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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 are captured in the authors' data set, which covers the establishment of agencies in 48 countries and 15 sectors for the period 1966-2007. Adopting a diffusion approach to explain this broad process of institutional change, the authors explore the role of countries and sectors as sources of institutional transfer at different stages of the diffusion process. They demonstrate how the restructuring of national bureaucracies unfolds via four different channels of institutional transfer. The 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, the authors 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 establishment of agencies in 15 sectors and 48 countries over 42 years (1966-2007), 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. Although 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 policy making from the responsibility for regulation (Majone, 1994, 1997).

What we found goes well beyond our initial expectations and what was known and appreciated in the established 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 agencies that were set up grew up from fewer than 5 new agencies per year until the 1980s to more than 15 new agencies per year from the 1990s to 2002 (reaching peaks of more than 20 new agencies per year between 1995 and 2001). We identified agencies in about 73% of all the cases under study at the end of 2007 (see Figure 1). This article first presents the data on these widespread changes and second disaggregates the sectoral, national, and temporal patterns of their diffusion. With the rise of neoliberalism and expectations of state contraction, many have assumed that deregulation would also lead to debureaucratization. However, our evidence on the scope of the establishment of regulatory agencies suggests rebureaucratization and, consequently, expansion in the regulatory capacities of the state (cf. Börzel & Risse, 2010; Simon, 2010).

If regulatory agencies are part and parcel of the process of rebureaucratization 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

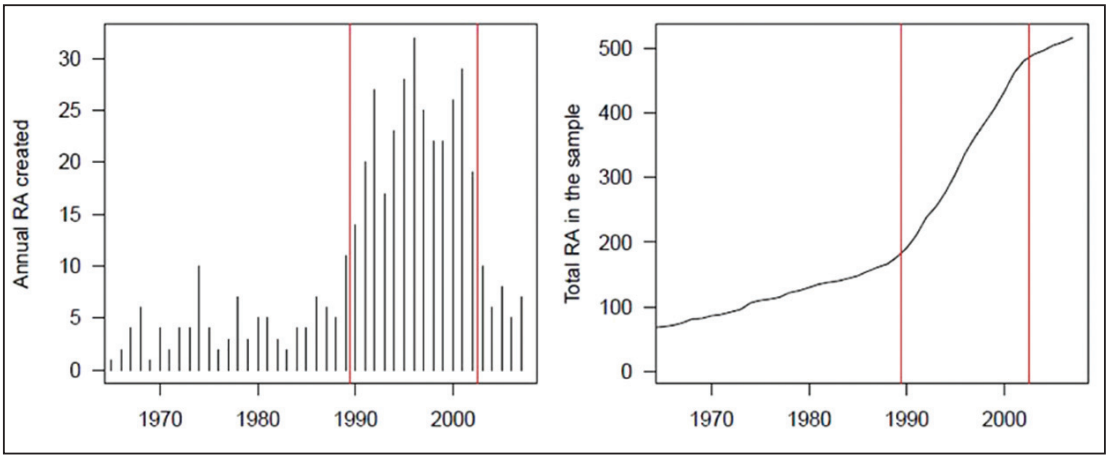

Figure 1. (a) Annual creation of regulatory agencies in the sample (b) Cumulative annual creation of regulatory agencies (1966-2007)
See the appendix for data and sources.

have so far focused on a limited number of countries, sectors, and regions. With a few notable exceptions (i.e., Gilardi, 2008; Polillo & Guillén, 2005), 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 (Coen & Thatcher, 2007; Guillén, 2001; Scholte, 2000; Simmons & Elkins, 2004). 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 article distinguishes among 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 (international transfer), and from other significant sectors (intersectoral 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 article examines correlates of diffusion at different stages of the process, suggesting, in line with the theory of diffusion, that causality differs in different stages.

Although we employ some of the "usual suspects" of causal analysis in comparative politics, this article's major concern is with interpreting the effects of different channels at different stages of diffusion. The first section of the article offers a theoretical framework that builds on insights from the literature on regulatory agencies, diffusion, and institutional transfer. The

second section sets out our working hypotheses. The third section presents the data gathered, defines the relevant variables, and sets out our methodological approach. The fourth section presents the findings, tests our hypotheses against them, and offers an interpretive analysis of the results. The fifth section concludes.

Channels of Transfer and the Spread of Regulatory Agencies

As noted, our data set on the establishment of regulatory agencies is wide and unique in covering variations across 48 countries (Latin America and all Organisation for Economic Co-operation and Development [OECD] countries) and 15 sectors (ranging from financial and utilities via competition to social; see the appendix for the complete list). Although 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 regulatory agencies. The extent of this change and its impact on our understanding of bureaucratic behavior 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 establishment of regulatory agencies up to the late 1990s. In the 2000s, however, the pace of establishment of new agencies in Latin American countries has declined when compared to that in the OECD (Figure 2a).

The article distinguishes among four "families of sectors," namely, financial, utilities, social regulation, and competition. As can be seen in Figure 2b, although financial sectors started to create regulatory agencies before the 1960s, competition agencies became popular in the 1970s. Social regulation agencies and utilities agencies started to spread widely a 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 (more than 94% compared with 74% for utilities, 61% for social regulation, and 88% 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 (Biggs, 2005; Brooks, 2005; Brune & Guisinger, 2006; Polillo & Guillén, 2005; Rogers, 2003; Simmons & Elkins, 2004; Strang, 1991b). Yet most scholars seem to converge on the view that diffusion is defined by the process of adoption rather than the similarity of outcomes.

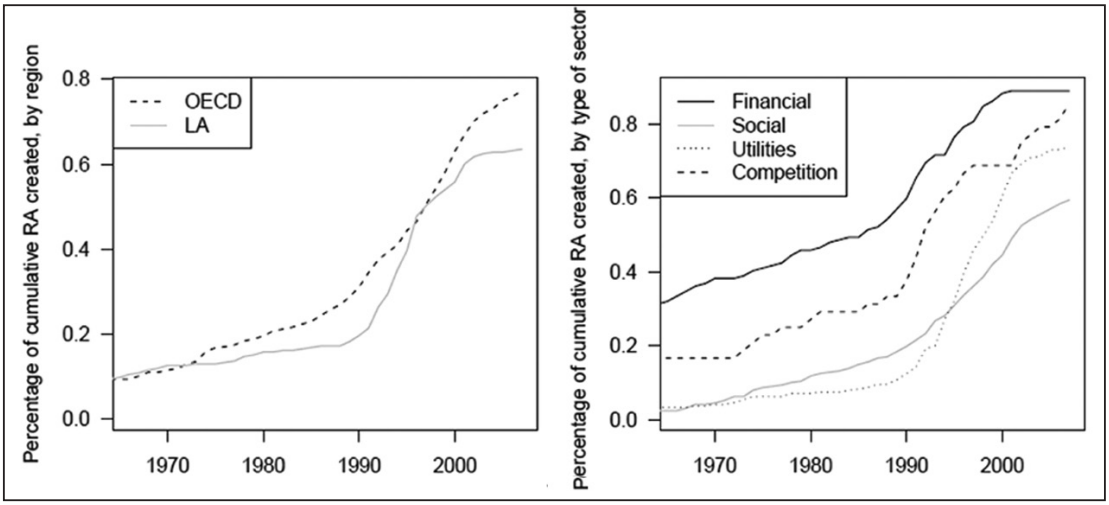

Figure 2. (a) Percentage of the sample with regulatory agencies, by regions (OECD—excluding Mexico—vs. Latin America) (b) Percentage of the sample with regulatory agencies, by type of sector (financial, social, utilities, and competition) Percentages are used to make the groups comparable since subsamples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

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.[1]

The clustering of our data suggests that regulatory agencification varies across time, countries, and sectors. 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 institutional transfer, on decisions to create a new regulatory agency. To capture the effects of these four channels, 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 although 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).[2]

Table 1. Channels of Institutional Transfer

Policy sector approach	National patterns 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.
Intersectoral (IST) The decision to establish a regulatory agency is influenced by the number of agencies created in the other sectors up to that year.	**International (INT)** The decision to establish a regulatory agency is influenced by the number of agencies created in other countries up to that year.

To provide an interpretative framework, we draw on the literature of two comparative approaches—the national patterns approach (NPA) and the policy sector approach (PSA)—and present some hypotheses about the internal dynamics of each channel of institutional transfer (Levi-Faur, 2006). The NPA suggests that political processes and outcomes are shaped by a country's unique national and historically determined characteristics. It also expects that national political networks will enjoy effective control over domestic policy processes. The strength, aims, and operational procedures of these political networks 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 policy makers 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 Yackee & Yackee, 2009; Yesilkagit & Christensen, 2009). To the extent that national policy communities also communicate across national borders, cross-national sources of influence may be identified. International transfer (INT) conceptualizes this influence as a channel of diffusion from country to country (on the diffusion of market-oriented reforms, see Henisz, Zelner, & Guillén, 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 (i.e., 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 (Atkinson & Coleman, 1989; Freeman, 1986, p. 486) as well as the emergence of transnational regulatory regimes within particular sectors

(Braithwaite & 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 networks of actors operating at the transnational level at the same sector (e.g., the establishment of electricity regulatory agencies influenced by prior establishment of electricity regulatory agencies in other countries), and, second, intersectoral transfer (IST), which is diffusion from one sector to another one (e.g., the establishment of electricity regulatory agencies influenced by prior establishments in the telecom sector).

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 takeoff 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 United States 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.

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 (Hypothesis 0 [H0]) suggests that diffusion occurs only through national and international channels of transfer (NT and INT). Hypothesis 1 (H1) examines the validity of the PSA by looking at the impact of sectoral and intersectoral channels of diffusion. Hypothesis 2 (H2) suggests that sectoral-based channels are stronger than national and international channels. Hypothesis 3 (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 international policy networks from one country to another (INT).

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 intersectoral forms of transfer (IST).

H2: Sectoral processes of transfer are stronger than national processes.

H2 allows us to compare the strength of sectoral channels (ST and IST) with that of national channels (NT and INT) and to assess the relative validity of the PSA and NPA perspectives. Considering the strength of PSA in recent globalization processes, it suggests 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.

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 the ST and NT channels to have significant influence at the early stages of the diffusion process and the IST and INT channels to be more influential at later stages. Thus, institutional innovations are expected to emerge and diffuse within particular national or sectoral policy communities.

Data and Method

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 establishment of regulatory agencies in sector–country units. 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. Since our primary interest is in modeling the probabilities of the establishing a regulatory agencies in a sector–country unit as it unfolds in time, we employ event history analysis (Berry & Berry, 1999; Box-Steffensmeier & 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.[3] We have also tested semiparametric 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.[4] Finally, the model includes some spatial econometric techniques, which allow some independent variables to include weighting matrices.[5]

Dependent Variable

The establishment of a regulatory agency is documented when an institution with a separate organizational identity from a ministry is established, pending a determination that the main functions of the agency are regulatory. We also include multisector cases, considering a new establishment when already existing agencies expanded their scope to other sectors.[6] The dependent variable *establishment of a regulatory agency* in a sector–country unit is coded 1 for the year in which the event occurs, is coded 0 for all years before and censored after the year of the event, and, in the case of noncreation, remains 0 through all the period (see the appendix for details of sources). We documented agencies establishment once for each sector–country unit (earliest instance of creation). 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 sector–country unit with 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 (i.e., 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 NT variable is the ratio between the number of sector–country units with regulatory agencies (RAs) that exists up to time t−1 in country c and the total number of sectors in the sample (S). We estimate its influence on the

establishment of an agency at time t in country c and sector s for each year and country (NTtc).

$$\left(NT_{tc}\right) = \frac{\sum_{t=1966}^{2007} ra_{c,t-1}}{s}$$

The sector transfer (ST) variable is the ratio between the number of sector–country units with RAs that exists up to time t−1 in sector s and the total number of countries in the sample (C). We estimate its influence on the establishment of an agency at time t in country c and sector s for each year and sector (STts).

$$\left(ST_{ts}\right) = \frac{\sum_{t=1966}^{2007} ra_{s,t-1}}{c}$$

The INT variables reflect the relative number sector–country units with RAs in each of the other countries weighted by the strength of the relationship between them. This allows us to examine which international connections had been most active in facilitating the diffusion of RAs. To construct the INT channel variables we calculate first the ratios between the number of sector–country units having established RAs by each of the countries C at time t−1 and the mean of sector–country units with RAs 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 an RA (INT_{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):

$$INT_{tcw} = \frac{RA_{Ct-1}}{\overline{RA}_{Ct-1}} * Wc_{w}$$

Multiplying this matrix by the different weighting parameters (Wc), we estimate each particular INT_{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 ($Wc_{OECD,}$ Wc_{EU}).

The IST variables are weighted by type of sector to assess whether sectoral similarities within families of sectors have been more active in facilitating the global diffusion of RAs. 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 of 1), medium similarity among utilities, competition, and finance areas (value of two thirds), and minimum similarity between social and all the other sectors (value of one third). 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 IST variable reflects how the relative number of sector–country units with agencies in each of the other sectors affects the probability of establishing new sector–country units with agency. 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 sector–country units with RAs created at time t−1 in each of the sectors S different from the original s and the mean of sector–country units with RAs created in each of these sectors up to the previous year, and then weight those ratios according to the degree of proximity among sectors (IST_{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).

$$IST_{tsw} = \frac{RA_{St-1}}{\overline{RA}_{St-1}} * Ws_{w}$$

This matrix includes the different weighting parameters related to IST (Ws_{dicho}; Ws_{weight}) to estimate each particular IST_{stw} variable.

Since these last diffusion variables are created using the number of creations of sector–country units with 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 test for all variables; none of them 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 an RA. First, we observe countries' economic wealth, using the GDP per capita variable, including observations for all the years considered in our analysis. We expect that wealthier countries are more prone to agencification to deal with more complex markets. Second, to assess the effect of the political characteristics of the countries, we use the veto player variable 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 subfederal 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 RAs (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 RAs.

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 intersectoral (IST) and international (INT) channels as ρ, and control variables expressed by θ.

Logit model for the analysis of RA diffusion

$$\text{Logit(RA\_Creation)} = \alpha_t * \text{natural splines} + \beta * NT_{tc} + \beta * ST_{ts} + \rho_i * IGT_{tc} + \rho_j * SNT_{ts} + \theta * \text{country controls}$$

Stages of Diffusion

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 subseries 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 subseries to observe differences (Carlin, Gelfand, & Smith, 1992; Spirling, 2007). When this model is applied to our data with an estimation of two different change points, we find that the years 1990 and 2003 represent the relevant points. From 1966 to 1989 the rate is 4.3 agencies per year, from 1990 to 2002 the rate of creation rises to 22.9 agencies per year, and finally, in the last stage, from 2003 to 2007, we have a rate of creation of 7.1 agencies per year. On the basis of these results, we identify the incubation stage (1966-1989), the takeoff stage (1990-2002) and the saturation stage (2003-2007). Having identified these periods, to be able to estimate the effects of the variables at different stages, we test H3 running the same model for each subsample of years.[7]

Findings

Our results are presented in Table 2 (Models 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 establishment of sector–country units with an RA across time. The effects of time on the probability of establishing a new unit with agency—the pattern of the hazard—can be seen in Figure A1 (see the appendix). This figure shows two peaks of agencification, one in the 1970s and another in the 1990s, reaching the hazard a rate of 3% 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 players, 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 regulatory agencification is basically related to the wealth of countries and to their existing institutional structure (more veto players increases the

Table 2. The Creation of Regulatory Agencies: Logistic Regression (1966-2007)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	−7.438 (0.74)****	−6.497 (0.78)****	−6.007 (0.79)****	−6.465 (0.82)****	−6.491 (0.82)****	−6.526 (0.81)****
National transfer (NT)		1.195 (0.35)****	1.27 (0.35)****	2.216 (0.37)****	2.256 (0.37)****	2.298 (0.36)****
Sectoral transfer (ST)				3.226 (0.28)****	3.198 (0.29)****	3.388 (0.27)****
Intersectoral transfer (IST_{dicho})				0.013 (0.05)		−0.164 (0.07)**
Intersectoral transfer (IST_{thirds})					0.073 (0.30)**	0.147 (0.04)****
International transfer (INT_{lang})		0.048 (0.05)	0.028 (0.05)	−0.0023 (0.06)	−0.001 (0.06)	0.006 (0.06)
International transfer (INT_{OECD})			0.384 (0.13)***	0.415 (0.13)***	0.418 (0.13)**	0.421 (0.13)***
International transfer (INT_{EU})			0.187 (0.07)***	0.250 (0.07)****	0.249 (0.07)****	0.262 (0.07)****
International transfer (INT_{trade})		0.101 (0.11)	0.011 (0.10)	−0.002 (0.10)	−0.002 (0.10)	−0.001 (0.10)
Veto players	0.971 (0.35)***	0.986 (0.35)***	0.976 (0.36)***	1.146 (0.37)***	1.188 (0.04)***	1.197 (0.37)***
Population	0.042 (0.04)	0.013 (0.04)	0.009 (0.04)	0.020 (0.04)	0.027 (0.04)	0.029 (0.04)
GDP per capita	0.130 (0.05)***	0.032 (0.05)	−0.043 (0.05)	−0.069 (0.06)	−0.084 (0.06)	−0.089 (0.05)
R^2	.120	.124	.130	.167	.169	.170
Baseline hazard[a]	Yes (*df* = 4)	Yes (*df* = 4)	Yes (*df* = 4)	Yes (*df* = 4)	Yes (*df* = 4)	Yes (*df* = 4)
N obs.	20,013	20,013	20,013	20,013	20,013	20,013
Akaike information criterion	−924.35	−957.41	−998.86	−1293.46	−1307.65	−1318.84

Clustered data (country sector); robust standard errors in parentheses (Huber–White).

a. Baseline hazard calculated with natural cubic splines, with *n* degrees of freedom (*df*), not shown here because of space considerations.

**Significant at .95%. ***Significant at .99%. ****Significant at .999%.

Table 3. The Creation of Regulatory Agencies According to the Stages of Diffusion: Logistic Regression (1966-2007)

	Model 6a (1966-1989)	Model 6b (1990-2002)	Model 6c (2003-2007)
Constant	–9.643 (1.85)****	–17.364 (6.85)**	1,267 (1,063.06)
National transfer (NT)	2.599 (0.83)***	0.155 (0.54)***	1.939 (1.38)
Sector transfer (ST)	2.227 (0.57)****	3. 405 (0.33)****	–16.99 (13.28)
Intersectoral transfer (IST_{dicho})	0.610 (0.16)****	–0.334 (0.08)****	–8.381 (4.85)*
Intersectoral transfer (IST_{thirds})	–0.313 (0.14)**	0.235 (0.04)****	3.769 (2.146)*
International transfer (INT_{lang})	0.120 (0.09)	–0.072 (0.06)	0.203 (0.25)
International transfer (INT_{OECD})	0.009 (1.04)	0.511 (0.14)****	0.106 (0.43)
International transfer (INT_{EU})	–0.822 (1.97)	0.830 (0.29)***	0.352 (0.18)****
International transfer (INT_{trade})	0.665 (0.32)**	–0.019 (0.10)	0.953 (0.52)*
Veto players	–0.302 (0.71)	1.546 (0.54)**	–0.501 (1.63)
Population	0.067 (0.08)	0.027 (0.05)	–0.059 (0.13)
GDP per capita	0.380 (0.19)**	–0.232 (0.08)***	0.0213 (0.23)
R^2	.099	.096	.238
Baseline hazard[a]	Yes ($df = 3$)	Yes ($df = 2$)	Yes ($df = 2$)
N obs.	13,845	5,112	1,056

Clustered data (country sector); robust standard errors in parentheses (Huber–White).
a. Baseline hazard calculated with natural cubic splines, with *n* degrees of freedom (*df*), not shown here because of space considerations.
*Significant at .90%. **Significant at .95%. ***Significant at .99%. ****Significant at .999%.

probability of creation of RAs). 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 onward 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 regulatory agencification 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 sector–country units with agencies already established in a country, the higher the probability of establishing new units with agency in

this country. Model 3 shows also a positive relationship for country membership of the OECD and the EU, suggesting that the number of sector–country units with RAs previously established in other member countries of the OECD or the EU is a significant predictor of new establishments in the country under observation (INT 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.

However, we argue that the diffusion of RAs was propelled by STs 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 sector–country units with RAs in a sector is a significant predictor of regulatory agencification expansion, whereas country channels of diffusion remain significant and stable. The ST variable is significant and positive: The higher the proportion of RAs already established in a sector, the greater the probability of new agency establishments. In addition, the creation of agencies in other sectors is relevant (IST channel). Although in Model 4 the IST_{dicho} variable is not significant, in Model 5 we find that the IST_{thirds} variable is significant, meaning that a smoothed weight of the number of agencies in other sectors is a predictor of further agencification in the sector under study. The higher the number of agencies created in other sectors, the greater the probability of new agency establishment in a sector. Behind these results, however, there is a puzzle, which emerges in Model 6, when both IST variables are introduced simultaneously. Both appear to be significant, but the IST_{dicho} variable 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 IST) have stronger effects explaining diffusion of regulatory agencification than do national channels (NT and INT). 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 agencies are 10 times more likely to be introduced in new sector–country units in the country that has more sectors already covered with agencies than in the country that has fewer. We find that the NT variable has lower odds than the ST one, at least more than double, whereas odds ratios for IST variables are relatively low, as are those for some INT variables. These results suggest that the

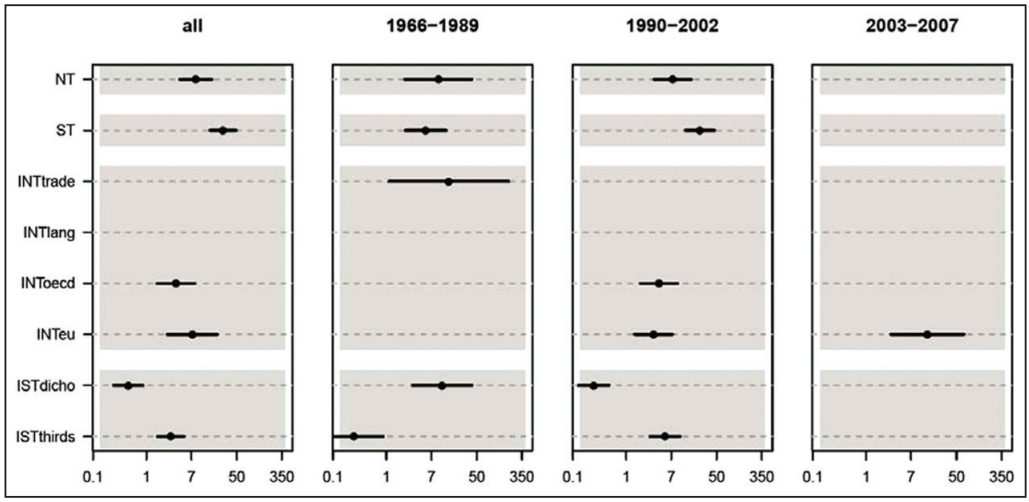

Figure 3. Predicted odds of creating a regulatory agency
Results based on Models 6, 6a, 6b, and 6c. The odds compare the variables when they go from their minimum of 0 to their maximum. Confidence intervals at 95% are shown in bold lines.

within-sector channel of transfer for the diffusion of RAs 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 RAs.

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 agencification 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.

In the incubation period (1966-1988) we find that all channels contribute to the spread of agencies (Model 6a). The national and the sectoral channels are both significant, with a slightly larger strength for the national one. As to the international channel, only the variable related to weighted international trade is significant: The higher the proportion of sector–country units with agencies created in other countries and the stronger the trade links existing between them and the country examined, the greater the probability of establishing new sector–country unit with agency in this country in this period. In addition, the intersectoral channel shows that diffusion occurred only within the most similar sectors, whereas dissimilar sectors did not have any influence.[8] As for the domestic variables, Model 6a suggests that richer countries (GDP per capita) had a higher probability of expanding agencification 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 establishing more sector–country units with RAs during the first stage of diffusion.

During the takeoff period (1989-2002), all channels of institutional transfer also had a simultaneous effect on regulatory agencification (Model 6b). As can be seen from Figure 3, the sectoral channel was the strongest. The weighted variables of INT (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 INT. The stronger significance of the OECD confirms the importance of this organization in the growing networks of intergovernmental governance (Mahon & McBride, 2008; Pal & Ireland, 2009). Proxies of IST 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 or expand RAs, particularity at the takeoff stage.[10] In the saturation period (2003-2007) few channels remain active: Some INT variables are significant, as is the intersectoral one (at 90% significance), which reproduces the same logic as in the second stage. Sharing trade appears again—as in the first stage—to be a predictor of the regulatory agencification (at 90% significance), and EU membership also remains significant—a result probably related to the enlargement process in the mid-2000s (whereas the effect of OECD membership disappears). Sectoral and national 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 takeoff 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 intersectoral and international channels were more active at the later stages. International variables are significant at all stages, whereas intersectoral variables are relevant only at the incubation and takeoff stages. What is relevant, however, is the changing role of different INT and IST variables over the three stages of diffusion, which suggests a shift in actors' motivations across the process of diffusion.

These findings open new questions about the dynamics of agency diffusion over time that will have to be dealt with elsewhere. For example, why

were significant international networks based on economic ties (foreign trade) during the incubation stage, whereas during the takeoff stage they were replaced by networks based on political links (OECD membership)? Why is the IST channel in the first stage significant only when transfer occurs within the same area, but in the second and third stages it is significant only when we also include the influence of distant sectors? One possible way forward is via the theory of strength of weak ties. 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 RAs since late 1980s if we consider that in the takeoff stage, networks active in the INT and IST channels showed more weak-tie characteristics than those operating in the previous stage. In fact, as the "strength-of-weak-ties" theory suggests, those networks based on more occasional contacts promote the explosion in the diffusion of RAs because they connect agents who share few links. As Rogers (2003) argues, "At least some degree of heterophily must be present in network links in order for the diffusion of innovations to occur" (p. 340).

Conclusions

This article's data reveal for the first time the extensive global diffusion of RAs and the restructuring of traditional national bureaucracies. Arm's-length autonomous regulators are devolved from hierarchical organizations that combine policy-making 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 behavior, policy making, and the state's role are yet to be recognized and fully discussed in the literature. We hope that this article will alert others to deal with these issues. One way to proceed in the study of this change is to see it as part of the legalization of the state and as another manifestation of the juridification of the economy and society (Cioffi, 2009; Tate & Vallinder, 1995; van Waarden, 2009). Another way is to treat it as more evidence for the emergence of a new order that increasingly formalizes the relations between actors in the capitalist economy and at the same time experiments with new methods of governance (Prakash & Gugerty, 2010; Skelcher & Torfing, 2010). 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 (Braithwaite, 2008; Jordana & Levi-Faur, 2005; Levi-Faur, 2005). 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 article 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 establishment of RAs. 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 a 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 preeminence of the sectoral channel during the takeoff stage, or the changing role of different INT and IST variables at each stage, suggests the existence of successive logics of collective action that allow diffusion to succeed. Studies that overlook this heterogeneity may underspecify 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 during the takeoff stage, despite increasing trade interdependences in the 1990s, suggests that economic globalization and networks was not the key factor in the regulatory agencification at that time. To the contrary, our results reflect the increasing importance of social networks of professionals, regulocrats, and epistemic communities that are active in international organizations or also share similar cultural identities, 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. Correctly determining their relative importance in explaining processes of institutional innovation is a major challenge, and this article has made a contribution to meeting it.

Appendix

Data Set Structure and Sources

We collected data on the year of establishment of regulatory agencies in 15 sectors and 48 countries for the period 1966-2007. We included in the data set 19 Latin American countries and all 30 Organisation for Economic Co-operation and Development countries (Mexico is a member of both groups, and the Slovak Republic is available only from 1989 to 2007). Sectors

included are competition, electricity, environment, financial services, food safety, gas, health services, insurance, pensions, pharmaceutics, postal services, security and exchange, telecommunications, water, and work safety.

Our unit of analysis is the 720 "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 the extent or scope 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 favor 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 in which the agency assumed such additional responsibilities as the year of a new "country–sector" case. 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, almost no cases of complete closure were identified for the period examined.

Other data sources include the following:

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

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

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

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

Table A1. Summary Statistics of Variables

	Min	1st Q.	*Mdn*	*M*	3rd Q.	Max	*SD*
NT	0	0.07	0.13	0.22	0.33	0.93	0.2
ST	0	0.06	0.13	0.21	0.30	0.98	0.2
INT_{trade}	−5.21	−0.13	0.06	−0.02	0.21	1.55	0.49
INT_{lang}	−2.87	−0.76	−0.07	−0.11	0.0	5.05	1.09
INT_{OECD}	−0.27	0.00	0.00	0.26	0.49	2.76	0.37
INT_{EU}	−0.05	0.00	0.00	0.07	0.00	7.53	0.40
IST_{dicho}	−1.9	−0.54	−0.31	−0.09	012	2.85	0.88
IST_{thirds}	−3.69	−1.19	0.33	−0.06	0.85	3.50	1.40
GDP per capita	130	1,022	2,486	6,602	8,127	103,000	9,461
Population	197,000	4,666,000	9,804,000	22,291,000	31,300,000	301,300,000	32,865,953
Veto players	0.00	0.15	0.40	0.331	0.481	0.72	0.21

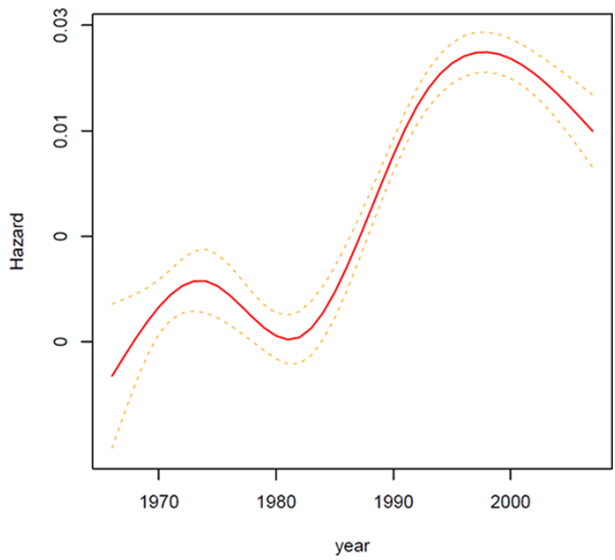

Figure A1. Hazard (1966-2007)
Source: Model 1.

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Notes

1. This definition draws on both "thin" quantitative approaches (e.g., Strang, 1991a, p. 325, 1991b) and "thick" qualitative approaches (e.g., Rogers, 2003, p. 5) to the study of diffusion. Also see Elkins and Simmons (2005), and Rapport, Levi-Faur, and Miodownik (2009).
2. 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 analyzing city-level adoption of antismoking policies, they distinguish mechanisms operating in horizontal (city to city) channels of diffusion from vertical (state to city) ones.
3. 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. Units with agencies established before the range of years selected are excluded from the risk set but are used to calculate the number of previously established agencies in specific sectors or countries.
4. We observe 447 units with agency in 20,013 observations (the proportion of 1s is 0.022). See King and Zeng (2001a, 2001b) for examples using rare events estimation in international relations.
5. A matrix of weights is inserted into the data matrices to control interdependencies among the units of analysis (see Beck, Gleditsch, & Beardsley, 2006), in the expectation that the strength of the links between the units will contribute to explaining its possible connection (see Francese & Hays, 2007). Coefficients that go with the international and intersectoral transfer variables are represented by rho (ρ), as commonly found in the literature on spatial econometrics.
6. For an analysis of the grwoth of multisector agencies in recent decades, see Jordana and Levi-Faur (2010).

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 the IST_{dicho} variable (at 0.99) for the first stage when we break down Model 4 into three stages, whereas in breaking down Model 5 the IST_{thirds} variable becomes not significant for the first stage (not reported here).
9. The IST_{dicho} variable is not significant for the second stage when we break down Model 4 into three stages, whereas in breaking down Model 5 the IST_{thirds} variable becomes significant for the second stage (not reported here).
10. This stands in contrast to the findings of Gilardi (2008, pp. 115-119) 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.

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