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Can the relationship between international clients and intermediate goods suppliers lead to declusterisation? A feedback model of the case of the Italian textile and ceramic tile machinery industry

(Preliminary version)

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Abstract

The internationalization strategy of actors operating in clusters has shown over time its weaknesses, producing a negative effect over the competitiveness of some operators of the cluster itself. In fact, the internationalization of machinery producers has interrupted the innovative process which originated from the interplay of the various actors of the cluster (relational capital). This phenomenon is particularly true if we consider the internationalization in the NICs which started from the beginning of the 90's, producing a resources diversion from the market of origin to farther markets. Analyzing the demographic data on companies operating in a district, it is clear and visible the fact that many downward operators are reducing in number and are exporting even less than the average of all Italian industrial companies. The feedback model presented in the paper explains this phenomenon exploring consequences produced by export strategies of machinery producers and on the cluster as a whole.

Key words: declusterisation, technology transfer, relational capital, knowledge creation, innovation

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Introduction

The purpose of this paper is to study the effects of internationalization strategies of machine industry firms upon the industrial district which they belong to. In the first paragraph we give a definition of industrial district. In the second one we apply the RBV of the firm to the industrial district. In the third one we analyze the internationalization strategies of the machinery industry firms, belonging or strictly connected to an industrial district. In the fourth one we point out in which cases the internationalization strategies of the machinery industry firm can lead to the declusterisation. In the fifth we examine the Italian textile and machinery industry case. In the last one, we to draw a number of conclusions from the evidences we have found using a feedback point of view.

1. Definition of industrial district

The industrial district (or cluster) is a localized and complex network of firms bound together in a social division of labor (Scott, 1992). Unlike the internal division of labor, which occurs when related activities required to produce a final demand (or indeed some intermediate product) are entirely controlled within the firm, a social division of labor occurs when related activities required to produce a final demand occur among a population of small and medium-sized firms performing highly specialized functions (Hayter, 1997). Therefore the industrial district’ main features are:

a) Geographic concentrations of activities;
b) Populations of small and medium-sized firms which are linked together by strong and frequent relationship;
c) Informal communication channels

The firms of a district can be linked in three ways (Bellandi, 1982):

a) Vertically, when different stages of a process are involved, as in the case of spinning or weaving or where assembly lines are fed by different sub-processes;
b) Laterally, where the same stage in a like process is involved, as in the case of men’s clothing and women’s clothing;

c) Diagonally, when service processes are involved, such as repairing, trading, collecting, etc.

In an industrial district these links, which envelopes both inter-firm and interpersonal relationships, are deeply rooted in the local context and are influenced by the historical and cultural background (Becattini, 1979).

2. Application of the RBV to the industrial district

We apply the Resource-Based View approach, that views the firm as a bundle of resources and capabilities and examine conditions that contribute to the realization of sustainable economic rents, to the study of industrial district.

Considering the strategies of the firm embedded in an industrial district we assume that:

Assumption 1: in an industrial district the resources and capabilities vital for firms to succeed in domestic and international competition can be found inside the district rather than within any single firm.

Assumption 2: the primary unit of analysis cannot be the industry nor the firm but the district.

The district can be seen as a unique combination of tangible and intangible resources and capabilities that accumulate slowly and are developed over time (i.e. they are history dependent variables) through complex interactions among the district embedded firms. The resources of the district are represented by the sum of the resources, defined as stocks of externally available and transferable factors that are owned or controlled by the firm (Amit, Schoemaker 19xx), of the different firms belonging to the district. The capabilities of the district are knowledge-based inter-firms processes regarding the setting and the tuning of the exchange connections of resources between the different firms of the district that make possible the conversion of the resources into final products or services. The industrial district is a substitute for both vertical integration and diversification. This substitution requires a dynamic coordination mechanism between the different firms of the district in order to make possible the exchange of knowledge[1].

[1] Knowledge can be divided in two categories (Kogut and Zander, 1992): information and know-how. Information is the knowledge which can be transmitted without loss of integrity once the syntactical

Therefore trust and cooperation are the most important features which help bind industrial districts together, including among firms who are rivals for particular product markets. Spatial agglomeration is at the ground of the coordination mechanism: cooperation involving joint learning, technology transfer and the development of new business requires face-to-face contacts and levels of trust that are facilitated by geographic proximity.

Applying the RBV approach to the industrial district we can affirm that the necessary bundle of resources and capabilities to the manufacturing and the development of competitive final products are, thus, internal to a district but external to any single firm. We can define this continuous exchange and creation of knowledge within the partner as relational capital (Kale, Singh & Perlmutter, 2000), which is based on the strict relationship among district members. The competitive advantage of an industrial district derives from the ownership of valuable resources. The value of the resources is a function of time and space. From a time perspective the resources' value depends on a) depreciation or b) substitutability by a different existing resource or by a new resource (innovation). From a space perspective the resources' value depends on repeatability by a) imitation, or by b) transfer. An industrial district will falter if its resources reduce their value because they loose uniqueness, are substituted or are imitated.

3. Internationalization

The internationalization of the machinery industry firms, belonging or strictly connected to an industrial district by a vertical link, could lead to a loss of district's resources and capabilities to other countries.

According to our analysis the capabilities of the district are part of the resources and capabilities of each single firm belonging to the industrial district. They are a sort of common set of practices and rules that make possible the coordination of the resources and capabilities of each firm with those of the other ones in order to produce or develop the final product or service. Once this dynamic coordination mechanism for the knowledge exchange is set we have to ask ourselves: where does the knowledge reside

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rules for deciphering it are known. Know-how is the accumulated practical skill. Knowledge as information implies knowing *what* something means. Know-how implies knowing *how* to do something.

in an industrial district? Is it shared among the different firms or is it diffused unevenly? And if so where is it concentrated?

The answers are different according the kind of industry we are looking at. Especially in customized product industries the vertical relation between upstream district firms (such as machinery industry firms) and the downstream district firms (the users of the machinery) make the first ones the recipient of the “core competence” and the skills about the final product developed by their clients.

For example, in the textile district there is a tight relation between textile firms and textile machinery firms. In order to produce or to develop a product the first ones must share their knowledge with the second ones in order to make them produce the machinery that fits their needs. The textile machinery firms have to know the kind of fabric their machines have to work with, the kind of texture and manufacturing. This imply the transfer of skills and know-how from the machinery user firms to the machinery producer firms.

This transfer can be observed in the mass production system as well as in the flexible specialization system (Piore and Sabel, 1984). The aim of mass production is to decompose every handwork task into simple steps, each of which could be performed faster and more accurately by a machine dedicated to that purpose than by a human hand. Mass production requires finely divided labor and specialized machines able to substitute the human skill. But, as Piore and Sabel pointed out, the special-purpose machinery required for mass production cannot itself be mass-produced. Because machinery is a specialty, with a limited market, production must be continually reorganized and workers must have the range of skills and general understanding of the process that are classically attributed to preindustrial artisans.

The machines export by machinery industry firms belonging to an industrial district is not only the export of a product but more and more the transfer of capabilities that have been developed inside the district itself to other countries. Especially in NICs, because the first stage of industrialization is characterized by growing imports of machinery in order to export the manufactured products.

The transfer of capabilities is unavoidable in the case of machines export because the machinery producers have to teach the clients how to use the machines they have sold to them. But, the more specialized the machines are the more the machinery producers have to transfer the skills about the product their machines are able to manufacture. This is

also due to another factor: the increasing international competition between machinery industry firms. The results of this competition are that: 1) it is no longer possible to sell NICs older versions of the product, thus maintaining a gap between domestic clients and foreign ones; 2) the transfer of skills is an important instrument of differentiation among competitors and one of the most requested features from foreign clients.

Therefore the export of machinery implies the transfer of knowledge and the decrease of the value of the district's resources and competencies.

We are not saying that the domestic firms and the foreign ones will have the same R&C. We are saying that, as a result of the transfer, they have the same competence in the manufacturing of the product. Both are able to manufacture the same product. But the transfer does not comprehend the R&C to bring the product to the market. These are R&C that the machinery industry firms do not have. Our analysis is focused only in the R&C in the manufacturing of a product. Even if the domestic and the foreign firms still do not have the same R&C in design or marketing they have the same R&C in manufacturing. With a difference: probably the foreign ones, when located in low labor cost countries, have a cost advantage. In some cases this advantage can fill up the other gap.

4. Declusterisation

If there is no cooperation between the machinery industry firms ("upstream firms") and the district user firms ("downstream firms") the internationalization strategy of the former can lead to the declusterisation (diminished competitive advantage, gradual impoverishment of resources and capabilities, exit of some firms) with negative effects upon the whole district. If the export strategy of the machinery industry leads to a transfer of resources and capabilities to the foreign user firms and these ones can thus reduce the competitive advantage (especially in NICs where they can improve the quality of their products while maintaining low labor prices) of the domestic firms, there could be two effects upon the district: a) first the weakening or the disappearance of the downstream firms; and later b) the weakening or the disappearance of the district machinery industry itself. The first is caused by the competition from foreign firms. The second is caused by the weakening of the downstream firms. In an industrial district the rate of innovation depends upon the knowledge exchange and the links between firms.

Marshall emphasized the importance of such knowledge exchanges to the diffusion of ideas and innovations. In the *Theory of Foreign Trade*, in the *Economics of Industry*, and in *Principles of Economics*, Marshall has a metaphor which suggests the term 'industrial atmosphere' introduced in his later *Industry and Trade*. In an industrial district, where a mass of skilled workers is concentrated, the mysteries of the industry 'become no mysteries; but are as it were in the air, and children learn many of them unconsciously' (Ballandi, 1992). Therefore it is difficult to substitute a disappeared "node" in the network with a distant one. According to Marshall's characterization of industrial districts, the exchange of information is facilitated by geographic proximity: the geographic concentration of activity facilitates person-to-person contact through informal as well as formal channels and thereby the flow of information on all kinds of matters related to the industry. And this is true particularly when technology is involved and when it is not easily codified. Infact, when technology is specific, complex, tacit and cumulative in its development, it is impossible or really hard to operate a transfer through patents, blue prints and operating manuals and for this reason it requires geographical proximity and face-to-face contact in order to maximize the knowledge transfer (Pavitt, 1987). We could also take into consideration the interpretation of the functioning mechanism of the clusters proposed by Porter (1990). His framework (the diamond) has four components: factor conditions, firm strategy, structure and rivalry, demand conditions and related or supporting industries. These four elements (all of them are present in the cluster) contributes to the creation of the competitive advantage of a nation and operate in such a way that a weakness in one of the four elements can be compensated by the outstanding characteristics of the others. Since the globalization of world economies has lead to a leveling of the characteristics of the demand and of the availability of factor conditions, the importance of the other two elements of the diamond in the creation of the competitiveness has grown. This means that any event which tend to weaken either the downstream or the upstream operators can pose a serious prejudice over the future competitiveness of all the actors and the whole cluster itself. Differently from Piore and Sabel, Porter does not apply his reasoning to small enterprises and for this reason underlines the importance of economies of scale in the enhancement of the competitiveness of the companies and the dimension can be seen as a critical factor for the companies.

The progressive depauperation of the cluster prevent the cluster to maintain the critical mass which can be described as the concentration of resources both human and technological (Temple, 1998). The same problem could be seen also considering the cluster as a network of relations (Powell, 1990) whose "glue" is represented by the existence of trust and on the ability to diffuse and create knowledge and to react fast. When one of this element disappears, one of the basic reasons which keep the cluster together ends and for this reason the whole cluster loose its competitiveness.

Exhibit 1 shows the simulation model designed around the previous paragraph analysis. Observing the model it is possible to note the existence of two fundamental engine favoring cluster consolidation and innovation. The first is fundamental cluster engine, which explains cluster's origin and development; the second is cluster innovation and relation consolidation engine, which describe innovation following a Marshallian approach and contributes to the accumulation of the so called relational capital.

5. The Italian textile and machinery industry case

With the term machinery industry we refer to all machineries and all plants employed in the transformation (production and packaging) of raw materials and intermediate goods by downstream companies. Since it is a business to business industry the connection with the downstream industries are so critical for both the upstream and the downstream companies. This means that the critical competencies of this operators are strictly connected to those of the downstream operators and their interaction is the key of the competitive advantage of these companies.

The cluster of mechanical industry is constituted by three major areas, the supplying of raw materials, the productive process and the market associated with three types of subjects: supplier, production companies and customers and/or final users. While the first two represent the direct and derived supply (costs), the last represent the demand (sales and revenues).

The supplier do not provide only raw materials but also components and complex parts of a machinery; they can be highly specialized either in the electronic or in the mechanical productions and very often they are subcontractors and long term cooperators of the machinery producers.

The producers focus on the design and project of the machinery, on the assembly of the different parts produced by the supplier, on the test of the functioning of the machines and of the delivery of the product. The most critical activities, on which the producers can build their competitive advantage, are certainly the first and the last. Infact, the design and the delivery or the machinery are the phases in which the interaction with the final users is greater.

The project of the machinery is the heart of the activity of business to business operators and this activity can be regard either the product itself or the production process and certainly is the first one where the interaction with the final producer is greater. It is in this phase that it is possible to define those characteristics of the machinery which can enhance the quality and the characteristics of the final product and the efficiency and productivity of the production process.

The delivery of the product is the other crucial part of the production process of a machinery; because it is the phase in which the machinery producers trains the final customer; it is in this phase that many additional information are provided both by and to the final customer regarding the correct use of the machinery and the final product. The time dedicated to this phase can be really variable depending on the market served and on the level of technology required by the customer. It is during this phase that it is possible to work on some minor or major modifications to the product.

The Italian companies are particular able in performing this activity if compared to the major competitors especially because they invest intensively on the geographic proximity with their customers which can allow a bilateral exchange of knowledge. This type of relationship between the machinery producer and the final user continues over time with the maintenance which must be fast and effective in order to reduce the stop times and, consequently the economic damage to the downward producer. Also in this case the geographic proximity is quite relevant and central in the building of the competitive advantage.

The textile machinery industry

The two major export markets of the Italian textile machinery industry are Europe (45%) and Asia (33%) even if this market has been subjected to a slight decrease during 1996 (-5%) (Table 1).

Table 1 - Final destination of exports in the Italian textile machinery industry

	1990	1991	1992	1993	1994	1995	1996
EU	686.409	565.409	606.668	589.380	678.139	871.933	879.852
Western Eur	227.586	153.242	203.948	325.951	205.576	520.484	775.370
Eastern Eur	290.783	221.079	126.136	169.389	196.984	185.273	187.785
Africa	135.049	120.829	131.659	112.707	123.468	157.742	159.806
Asia and Oc.	575.223	666.491	860.350	1.328.074	1.283.819	1.412.365	1.339.460
N. America	291.138	256.193	314.159	404.313	449.790	367.747	502.690
S. America	154.690	164.575	211.931	219.981	269.309	288.250	259.724
Total	2.360.878	2.147.818	2.454.851	3.149.795	3.207.085	3.803.794	4.104.687

Source: ACIMIT

The tile machinery industry

As far as the tile machinery industry is concerned, the positive trend of exports has been continuing for a long time (Table 2), with a substantial growth of the relevance of the Asian markets which represent around 50% of the entire market.

Table 2 - The geographic destination of the Italian tile machinery exports

Areas	Absolute values 1995 *	Values % 1995	Values % 1996	Variations. % on 1994
European Union	581.666	27,3	20,5	+64,4
East Europe	115.055	5,4	5,4	-0,4
North America	68.181	3,2	3,9	-34,4
South America	147.014	6,9	6,4	-32,5
Middle East	227.979	10,7	8,4	+62,0
East Asia [1]	345.164	16,2	22,0	-46,5
Other Asia [2]	504.963	23,7	27,9	+45,9
Africa	129.969	6,1	5,0	+17,7
Oceania	10.653	0,5	0,5	-0,2
Total	2.130.644	100,0	100,0	+4,2

* Million liras

1 Popular Republic of China, Taiwan e Hong Kong

2 India, Singapore, Japan, Korea, Philippines, Indonesia, Malaysia, Thailand, Cambodia, Vietnam, Laos, Mianmar, Brunei, Pakistan, Bangladesh, Afghanistan, Mongolia, Nepal, Sri Lanka, Mauritius.

Source: ACIMAC

Even if tile machineries are not employed exclusively in tile production (but also in the production of bricks, sanitary fixtures, dishes and refractory material), all over the world, tile producers are the principal customers of tile machinery producers and this tendency seems to be even more evident if we consider emerging countries, as the South-east

Asian countries (Table 3 and 4). On the other side it is in Europe that the demand is the most articulated and various.

Table 3 - Contribution of every single client industry to the export in the various geographic areas (1995), Values in percentages

Areas	Tiles	Bricks	Sanitary fixtures	Dishes	Refractiry bricks	Various ceramics	Total
European Union	76,33	17,19	4,13	1,72	0,52	0,11	100,00
East Europe	84,31	12,01	0,35	2,46	0,87	-	100,00
North America	88,00	8,48	2,93	-	0,59	-	100,00
South America	82,31	10,21	5,44	0,68	0,68	0,68	100,00
Middle East	92,11	5,70	1,32	0,47	-	0,39	100,00
East Asia [1]	96,06	2,90	0,72	-	-	0,32	100,00
Other Asia [2]	91,83	7,69	0,17	-	0,20	0,12	100,00
Africa	85,40	10,00	3,08	-	1,51	-	100,00
Oceania	84,50	14,06	-	-	1,44	-	100,00
Total	86,70	9,90	2,10	0,70	0,40	0,20	100,00

1 Popolar Republic of China, Taiwan e Hong Kong

2 India, Singapore, Japan, Korea, Philippines, Indonesia, Malaysia, Thailand, Cambodia, Vietnam, Laos, Mianmar, Brunei, Pakistan, Bangladesh, Afghanistan, Mongolia, Nepal, Sri Lanka, Mauritius.

Source: ACIMAC

Table 4 - Geographic distribution of exports and their contribution to the sales for each single category of customers (1995), Values in percentages

Areas	Tiles	Bricks	Sanitary fixtures	Dishes	Refractiry bricks	Various ceramics	Total
European Union	24,04	47,41	53,64	67,05	35,20	15,63	27,30
East Europe	5,25	6,55	0,89	19,01	11,73	-	5,40
North America	3,25	2,74	4,47	-	4,69	-	3,20
South America	6,55	7,12	17,88	6,71	11,73	23,47	6,90
Middle East	11,37	6,16	6,70	7,23	-	21,12	10,70
East Asia [1]	17,95	4,74	5,59	-	-	25,63	16,20
Other Asia [2]	25,10	18,40	1,88	-	11,73	14,15	23,70
Africa	6,01	6,16	8,94	-	23,10	-	6,10
Oceania	0,49	0,71	-	-	1,80	-	0,50
Total	100,00	100,00	100,00	100,00	100,00	100,00	100,00

1 Repubblica Popolare Cinese, Taiwan e Hong Kong

2 India, Singapore, Japan, Korea, Philippines, Indonesia, Malaysia, Thailand, Cambodia, Vietnam, Laos, Mianmar, Brunei, Pakistan, Bangladesh, Afghanistan, Mongolia, Nepal, Sri Lanka, Mauritius.

Source: ACIMAC

The continuous growth of the export to foreign countries have contributed to the progressive spreading of the Italian technology all over the world. Someone could argue that the internationalization of the machinery producers is not at all a recent or new phenomenon because the internationalization of the industry started in the sixties. And this is true but what is, according to us, the phenomenon which has caused a deep

changing in the functioning mechanisms of the cluster is the geographic destination of export. In fact, when Europe was still the only area of destination of the Italian exports, the proximity of the customers allowed the machinery producer to offer to the foreign customers a high standard of service without dedicating specific resource to foreign markets. As and example we could mention the fact that, in case of breakdown of a machinery sold to a European customer, it is almost always easy to intervene fast and effectively without being constantly present in the foreign countries: with a plane you can reach almost every European destination in about two hours. The more distant the customers the greatest the resources which will have to be dedicated exclusively to those markets. In this sense we could talk about a diversion of resources from the home countries' cluster to foreign countries. And this produces a double effect: on one side the weakening of the home-country downstream producers and on the other side the reinforcing of the competitiveness of the foreign producers.

The following tables (Tables 5 and 6) show the beginning of the phenomenon of reduction of the relevance of the district on the total value of industry export. The differences can be explained by the various exposure to the emerging countries which can challenge the production of the Italian producers.

Table 5 shows the relevance of each district on the Italian export; first of all in many cases the percentage has increased and has not decreased as we expected.

Table 5 – The relevance of the districts on the total value of the industry export

	Systems	Provinces	% 1986 (a)	% 1995 (a)	Italy 1995 (b)
Yarns	6	8	72,7	71,5	4111
Textiles	7	10	77	84,5	11696
Apparel	10	15	73,5	79,8	10456
Clothing	15	23	68,1	83,1	12924
Tools machinery	6	12	71,1	70,1	6627
Textile machinery	7	10	84,1	81,4	3609
Ceramics	3	5	65,9	78,8	6387
Porcelain	3	3	41	42,3	1346
Total	57	86			

(a) Relevance of the export of the district on the total Italian exports
(b) Italian industry export
Source: ICE, 1997

Table 6 – The exports of the main districts

Rank 95	Provinces	Industry	Export 95	Rank 86	Export 86	95/86 (Italia = 100) (a)
1	MO-RE-BO	Ceramics	4672	8	1202	182
2	MI-VA	Apparel-clothing	3978	4	1364	121
3	TV-VI	Apparel-clothing	3502	6	1253	113
4	CO	Textile-apparel-clothing	3256	9	1187	109
5	FI	Textile	3142	2	1542	65
9	MO-RE-BO	Apparel-clothing	2568	5	1294	62
11	FI	Apparel-clothing	2042	3	1532	21
12	MI-VA	Textile	1973	13	700	114
14	MI-VA-CO	Tool machinery	1885	15	633	125
26	BG-BS	Textile machinery	1057	30	356	124
29	VC	Wool textile	985	44	199	248
30	VC-NO	Yarn	978	26	442	76
32	MI-BG	Yarn	884	16	629	26
33	MI-VA-CO	Textile machinery	869	28	385	79
34	TO-NO	Clothing	798	34	290	110
35	FO-PS-AN	Clothing	789	45	199	186
37	VI-TV	Tool machinery	730	35	276	103
39	BG-BS	Apparel	703	29	372	56
40	MN	Sinthetic apparel	665	49	177	174
41	PS-FO	Tool machinery	664	47	183	165
42	TO-CN	Tessuti	648	48	179	165
46	MO-BO	Tool machinery	556	41	223	94
47	BG	Textiles	523	46	191	109
49	PD-VE	Clothing	508	59	149	152
50	VR-VI	Textiles	507	55	158	139

(a) Numeri indici: variazione % 1986-1995 dell'Italia = 100

Source: ICE, 1997

6. Conclusions: a feedback interpretation of cluster dissolution

Internationalization must be led by the downstream firms hauling the upstream ones. If the upstream firms start a strong internationalization process they put great pressure upon the downstream ones who must increase their competitive advantage and face the external competition fostered by their suppliers. This could be a risky strategy because if the downstream firms do not maintain such competitive advantage there will be a loss of resources that will weaken the whole district and also the upstream firms.

In feedback terms, clusters emerge fuelled by feedback oops (1) and (2) in exhibit 1.

In positive feedback (1), demand for machinery stimulates aggregation of machinery producers. In turn, the location, in the area, of a number of producers creates a suitable environment for machinery users to settle down. Feedback (1), generates self-reinforcing dynamics where firms have increasing incentives to locate their operations in a specific geographic area [Arthur 1998 and 1990].

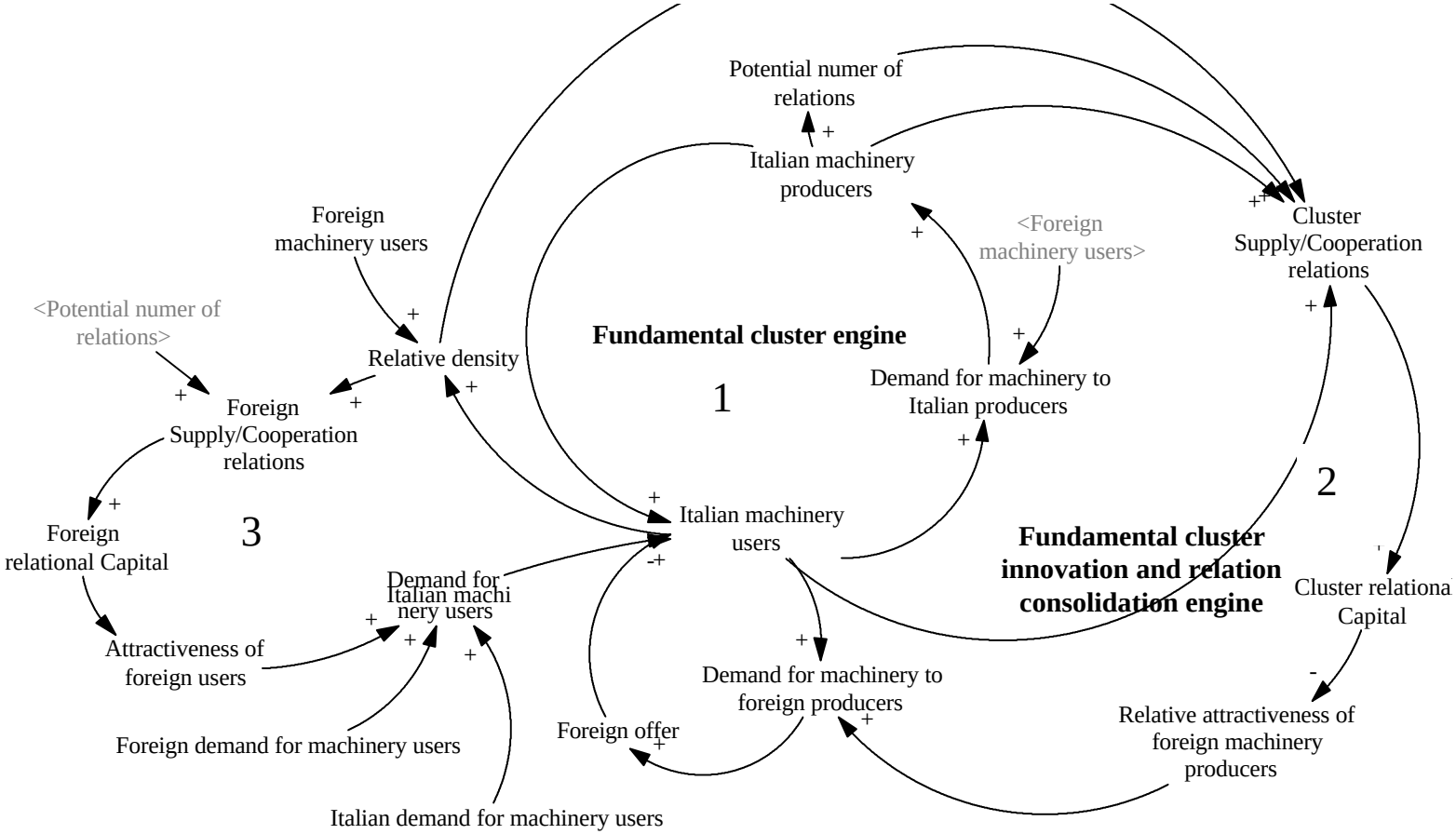
In addition, as the cluster is built up, the density of overlapping supply/cooperation relations contributes to accumulate *relational capital*. Relational capital crystallizes competencies and knowledge which are accumulated at cluster-level rather than at the level of single firms. Relation capital is the base of a cluster's competitive advantage. In feedback (2), formation of relation capital weakens competitiveness of foreign machinery producers thereby increasingly reinforcing relationships among firms within a cluster.

Yet, as Italian machinery producers, pressed by demand saturation, start exporting to low-labor-cost countries, machinery users in this latter countries increase their competitiveness: they can now couple low-labor costs and the expertise, this latter generated by new relations Italian machinery producers.

As a result, in feedback (3), Italian machinery users gradually are excluded from the market thereby creating incentives for Italian machinery producers to shift relationships from indigenous to foreign machinery users.

Gradually, relational capital in eroded and new relational capital is accumulated abroad, as a consequence of a new web of relationships which embeds Italian machinery produces and foreign machinery users.

Exhibit 1 – Simulation model of declusterization process



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