (not reported here).

[10] This stands in contrast to the findings of Gilardi (2008: 115–19) regarding the creation of west European regulatory agencies, but not to the central bank literature, which expects a positive relationship between veto players and formal independence of central banks (Goodman, 1991). In any case, our findings alert us to the homogenization assumption regarding this relationship since, depending on the stage of diffusion; the direction of influence may change.