

DISORGANIZATION OR SELF-ORGANIZATION?¹

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Transition provides a rare opportunity for insight into the endogenous development of market institutions. Production activities during the Soviet regime were highly coordinated and organized by the central authority. These coordinating mechanisms were disrupted during the transition period leading to an increase in the transaction costs for firms. Blanchard and Kremer (1997), among others, emphasize the negative impact of this “disorganization” on output behavior at the beginning of transition. Though this argument is correct, we believe that this and similar works stop short of a fuller characterization of transition by concentrating on the disruptive effects of the reform process.

This paper begins where the former works end by examining one of the key institutions that have emerged spontaneously in response to the challenges of transition: business associations. Its main contribution is to provide empirical evidence that “institutions”, which help coordinate production and trade, spontaneously emerge in an environment characterized by widespread “disorganization”. Using a largely unexplored, firm-level data set, we document the emergence of business associations at the beginning of transition and provide evidence that these new coordinating institutions mitigated the initial output decline. Building on the recent advance of the science of complexity, we interpret the emergence of these informal institutions as the firms’ spontaneous attempt to coordinate activities in a decentralized economy.

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“And so we return to a tantalizing possibility: that self-organization is a prerequisite to evolvability, that it generates the kind of structures that can benefit from natural selection. . It generates structures that can evolve gradually, that are robust.. Robustness is precisely what allows such systems to be molded by gradual accumulation of variations.. If this view is correct, then precisely that which is self-organized and robust is what we are likely to see preeminently utilized by selection.”

Stuart Kauffman,

At Home in the Universe: The Search for the Laws of Self-Organization and Complexity, p. 188.

1. INTRODUCTION

The transition from socialism to markets was initially marked by a deep and, in some cases, enduring output collapse. Scholars attribute the observed decline to a number of different causes: a decline of production of goods important during the regime of central planning, but subsequently in excess supply (Berg, 1994); mis-measurement of the GDP due to a shift from official to unofficial activities (Kaufmann and Kaliberda, 1995), inconsistent and unsustainable macroeconomic policy (IMF, 1995); credit contraction (Calvo and Coricelli, 1992, 1993) coordination failures due to an institutional vacuum created by the dismantling of central planning institutions (Murrell, 1992; Blanchard and Kremer, 1997; Recanatini and Ryterman, 1999), and rent-seeking behavior (Aslund, Boone and Johnson, 1996). The importance of each of these arguments certainly varies by country, but together they form a common image, that transition has produced a rugged and somewhat chaotic landscape in which firms must modify their organizational, productive, and transactional strategies or risk their own obsolescence.

Blanchard and Kremer (1997) provide one of the most visible of these arguments, observing that central planning was characterized by highly specific

relationships between firms, which were intermediated by central planning institutions. The elimination of these institutions resulted in a breakdown of relations, which the authors characterize as “disorganization”. In our view, this argument is correct, providing an important example of the way in which transition has increased the cost to firms of transacting. But, this and similar arguments stop short of what we believe is a fuller characterization of the transition process, as one in which the shock waves of the reform process have triggered a search by firms for ways to survive this adversity, leading to the emergence of new institutions. In this paper, we begin where the former arguments end, by examining one of the key institutions that have emerged spontaneously in response to the challenge of transition.

Transition provides a rare opportunity for insight into the endogenous development of market institutions. Although a number of scholars have written on the endogenous emergence of market institutions,³ few have discussed this issue in the specific context of transition. Exceptions are Ickes and Ryterman (1995), Gaddy and Ickes (1998), Commander (1998), Pinto (1999), and others who study the evolution of barter, commercial paper, and trade credit as mechanisms to conserve on the need for firms to fully adjust to market-based competition.

In this paper, we examine a different response to the shock of transition: the organization of firms into formal and informal networks of firms, which we refer to generically as business associations. Much has been written about this phenomenon (for example, see Johnson, 1997), but little empirical evidence has been provided on their impact on the performance of firms. An exception to this is Perotti and Gelfer (1998), who examines the role of groups in countries in transition in the allocation of credit.⁴ Credit reallocation, however, is but one of several roles played by these associations, as

³ Much of this literature concerns the endogenous formation of the firm. Seminal contributors to our understanding of the theory of the firm include: Coase, Williamson, North, and Grief.

⁴ The authors find that group firms have easier access to finance for investment than independent firms.

we explain below. This paper aims to offer a more encompassing analysis, by providing empirical evidence on the role of business associations in mitigating the output decline.

Specifically, we argue that business associations emerge as a spontaneous response by firms to address the adversity of transition. We build our argument intuitively on the recent advances in the science of complexity. This science suggests that the creation of complex organizations, such as associations, is not an unlikely phenomenon, but the result of a natural tendency of systems to create order. Using this framework, we argue that business associations are most likely to emerge in locations where disorder is most likely, with the effect of providing its members with some amount of stability and coordination and improving their performance. We predict that these locations are cities with the highest concentration of firms previously more closely coordinated by the central planner and whose managers are in greatest need of finding new strategies for survival.

We test this intuition using data on the characteristics and performance of firms in five Russian cities. This data set was constructed by a team from the World Bank⁵, and includes statistics on the membership of the firms in different types of business associations. The data were collected for 1994, a year witnessing active privatization and a dramatic decline in the volume of government subsidies to firms. These conditions suggest that 1994 is precisely the time period during which we would expect firms to actively search for survival strategies.

We estimate a bivariate model to jointly explain the firm's probability to experience a decline in output and to join a business association. We define the probability of decline in a firm's output as a function of changes in the demand for its products and other characteristics of the firm, including its membership in a business association. The decision of joining an association is instead a function of the degree of

⁵ Led by Barry Ickes (Professor of Economics, The Pennsylvania State University) and Randi Ryterman (Economist, The World Bank), with the assistance of Annette Brown.

coordination failure and disorganization surrounding the firm. Our empirical analysis supports our intuition: being a member of a business association improves firm's performance significantly. Moreover, the decision of joining an association is affected by the disorganization existing in the region in which the firm operates. Hence, the results of this estimation procedure, in line with the complexity literature, characterize the use of associations by firms as a way to limit output decline by locally solving coordination problems.

The novelty of this work is therefore to suggest a simple, yet promising framework of analysis and provide empirical evidence of the link between the institutional "disorganization", output decline and the endogenous emergence of new coordinating institutions. In doing so, this paper offers new evidence on the role of informal institutions on firm's performance. The "self-organization" approach employed also helps begin thinking about the causes triggering the endogenous emergence of these institutions and their evolution over time.

The rest of the paper is organized as follows. Section 2 introduces some preliminary evidence on business associations motivating the intuitive framework built on the recent advance of the complexity theory. This simple, yet novel characterization of the transition process as a phase characterized by "disorganization" in which institutions may emerge endogenously as the firms' response to adversity sets the stage for the empirical analysis presented in Section 3. The results of our estimation procedure are startling: business associations do mitigate the output decline. Moreover, as predicted, these institutions are more likely to emerge in locations which exhibit a higher concentration of firms more influenced during the Soviet era. The Conclusion discusses the implications of our findings for the understanding of the transition process and presents possible extensions.

2. WHY DO ENTERPRISES JOIN GROUPS?

Business associations in Russia are a common phenomenon. In 1994, nearly half of all firms were members of some business or trading associations (see Table 1). Some might think that the emergence of business associations in countries such as Russia is not an unlikely phenomenon. After all the ministries of the former Soviet Union and its constituent Republics could be characterized as managing a formal network of plants producing similar types of goods. Beginning in the 1960s, the plants within ministries were further organized into smaller units, known as production associations, which primarily consisted of plants producing the same types of goods located in the same city or town. In fact, we agree with this characterization and suggest that the blueprint for the self-organization of enterprises existed in the Soviet system and possibly before. As shown in Table 2, the key organizers of about half of the associations were former ministerial officials at the all-union or republic levels. As the institutions of central planning were dismantled, these officials found themselves without a public office, but with extensive experience in planning and solving problems of production. Many moved out of the public sector into the non-government sector, trying to coax firms into joining associations that would help them navigate some of the difficulties of the transition.

While the propensity to associate might be driven by a historical legacy, the associations formed during the transition were typically quite distinct from their antecedents. As shown in Table 3, these were no longer predominantly comprised of firms in the same industry (firms that post-1992 became competitors), but also included suppliers, customers, and banks. This new composition reflected the expanded role of associations, which shifted from primarily allocating a fixed stock of inputs among competing firms in an industry to helping firms find and transact in new input and product markets and finance their production, preferably at below market rates (see

Table 4).

To provide an intuition for the emergence of these new types of business associations, we turn to recent advances in the science of complexity. We consider a model that is typical of a well-studied class of models of complexity (Kauffman, 1995), in which there are N identical firms, each firm having K relationships with other firms. A firm may exist in two states: S_1 =no production and S_2 =production. The impact of the K relationships on the state of the firm depends on some rule P , where P expresses how the K relationships operate on the present state of the firm to produce a new state in the next period. We depict this model in Figure 1.

FIGURE 1

Model: N firms

K INTERACTIONS
with other firms
Firm (state, time t) ----- P -----> (state, time $t+1$)

where state = [S_1 = no production, S_2 = production]

Depending on the initial conditions, the set of N firms will pass through a series of states, and eventually settle down into a cycle, known as an attractor, which will continually repeat itself. An attractor is said to be a source of order if the cycle is short and robust to small perturbations in initial conditions.

The likelihood that the system of N firms will settle into order depends on an interplay between K and the rule P . When K is low (externalities between firms are few) and P is biased toward a particular state (most of the configurations of the

externalities result in a particular state⁶), order is likely. As K rises and P becomes less biased, the likelihood of chaos increases.

In simplest terms, we can think of the Soviet system of central planning as a system of N firms, in which every firm potentially interacts with every other firm (N-1 firms) in the economy. However, the central planner has assigned to each firm a single supplier (firm A) and a single customer (firm B). Following Kornai (1980), we characterize the central planning system as a supply driven system, so that the rule P states that the firm produces as long as its supplier (firm A) produces. Because the state of the firm is determined only the behavior of firm A, this system reduces to one in which K=1 and the rule P is unbiased.⁷ It is trivial to show that, from any set of initial conditions, this system quickly establishes order: the system is completely static. If most firms enter the regime of central planning in a state of production, we would expect this outcome to persist over time.⁸

The problem with central planning, especially when it is modeled in this simple way, is that it cannot evolve. It is too robust. In models of complexity, evolution is conceived as a process that is initiated in periods of intense change, when order is at the ‘edge of chaos’. The tension of a phase transition is believed to release an energy, which catalyzes innovation. While central planning was certainly not as robust as our simple

⁶ We measure bias by examining all the possible combination of states of the K firms whose behavior affects a given firm, which is equal to 2^K . Then, we identify the share of outcomes in which, according to rule P, the firm produces. Thus, the bias is a number bounded by 0 and 1. When the bias is equal to .5, we say the control rule is unbiased. If it is greater than .5 the rule is biased toward production and when it is less than .5 it is biased toward non-production.

⁷ To see that the rule is unbiased, consider the possible states of a random firm given the control rule P:

Input: Firm A	Outcome: Firm A's customer
0	0
1	1

Notice that 50 percent of the outcomes are S₁ and 50 percent are S₁. This confirms the rule is unbiased.

⁸ Recall that the system of central planning was not introduced in the Soviet Union immediately following the civil war that ended in 192X, but was introduced only after the New Economic Policy (NEP) – a semi-market system – was allowed to jump-start the economy for X years. One could argue that NEP was necessary because central planning was such a rigidly ordered system, which could only work if its initial conditions were favorable.

model suggests⁹, a key problem that may be accountable for its demise is a lack of innovation in the system (Berliner, 1988; Hewett, 1990).

In a market system, firms must have both suppliers and customers, so that $2 \leq K \leq (N-1)$. We characterize the rule in a market system as one in which a firm produces only when at least one of its suppliers and at least one of its customers produce. (Production by the customer is a proxy of its ability to pay for its purchases.) Notice that the bias implicit in this rule is linked to the value of K (see Figure 2).¹⁰ The bias shifts from favoring non-production to favoring production, as the number of suppliers and/or customers increases.¹¹

⁹ Indeed shortages in the supply of key inputs were common, arguably due to random shocks in production. But this tension spawned two types of innovation: (i) informal vertical integration, making factories more self-reliant and (ii) the profession of the *tolkach* or expeditor, who informally arranged for deliveries of inputs in short supply.

¹⁰ The formula for the bias is equal to $[2^K - 2^{K_1} \cdot 2^{K-K_1} + 1] / 2^K$, where K_1 is the number of firms that are the firms suppliers.

¹¹ Notice that the bias does not necessarily increase with K . For example, consider the case when there is one supplier and four customers, so that $K=5$. In this case, the bias is .47. Compare this bias with the case in which there are two suppliers and two customers, so that $K=4$. In that case, the bias is .56. Although K is lower, firms in the second case have a choice of suppliers and consequently have greater flexibility. This feature shifts the direction of the bias from non-production toward production.

Figure 2. Selection in a Market System

Number of Suppliers	Number of Customers	K	Bias in P
1	1	2	.25
1	2	3	.38
1	3	4	.44
2	2	4	.56
3	2	5	.63
5	5	10	
25	25	50	
50	50	100	

We characterize the transition as a process in which the number of connections between firms gradually increases. At the beginning of transition, we assume that a firm is only able to transact with its two pre-transition partners (recall firms A and B), due to imperfections in the market, such as problems of information, contract enforcement, or credit allocation. Thus, $K=2$, which is a system of remarkable order. Notice that the rule is biased toward non-production, which suggests that forces in the new regime will push the system toward non-production. But, as the number of suppliers and customers each rises, P initially becomes less biased, suggesting that the system will become more chaotic. Finally, as the number of suppliers and customers becomes large, P approaches 1 at which point the system will certainly again demonstrate order, but this time with production.

A natural question is: what causes K to rise? We speculate that it is a process of evolution, in which firms search out and begin to work out relationships with other firms. More precisely, as the system moves from central planning to the earliest stage of transition, pressures in the system build that begin to push many firms toward a

state of non-production. As these firms begin to feel the strain of transiting to the new system, they begin to search for strategies to relieve this strain. A direct approach to relieving the pressure created by the shift in the rule P is to begin to search out new suppliers and customers to add some flexibility back into the system.

For many firms, this search can be approximated by a simple evolutionary model, in which firms make small adaptations in their current transactional strategy. By taking a random walk in their 'immediate neighborhood' – defined as adding or deleting one trading partner in geographic or technological proximity at a time – these firms can attempt to build a more complex and possibly more profitable trading network. The problem with this strategy is that it will often fail, because firms can quickly get stuck in local optima, which are much inferior to the global optimum.

One possible alternative strategy is for firms to 'leap' rather than walk, so that they can explore a greater number of potential trading relationships in a shorter time period. This leap, we argue, can be accomplished when a number of small trading networks decide to 'associate' and exchange information about the success of their 'walks'. This information may include the location and reliability of alternative partners, as well as strategies that will enable a firm to transact with them. In addition, members of associations may share resources, such as credit or reputation, that will help to facilitate new relationships, understanding that they will potentially receive valuable information and resources in exchange.

Is such a strategy likely in an economy in transition? Yes, we argue, because the act of associating is a blueprint that arises out of historic legacy. But, we argue, it is a strategy that is most likely to be uncovered by firms in the deepest distress and operationalized when these firms are in the same geographical and technological neighborhood. Next, we present some empirical evidence supporting our intuition.

3. BUSINESS ASSOCIATIONS AND ENTERPRISE PERFORMANCE

The previous discussion has emphasized how a change in the coordinating institutions of an economy, though it initially translates into a negative shock, it may also trigger the emergence of alternative, endogenous mechanisms to coordinate trade among firms. We have focused, in particular, on the early years of the transition process in Russia and documented the emergence of business associations. We characterize this phenomenon as the spontaneous reaction of firms to the dismantling of the Soviet institutions and to the coordination failures and higher transaction costs which followed. Specifically, we suggest that firms at the beginning of the transition engaged in activities that promoted the coordination of trade and the sharing of information. Joining a business association is an example of such activities. Business associations may in fact facilitate the circulation of information about, for example, trading possibilities among their members. They may also mitigate contract enforcement problems by monitoring the actions of members and their trading partners.

Moving from these consideration, we have provided in Section 2 (and in the Tables in the Appendices) some preliminary evidence to better characterize business associations in Russia at the beginning of the transition process. Firms that are members, for example, appear to have better information about alternative trading partners (see Table A12); on the other hand, business associations which include financial institutions seem to mitigate the “disorganization” shock on production. These simple stylized facts suggest the existence of a link between these informal institutions and firms’ performance, and set the stage for a more formal analysis.

In the following section, we explore the impact of associations on firm’s performance using our firm data set. The results of this empirical exercise are startling. Being a member of a business association significantly improves firms’ performance, reducing the probability of a decline in production. As for the decision whether or not

to join an association, the increase in transaction costs affects the firms' choice. In particular, firms previously more influenced by the Soviet institutions are more likely to join an association. Hence, the results of this estimation procedure characterize the use of associations by firms as a way to limit the (negative) "disorganization" shock, which followed the removal of the Soviet institutions, by "self-organizing" their activities.

3.1 THE STRUCTURAL MODEL

A clear implication, that can be drawn from our characterization of business associations, is that the decline in output, which followed the dismantling of the Soviet institutions, should be smaller for firms which are members.

To explore the link between membership and firms' performance, we use a data set compiled at the end of 1994 by the World Bank. This survey gathered extensive information on 157 enterprises in five Russian provinces between January 1992 and October 1994. In particular, the data set contains information on firms' performance and membership in business associations. Using this information, we construct two variables, \tilde{y}_i and $Assoc_i$, where \tilde{y}_i is an index for firm i 's growth rate, y_i^t , and is defined as follows:¹²

- if $(y_i^{94} - y_i^{91}) \geq 0$ then $\tilde{y}_i = 0$;

- if $(y_i^{94} - y_i^{91}) < 0$ then $\tilde{y}_i = 1$;

and $Assoc_i$ is a dummy variable which takes value 1 if firm i is a member of a business association, zero otherwise.

¹² Our choice of creating this index of growth was determined by the fact that the survey provides information only on the sign of the change in production after 1991.

Following the set-up developed in Recanatini and Ryterman (1999), we introduce the following structural equation to estimate the impact of membership on the output decline of firm i belonging to sector I :

$$\Pr[\tilde{y}_i = 1] = \Pr[\beta_0 + \beta_1(LP_I^{94-91}) + \beta_2(L\bar{C}_I^{94-91}) + \beta_3(Assoc_i) + \beta_4(x_i^{94-91}) + \beta_5(z_i^{94-91}) + \tilde{\varepsilon}_i > 0] \\ = \Phi[\beta_0 + \beta_1(LP_I^{94-91}) + \beta_2(L\bar{C}_I^{94-91}) + \beta_3(Assoc_i) + \beta_4(x_i^{94-91}) + \beta_5(z_i^{94-91})]$$

where:

- $\tilde{y}_i = 1$ means that firm i experienced a decline in output between 1991 and 1994;
- LP_I^{94-91} represents the change in prices for sector I , with $i \in I$, between 1991 and 1994;

- $L\bar{C}_I^{94-91}$ describes the change in input costs for sector I , $i \in I$, for the same period;

- $Assoc_i$ captures firm i 's membership in business associations;
- x_i^{94-91} is a vector of firm specific variables to control for some other factors

which may have contributed to the decline in output;

- z_i^{94-91} is a vector of variables to proxy for the institutional changes and disorganization;

- $\Phi[\cdot]$ is the standard normal cumulative distribution function.

Equation (1), in part inspired by Diamond (1982)'s model¹³, tries to capture the essence of our argument: firms' activities are affected not only by changes in prices, costs or firm-specific factors, but also by the change in the mechanisms coordinating economic activities. We separate the effect of this change in coordination regime into two different parts, the “disorganization” effect and the “self-organization” effect.

The dismantling of the Soviet coordinating institutions translated into a widespread “disorganization” of economic activities, which in turn led to an increase in the costs of search, financing, contract negotiation and enforcement. The vector z_i^{94-91} proxies for this change in coordinating institutions and the disorganization which followed. We expect these variables to affect negatively firm’s growth.

But the transition process forced firms to learn to survive in a new environment and, in particular, to find new ways to coordinate activities. The dummy $Assoc_i$ attempts to capture these “self-organization” efforts and the institutional innovation which followed the initial disorganization of the economic activities. Specifically, we expect that the dummy $Assoc_i$ will have a positive impact on firm’s performance by alleviating the initial “disorganization” shock.

Following the findings of Recanatini and Ryterman (1999), we then define the vector z_i^{94-91} - the “disorganization” effect of the change in coordinating regime - as follows:

$$z_i^{94-91} = (AU_i, Ic_i, ds_{ip}, db_{ip}, CMEAEX_i, CMEAIM_i)$$

with $i \in I$ and where:

- AU_i is a dummy variable that takes value 1 if the firm belonged to an All-Union sector during the Soviet era, zero otherwise;
- Ic_i is the index of complexity introduced by Blanchard and Kremer and defined as follows:

$$Ic_i = 1 - \sum_k \left(\frac{z_{ik}}{\sum_j z_{ij}} \right)^2$$

with z_{ij} is the share of input j in the production of good i¹⁴;

¹³ See also Recanatini and Ryterman (1999) for a more detailed discussion of the intuition behind this structural equation.

¹⁴ This index was constructed using the 1990 Russian “100-sectors” input-output tables.

- ds_{ip} and db_{ip} are the distance of potential suppliers and buyers, respectively, for firms in industry I located in province p, and are defined as follows¹⁵:

$$ds_{ip} = \sum_j \left[S_{ji} * \sum_h (C_{hj} * D_{ph}) \right]$$

$$db_{ip} = \sum_j \left[B_{ji} * \sum_h (C_{hj} * D_{ph}) \right]$$

with:

- S_{ji} is the share of input j used in the production of commodity I;
- B_{ji} is the share of output I purchase by industry j;
- C_{hj} is the concentration of industry j in province h in 1990;
- D_{ph} is a dummy variable which takes value
 - 0 if p and h are the same province;
 - 1 if p and h are neighboring provinces;
 - 2 otherwise.
- $CMEAEX_I$: the pre-transition share of sector I production exported to countries belonging to the CMEA;
- $CMEAIM_I$: the pre-transition share of inputs used by sector I imported from countries belonging to the CMEA.

These variables attempt to proxy the disorganization shock by exploiting different “dimensions” along which economic activities may have been coordinated during the Soviet regime. The intuition is the following. The Soviet system

¹⁵ These indices were calculated using the 1990 Soviet input-output Tables.

coordinated activities and exchanges through the use of government agencies. The transition from plan to market implied the dismantling of the old Soviet coordinating institutions with a subsequent increase in transaction costs for individual firms. This rise in transaction costs varied however across enterprises depending on the pre-existing institutional arrangements of firms, their production links and their spatial location.

Consider, first, the dummy AU, which exploits the institutional heterogeneity in terms of coordination existing across firms before the transition. During the Soviet period firms' activities were monitored and coordinated by the Soviet government. In particular, each sector of the economy was controlled by a separate Ministry. The degree of control and coordination was however different across sectors. The activities and exchanges of sectors under the so-called All Union Ministries were highly monitored and coordinated. Sectors instead under the Union Republic or the Republic Ministries were given greater degree of freedom.¹⁶ The dismantling of the Soviet institutions halted this coordinating activities and unevenly increased transaction costs across sectors. We should therefore expect that firms more closely monitored by the Soviet authority, i.e. under the control of an All Union Ministry ($AU_i = 1$), should suffer more.

Disorganization manifested itself also through the break up of the very rigid production links existing among firms. Business relationships between firms during the Soviet period not only were set in fact by the government, but were also highly specific (Blanchard and Kremer, 1997). This specificity on the production side and the potential bargaining problems were controlled by the central planner. The transition process eliminated the central authority without reducing the specificity of these relationships, opening the door for bargaining. The index of product complexity, Ic_i , captures this

¹⁶ For more details on the institutional structure of the Soviet industry and how information traveled across agents, see Recanatini and Ryterman (1999).

intuition: the more complex the product, the greater the specificity problem faced by firms, and thus the more likely is output to decline.

The third dimension we use to proxy for the disorganization shock is related to the spatial distribution of enterprises. Firms, in fact, differ not only in terms of their pre-existing institutional or production links, but also because of their geographical location. The increase in transaction costs which followed the removal of the Soviet institutions was uneven across firms depending on the spatial location of their alternative buyers and suppliers: the closer the potential trading partners are, the smaller the increase in transaction costs for firm i , the less likely is production to collapse. The indices ds_{ip} and db_{ip} capture this type of geographical heterogeneity in transaction costs existing across firms.

Finally, the last two measures of the vector z_i^{94-91} focus on the coordination of activities with foreign firms by capturing the dependence of sector I on foreign sectors prior the transition.

To complete our specification, we introduce the firm-specific vector x_i^{94-91} :

$$x_i^{94-91} = (AGE_i, DUR_t)$$

where:

- AGE_i : the number of years firm i has been in business;
- DUR_t : the pre-transition index of durability of sector I.

To summarize, our equation (1) becomes the following:¹⁷

$$\begin{aligned} \Pr[\tilde{y}_i = 1] = & \Pr[\beta_0 + \beta_1(LP_t^{94-91}) + \beta_2(L\bar{c}_t^{94-91}) + \beta_3(Assoc_i) + \beta_4(AGE_i) \\ & + \beta_5(DUR_t) + \beta_6(AU_t) + \beta_7(Ic_t) + \beta_8(ds_{ip}) + \beta_9(db_{ip}) \\ & + \beta_{10}(CMEAEX_t) + \beta_{11}(CMEAIM_t) + \tilde{\varepsilon}_i > 0] \end{aligned} \quad (1')$$

¹⁷ Table 5 and 6 provide summary statistics for these variables.

How will being a member in an association affect firms' performance? If joining an association is a way to solve some of the coordination problems faced by firms, then members should experience a smaller decline in output. Table 7 presents the results of our estimation procedure. This simple exercise suggests that $Assoc_i$ does in fact affect positively firms. We could therefore conclude that associations - as a form of sharing information and coordinating activities - help firms' performance at the beginning of transition. This conclusion however is not robust.

The single-equation model estimated has taken $\tilde{\varepsilon}_i$ to be uncorrelated with the $Assoc_i$ dummy. This can be justified only if we have included in equation (1') all the relevant explanatory variables. This may not be the case. There may be unobserved factors which affect both \tilde{y}_i and $Assoc_i$, leading to a bias in the estimates discussed above. Specifically, there may be some managerial characteristic which is related to both firm's performance and the decision to join an association.

Suppose for example we define an omitted variable called "Soviet legacy" (S) which captures a manager's characteristic. We can reasonably expect S to be positively related with both the decline in output and the "Membership" dummy: high S managers did not know how to adjust to the change in the system, and may have viewed associations as a recreation of the past. Hence, if this variable is omitted, there will be a positive correlation between the error terms and the single-equation estimates will be upwardly biased.

To correct this endogeneity problem, we introduce a second equation to explain the decision of joining an association:

$$\sum_i^* = \delta * W_i + \varepsilon_i^m \quad (2)$$

where:

- \sum_i^* is the latent variable measuring the benefits from

joining an association; and $Assoc_i = 1$, when $\sum_i^* > 0$, zero otherwise.

- W_i is a vector of observable variables which influence \sum_i^* ;
- and ε_i^m is the error term, and $E(\varepsilon_i^m) = 0$.

If all the relevant explanatory variables are included both in equations (1') and (2), then $E(\varepsilon_i^m, \tilde{\varepsilon}_i) = 0$, and the single-equation estimates are consistent. If however, $E(\varepsilon_i^m, \tilde{\varepsilon}_i) = \rho \neq 0$ - the unobserved determinants of output and association decision are correlated - then $\tilde{\varepsilon}_i$ and $Assoc_i$ are correlated and the estimates obtained using the single equation approach are inconsistent. To test whether our estimates are consistent, i.e. $E(\varepsilon_i^m, \tilde{\varepsilon}_i) = \rho \neq 0$, we estimate equation (1') and (2) simultaneously.

But which variables may affect the decision to join an association? If our characterization of business associations as a way for firms to coordinate activities and obtain information is correct, then the degree of “disorganization” faced by firms will affect the decision to join. Thus, the more closely controlled firm i was during the Soviet era, the greater the disorganization shock at the beginning of transition, the larger the benefits from joining an association. In addition, the greater the distance of firm i from its suppliers and buyers, or the more complex the production process, the higher firm i 's transaction costs, and, in turn, the greater the benefits from joining an association.

The resulting model to be estimated is therefore:

$$\begin{aligned} \Pr[\tilde{y}_i = 1] = \Pr[\beta_0 + \beta_1(LP_i^{94-91}) + \beta_2(L\bar{c}_i^{94-91}) + \beta_3(Assoc_i) + \beta_4(AGE_i) \\ + \beta_5(DUR_i) + \beta_6(AU_i) + \beta_7(Ic_i) + \beta_8(ds_{ip}) + \beta_9(db_{ip}) \\ + \beta_{10}(CMEAEX_i) + \beta_{11}(CMEAIM_i) + \tilde{\varepsilon}_i > 0] \end{aligned} \quad (1')$$

$$\begin{aligned} \Pr[Assoc_i = 1] = & \Pr[\delta_0 + \delta_1(LP_i^{94-91}) + \delta_2(LC_i^{-94-91}) + \delta_3(AGE_i) + \\ & + \delta_4(AU_i) + \delta_5(Ic_i) + \delta_6(ds_{ip}) + \delta_7(db_{ip}) + \delta_8(CMEAEX_i) \\ & + \delta_9(CMEAIM_i) + \delta_{10}(AU_Ob_i) + \tilde{\epsilon}_i > 0] \end{aligned} \quad (2')$$

This system of two equations is identified if we have at least one instrument for $Assoc_i$, which is not included in the output regression. For this purpose, we introduce a new variable, AU_Ob_{ip} , which measures the concentration of firms under an All-Union Ministry located in the same province p as firm i . The validity of this instrument can be justified by the following intuition built on the idea of the random walk of firms in their immediate neighbor presented in Section 2.

If firm i is located in a region with a high concentration of previously controlled firms, the removal of the Soviet system has left a larger informational vacuum than otherwise. In this region, alternative information networks are more likely to develop because of the greater degree of disorganization surrounding each firm. The benefits and the efficacy of joining an association are therefore larger if firm i belongs to a region which has a greater concentration of controlled firms at the beginning of transition. This "necessity-is-mother-of-every-invention" explanation for the use of AU_Ob_{ip} as instrument for $Assoc_i$ also helps us to justify why AU_Ob_{ip} does not affect output directly, but only indirectly.¹⁸

¹⁸ Alternative interpretations AU_Ob_{ip} are however possible, some of which make it more difficult to justify the exclusion of this variable from the output regression. High values of AU_Ob_{ip} may in fact capture the higher search costs faced by firm i because of the destruction of the information network existing in her region. In this case the variable should be included in the output regression. Our argument however is that this increase in transaction costs is captured by the transaction costs indices introduced above, while AU_Ob_{ip} only captures the institutional trigger for the emergence of associations.

3.2 SELF-ORGANIZATION?

To answer this question we test the following hypotheses¹⁹: did the spontaneous emergence of alternative ways to coordinate activities and obtain information reduce the negative impact of the disorganization shock? And, do business associations are more likely to emerge in regions which exhibit a higher degree of disorganization?

In terms of equations (1') and (2'), these hypotheses imply $\hat{\beta}_3 < 0$ and $\hat{\delta}_{10} > 0$ ²⁰: being a member of an association, by facilitating coordination among agents and reducing transaction costs, decreases the probability that output declines. Moreover, firms are more likely to join the greater the institutional disorganization surrounding them. Our empirical exploration may also help to shed some light on the function played by these institutions through the estimation of equation (2'). A negative and statistically significant $\hat{\beta}_3$ in fact, though it highlights the existence of a link between firms' performance and coordinating institutions, it does not provide information on the role played by these institutions.

To estimate equations (1') and (2') we use a bivariate probit procedure.²¹ The results of this regression are summarized in Tables 8 and 9.

Two are the key findings of our exploration. The first is that the Maximum Likelihood Estimates of equations (1') and (2') still support our hypothesis (Table 8): output is less likely to decline if firm *i* is a member of a business association. The average treatment effect - the difference in the probability of output decline between members and non-members - suggests that being a member of an association has a very strong impact on firm performance: belonging to an association reduces the probability

¹⁹ In Recanatini and Ryterman (1999) we focus on whether the destruction of the Soviet information network affected negatively firms' performance.

²⁰ Recall that $\{y\}=1$ means that output declined.

that output declines by 47 percent. These findings therefore strongly support the importance of alternative ways to coordinate among agents and obtain information during transition in explaining firms' performance.

The bivariate estimation procedure also adds a relevant piece of information about the relationship between membership and output: $\hat{\rho}$ is significantly different from zero and positive, indicating that the single-equation estimates are inconsistent and likely to be upwardly biased (i.e. the effect of associations on output decline is more negative than equation (1') would imply). This result suggests that the single equation approach suffered of an omitted variable problem. It also highlights the potential role of the "Soviet legacy" variable.

Few other factors help explain the decline in output. Our proxy for the institutional disorganization (AU) is statistically significant and positive ($\hat{\beta}_6 > 0$) indicating that the removal of the government institutions coordinating exchanges did have a negative impact on firms. The other measures of disorganization - ($Ic_1, ds_{lp}, db_{lp}, CMEAEX_1, CMEAIM_1$) - are instead not statistically significant.²² In addition, older firms seem to do worse than younger ones ($\hat{\beta}_4 > 0$). A possible explanation for this result is that in the Soviet system age and size of firms were positively correlated. The size of firms also was not based on efficiency considerations in most of the cases. Older firms were therefore more likely to be in need of restructuring at the beginning of the transition. Finally, higher prices also significantly reduces the probability of output decline ($\hat{\beta}_1 < 0$).

²¹ Ignoring the discreteness of both dependent variables, we could estimate this model by using a standard linear procedure. The last column of Tables 13 and 14 presents the results of the 2SLS procedure. These results are consistent with the bivariate probit results discussed below and provide more evidence of the robustness of the "Association" effect.

²² For a more detail discussion on the link between coordination problems and output, see Recanatini and Ryterman (1999).

Thus, these results seem to suggest that the dismantling of the Soviet coordinating system, the emerging of an alternative system and the price shock are the most important factors in explaining the output collapse at the beginning of transition.

But, why do firms choose to join a business association? The second key finding of our analysis is that firms are affected by the surrounding lack of coordination in their decision to join. These self-organizing institutions are in fact more likely to emerge in regions where the institutional disorganization is greater. The analysis of Table 9 suggests that the decision regarding membership is also affected by the age of the firm ($\hat{\delta}_3 > 0$) and the change in prices ($\hat{\delta}_1 > 0$): the benefits of joining an association are larger for older firms than for younger ones, since the former are more likely to have been influenced more by the Soviet system and to have less knowledge of the market system rules. Moreover, since firm i joins an association in an attempt to decrease its transaction costs, an increase in the price of firm i 's product reduces the benefits from using this alternative form of coordinating activities and sharing information.

More surprisingly, the geographical distance of suppliers reduces the benefits of joining an association. This result suggests that associations among distant members are less likely to arise. A possible explanation for this seemingly surprising result is that distance makes it more difficult to monitor other members' actions, and therefore reduces the usefulness of business association. This result also helps to better characterize some of the functions of this self-organizing activities: associations are a potential way to not only share information, but also to control members' behavior. The other proxies of disorganization however are not statistically significant, though with the predicted sign ($\hat{\delta}_4 > 0$ ²³, $\hat{\delta}_5 > 0$)

This last set of results on the role and the emergence of associations is in line with the theoretical framework discussed in Section 2 and with Greif (1989, 1993) and

²³ The positive coefficient of AU may also suggest that firms under an All-Union Ministry are more likely to join an association because of the larger information loss brought by the transition.

Milgrom (1992)'s studies of the importance of historical institutions for trade and growth: agents may attempt to resolve problems due to market failures - such as information asymmetry and contract enforcement issues - by joining efforts with other agents. This strategy, though socially sub-optimal, improves the performance of each single agent. Further work along these lines is necessary at this stage to better understand the evolution of these institutions.

3.3 BUSINESS ASSOCIATIONS: WHICH ROLE?

The results presented in the previous section highlight how somehow business associations have a positive impact on members' performance. Our empirical analysis however cannot sort through the competing hypotheses of why membership in associations is beneficial for firms. Do, for example, business associations reduce transaction costs by facilitating the circulation of information among their members? Or do they mitigate contract negotiations and enforcement problems? Or do business associations alleviate the credit constraints faced by firms?

A closer look to Table 9 indicates that the decision of joining an association is strongly affected by the institutional vacuum brought by the transition and the "Soviet legacy" (AU_Ob and AGE). Next, we discuss the results of few empirical exercises undertaken with the objective to better understand the role of business associations. Our exploration, though constrained by data availability issues, suggests that the beneficial effects of business associations should be seek in their ability to facilitate contacts with suppliers and buyers. More surprisingly, associations lead by former official of a Ministry of the USSR or Russia seem to have no effect on firms' performance²⁴. Finally, we cannot say whether or not associations facilitate access to

²⁴ This result may be driven by the somewhat poor performance of the instrument used.

credit, or help to coordinate activities with competitors because of the poor performance of the instrument used.

Specifically, in the attempt to separate potential functions of associations we build on the preliminary evidence presented in Section 2 on the composition of associations and their key organizers (Tables 2 and 3). In fact, being a member of an association that includes suppliers or financial institutions or was organized by a former official of a Ministry of Russia seems to be associated to a smaller likelihood of output decline. We therefore repeat our bivariate analysis only for the firms who are members using a set of modified membership variables defined as follows²⁵:

- Supplier = 1 if the association includes the most important suppliers, zero otherwise;
- Banks = 1 if the association includes financial institutions or banks, zero otherwise;
- Customer = 1 if the association includes the most important customers, zero otherwise;
- Legacy = 1 if the key organizer is a former official of a Ministry of the USSR or Russia, zero otherwise;
- Industry = 1 if the key organizer is an employee of an industrial enterprise, zero otherwise.

The intuition, and the final scope, of this exercise is to isolate some of the different functions that business associations perform, and evaluate their impact on output behavior. As anticipated above, the bivariate estimation procedures suggest that the dummies “Supplier” and “Customer” significantly reduce the probability of output decline (see Tables 10-17). This seems therefore to imply that business associations provide valuable information to their members about trading opportunities. The

²⁵ The complete results of these regressions are available from the authors upon request.

regressions with the dummies “Banks”, “Legacy” and “Industry” instead do not provide us with clear-cut results. The instrument used in fact in the bivariate analysis is not statistically significant, undermining the estimation results. Thus, we cannot conclude from our analysis that associations do not facilitate access to credit or are simply an heredity of the Soviet regime, although these dummies are not statistically significant.

To conclude, these exercises, because of the noisy measures used and the limited performance of the instruments, offer only preliminary evidence on the different functions potentially performed by these informal institutions and their impact on output behavior. Their main value is, however, to set the stage for further discussion and research on the role of these institutions and to indicate a possible approach to separate different functions.

4. CONCLUSIONS

Do self-organizing institutions emerge endogenously? If so, in which circumstances are they more likely to emerge? And, do these institutions significantly affect firm’s activities? The illustrative model and the empirical evidence presented in this paper provide some answers to these questions: self-organizing institutions emerge spontaneously in presence of disorganization. Furthermore, these institutions have a positive impact on firms’ performance. A brief discussion of these results will highlight the importance of these conclusions and emphasize the need for further research.

The focal point of this paper is the transition from planned to market economies and the firm’s response to the widespread disorganization. Building on the recent advances of the theory of complexity, we suggest that transition is a phase characterized by “order at the edge of chaos”, in which self-organization institutions emerge endogenously.

Our empirical analysis supports this conclusion emphasizing that being a member of an association reduces the probability that output declines. This finding helps us to characterize the endogenous emergence of associations as a mean of self-coordinating activities by sharing information about an uncertain environment. Joining a business or a trading association helps in fact firms to reduce transaction costs by providing information not only about the location but also the reliability of the potential trading partners. These findings, therefore, suggest that disorganization may create the proper conditions for the development of certain non-market institutions, which in turn play a role in explaining firms' performance in an environment characterized by some type of market failures.

In summary, this work sheds some light on the complex relationships between firm's behavior and the evolution of informal institutions, opening the door for further, much needed, discussions.

This perspective on coordination problems and self-organizing mechanisms suggests potentially fruitful directions for further empirical and theoretical research. The simple model describing production and membership decisions should focus more on the evolution of market institutions to better represent the reality in which firms operate. The explicit introduction of the accumulation of knowledge on the part of the agents, for example, may improve our understanding of the evolution of market and non-market institutions for trade and exchange.

Few more questions are left open by this work. This paper provides evidence that sectors under All-Union Ministries did in fact experience a larger decline in output. We label this effect as "the larger increase in transaction costs due to institutional changes", but other interpretations are plausible. Although we have in fact controlled for many other factors which may have affected output - such as the CMEA collapse, demand and supply shocks, durability of goods - few more may still be missing. Among them, credit availability is the first to come to mind: All-Union industries

received from the central government not only the information but also the credit resources necessary to complete their trades. The collapse of the Soviet system, therefore, led to both a loss of information and a loss of credit resources.²⁶

The previous remark is related to the broader issue of the omission of potentially important variables because of data availability problems. In Eastern Europe, for example, researchers have documented the more limited and somewhat different role played by business associations. To make this analysis more robust, the collection of additional firm-level data and more empirical work are therefore necessary.

Cross-country comparisons are also needed to test the robustness of our findings and to reconcile the observed discrepancies in the evolution of institutions. Our intuition suggests that the differences in institutional patterns between Eastern Europe, the Former Soviet Union countries, and other emerging economies may lay in the coordinating mechanisms existing before transition in each one of these countries and in the institutional disorganization faced by firms. In line with the recent works on groups in Latin America and East Asia, a comparison between Russia and any of these countries will provide us with further, deeper insights on the possibility and the role of self-organizing institutions on firm's activities.

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²⁶ This point becomes less relevant if we realize that the information lost with the transition was not only about trading and production, but also about access to credit sources.

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TABLE 1**MEMBERSHIP IN BUSINESS ASSOCIATIONS**

(Russia, 157 firms)

Are you a member of a business or trade association?	Percentage of Respondents
Yes ²⁷	42.3%
No	57.7%

TABLE 2**WHO IS THE KEY ORGANIZER OF YOUR ASSOCIATION?**

(Russia, 58 firms)

A former official of a Ministry of the USSR	29.8%
A former official of a Ministry of Russia	21%
A current or a former employee of an industrial enterprise	24.6%
Other.	24.6%

TABLE 3**WHO DOES BELONG TO YOUR ASSOCIATION?**

(Russia, 58 firms)

Your most important suppliers.	36.7%
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²⁷ Of the 157 firms interviewed, 58 responded that they were member of an association, 79 that they were not, and 20 did not respond.

Your most important customers	39%
Your most important competitors.	36.4%
Financial institutions.	36.7%

TABLE 4	
PERCEIVED BENEFITS OF MEMBERSHIP	
(Russia, 58 firms)	
You decided to join your association because it helps provide:	
Access to capital at market interest rates	24.6%
Access to capital cheaply	40.3%
Access to important material inputs	55.2%
Access to important product markets	50.9%
The association is not expensive	8.8%

TABLE 5**FIRM LEVEL DATA - DISCRETE VARIABLES BY REGION**

Variables	Barnaul	Yekaterinburg	Novorsibisk	Saratov	Voronezh	Total
Output Decline ¹	22	24	24	17	23	110
AU ¹	18	21	21	23	13	96
Number of Firms	30	30	30	36	31	156

¹Number of firms.**TABLE 6****FIRM LEVEL DATA - CONTINUOUS VARIABLES BY REGION**

Variable	Barnaul	Yekaterinburg	Novorsibisk	Saratov	Voronezh	Total
LP94_91 ²	1.52503	1.50948	1.54319	1.53227	1.49177	1.5239
LC94-91 ²	1.4504	1.48207	1.33821	1.284	1.5544	1.4218
Ic ²	0.793	0.803	0.837	0.84	0.803	0.807
CMEAEX ²	7.0867	5.7967	2.4897	6.7686	5.5931	6.2039
CMEAIM ²	18.263	19.21	20.307	23.58	26.24	22.81
AU_OB ²	0.6792	0.449	0.7639	0.8985	0.5246	0.6766
DS ²	1.9253	1.7655	1.9146	1.8728	1.863	1.8686
DB ²	2.3693	2.0751	2.2862	2.407	2.1957	2.3318
AGE ²	26.8	52.3	41.3	23.1	39.3	36.6

TABLE 6

FIRM LEVEL DATA - CONTINUOUS VARIABLES BY REGION

²Average

TABLE 7

**PROBIT REGRESSION
FIRM LEVEL DATA
DEPENDENT: OUTPUT DECLINE**

Variable	Good and Input Prices	Search Costs	Both	With Association
Intercept	1.045 (0.678)	-0.339 (0.94)	4.7814 (0.40)	6.20 (0.28)
LP94_91	-0.991 (0.557)	--	-3.2618* (0.096)	-4.30** (0.04)
LC94_91	0.1214 (0.605)	--	0.025 (0.90)	-0.0359 (0.86)
AGE	0.015** (0.013)	0.0088 (0.139)	0.0091 (0.1276)	0.0141** (0.041)
DUR	0.0227* (0.091)	--	0.0198 (0.14)	0.0191 (0.161)
AU	--	0.8596** (0.0044)	1.044** (0.0038)	1.143** (0.003)
Ic	--	-1.2805 (0.302)	-1.6763 (0.20)	-1.3321 (0.314)
DS	--	0.7213 (0.76)	0.3656 (0.88)	0.2947 (0.91)
DB	--	-0.1283 (0.702)	0.176 (0.695)	0.1764 (0.698)
CMEAEX	0.0013 (0.95)	--	-0.0203 (0.38)	-0.0221 (0.36)
CMEAIM	0.0034 (0.78)	--	-0.0061 (0.668)	-0.0049 (0.733)
ASSOCIATION	--	--	--	-0.5845* (0.054)

Observation: 123

Probability Values in parenthesis (Chi-squared)

** Significant at the 5% level. * Significant at the 10% level.