

## A THEORETICAL AND POLICY APPROACH OF CLUSTERS, AS SUPPORTING INNOVATION AND DEVELOPMENT

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(Received August 2014; accepted November 2014)

### **Abstract**

The concept of Clusters seems to belong to the present whereas actually it is an old economic concept. Even classics (e.g. David Ricardo) or old neoclassic (e.g. Alfred Marshall) have still significant references for the today, whereas present produced enough favorable environment for. This paper will develop some of all references about, economic thinking, description and policy issues to be noted on. Moreover, the new need of clusters consists in the scenery that the economy exposes and preserves today. Risks, disadvantages and all that shadow such new current character and actor' are not only inherent, but keep their place in context. The specific cluster policy, in its turn, explicitly identifies what the national level's interests and the barriers of achieving those goals are and how cluster approach can help overcome these problems. It equally weights the relative merits of active intervention from the national level, versus framework conditions and facilitation, vis-à-vis theories and models.

**Key words:** cluster, economics, economic policy, development, innovation

**J.E.L. codes:** A 10, B41, M29

### **1. Theoretical approach**

#### **1.1 Introduction and key points**

Let us first try a definition like the following one. Cluster is a *geographically closed group of interconnected companies and associated institutions in particular field, linked by common technologies and skills... within a geographic area (region, sometimes even town)... for ease of communication, logistics and personal* (Porter 2003). And this is among plenty of other definitions and reaching the largest comprehension. This concomitantly is inter-industrial interactions (Brusco 1982), i.e. the classical activity-shared among firms/ more or less competition based; systems of production (Storper 1997) i.e. external economies completing internal economies of scale; regional systems of innovation: knowledge, and not firm, under focus, plus its "knot and diffusion" (OECD 2007); networking: as enough compatible with the cluster idea, see "networks of production of strongly interdependent firms... in a value chain, with no necessary spatial localization" (Roelandt & den Hertog 1999).

Theoretical basics and origins of clusters ought to be looked in the marginalist perfect competition model of V.Pareto (Hardwick 1992) versus monopoly and oligopoly, as well as in the treaty of Alfred Marshall called *Principles of Economics* (1890), that first characterized clusters as a "concentration of specialized industries in particular localities" or "industrial districts", plus. The

‘first neoclassic’ that Alfred Marshall was equally mentioned greater firm’s productivity in the same industry when all firms are concomitantly located in the same proximity (closely to one-another). Even D. Ricardo might be here mentioned with an image of regional specialization in international economic context, given different natural endowments for different areas (Hardwick 1992).

As at present, incentives to investors from already developed infrastructure areas are pointed by Krugman & Venables (1990), as well as other basics, like impact of industrial organization on culture, urbanism and economic development (Cortrights 2006).

### 1.2 Typologies & classifications

From theory to practice, in Table 1<sup>i</sup> what might be characterized as ‘step 1’ of analysis is exposed.

**Table 1. Science-based versus traditional (clusters)**

Criterion for:	Science-based	Traditional
Age	Young industries, new concentrations	Mature industries, established concentration
Type of relationship / transaction	Market-based, temporary coalitions for R&D joint ventures	Long-term relationships, market-based local supply chains
Innovation activity	Technological innovation	Incremental innovation, technology absorption

And it might be completed by ‘step 2’ of analysis proposed by Enright (1998) with a longer list of classifying dimensions. These are: (i) geographical scope, with localized - tight grouping in small geographic area(s), versus dispersed clusters - spread across large region or city; (ii) density, with dense - heavy concentration / large number of firms in cluster – and sparse - small number of firms and low economic weight; (iii) breadth, with broad - a variety of products in different, but related industries, versus narrow - focused on one or a small number of products or industries; (iv) depth, with deep - region includes a range supply chain of activities – and shallow – in which cluster firms relay on external inputs; (v) activity base, with activity-rich - cluster firms are involved in a large set of activities, versus activity-poor - cluster firms are involved in just a limited range of activities (e.g. assembly activities); (vi) growth potential, with industry context: **‘sunrise’** industry, **‘noon-day’**, **‘sunset’**, versus **competitive** or **not** within the same industry; (vii) innovation capacity, see high innovation - cluster is able to work innovation out of its structure, versus low innovation - nature of cluster just inhibits innovation; (viii) industrial organization, with large firms, versus small firms, small firms only and other types; (ix) coordinating mechanism, with spot makers, short-

<sup>i</sup> EC & Enterprise Directorate-General (2002): *Regional Clusters in Europe: Observatory of European SMEs*. Nmb. 2/2002. European Commission. Brussels

term coalitions, long-term relationships and hierarchies; (x) development stage, with: working - critical mass of firms, knowledge and resources with dense interaction, latent - critical mass of firms, but interaction and information flows not sufficient, potential - some elements present, but a need to be deepened and broadened – and ‘wishful thinking’ - chosen for government support, but lack of critical mass of favorable conditions for organic development.

Thirdly, a *multi-criteria approach* for a very general classification (Gordon & McCann, 2000), results into three basic types of clusters: (i) **“pure agglomerations”**, in which links are exclusively as “co-locative”, not internal; (ii) **“industrial complexes”** - in which internal links are either demand-supply, or (large) firm domination types; (iii) concentrated on **“social networks”** – even more complex and long-term relationships among firms

The “Markussen” typology (Barkley & Henry 2001), votes for four types of clusters. First, the **“Marshallian”** type of clusters is all: locally owned, small and medium sizes, concentrated in craft-based, high technology, versus producers of service industries, and of substantial trade developed between firms. Firms in this cluster are directly helped by: institutions, labor markets and specialized services. Forthcoming problems to be solved are directly encountered by firms in the cluster and government policy works for improving competitiveness of the whole cluster.

The second type in that belongs to Markussen is called **“Hub and spoke”**. One or several big firms are surrounded and supplied by smaller firms, as for related activities. Small firms may buy from/sell to a big **“anchor”** firm, or take advantage of the last’s presence in multiple ways. Cooperation inside the cluster works as the one of “hub” type: between small (numerous) and big (hub type) firms, but cooperation is rather missing among competitors, as for presumptive actions like: risk spread, sharing innovations and/or markets stabilizing.

**“Satellite platforms”** come on the third place on “Markussen” and they are specific to industry (seen as branches) clusters basing on externally-based multi-plant firms, the way that plants are assumed to be large enough and independent, minimal trade or networking develops among plants and incidence of entrepreneurship and suppliers’ activities (spin-over activities) is assumed as relatively small size.

**“State-anchored industry”** type, as fourthly, is assumed as a region which’s business structure stays dominated by one public or non-profit entity (e.g. military base, university, government offices). Service sectors develop around this central activity ( local facility), whereas they remain individually unimportant for the cluster.

### 1.3 Benefits and risks for clusters. Globalization’s specific

Literature mentions *firm’s productivity* – there is to be noticed a more obvious behavior of clusters regarding what’s happening on (dimensions like): productivity, wages and employment (OECD 2007). Then, *regional specificity*, for which “...It is not the way the industry that matters, but the way the firm competes, its use of the advantages that the local environment brings” (Porter 1990; 1994). Or a basket of “un-traded interdependencies” – e.g. labor markets, regional conventions, norms

and values, public and semi-public institutions – might lead (at least) to fostering innovation (Storper & Venables 2004). And even *knowledge* created and mobility increased, together with personnel mobility and exchanges (OECD 2006) higher in the cluster environment, than in the rest of the economy.

Three groups of theoretical **benefits** of clusters are drawn by Lublinski, A. (2003)<sup>i</sup>. The one is called *Marshallian externalities* due to its identifying issues like labor market pooling, increasing specialization, so accessing higher order services, knowledge spillovers and so on. Labor market pooling consists in labor cost savings due to access to specialized skills, especially in an environment where quick turnaround is important. Another aspect consists in the greater variety of specialized intermediate goods and services – this is about access to local supplier bases that have more product variety and a high degree of specialization. Lastly, (tacit) knowledge spillovers is the access to tacit knowledge in the proximity by means of both formal processes as well as through such information channels as knowledge leakages made possible by casual inter-firm interactions.

The *Porter's market conditions* form the second group of benefits that regards, first, demanding customers, namely motivation effects due to demand of highly competitive local customers that improves quality, costs etc. Secondly, rivalry means motivation effects related to social / peer pressure. Then, complementarities consist in better sales opportunities of firms due to search cost savings for the buyers of complementary products offered in proximity and privileged opportunities for cooperation (e.g. sales, marketing) between nearby suppliers of complementary products. Finally, *cost advantages* focus on transportation and trust. The previous points on transportation cost savings due to geographic proximity, especially in the case of just in time delivery contracts. The latter does the same on transaction cost savings due to an environment that encourages trust.

**Risks** of clusters, on the other hand, group into four. They so are:

- **strategy**-related: (the other face of the coin) too much advantage on the growth and related side could lead to generalizing this practice against availability and/or costs of founding clusters and/or jeopardizing other (non-clustered) activities;
- **structure**-related: vulnerability of small firms, in recession, crisis environment etc. might generalize within a whole cluster structure;
- “hub and spoke”, platform and state industry types clusters stay **dependent on the “anchor” activities’ evolving** (OECD 2007);
- **too “inward looking”** cluster’s spirit makes it less adaptive to potential changes as either structural or strategic, the way that potential investments stay rather confused (Anderson and al. 2004) – nevertheless, this might also remain a point of debate, given the cluster’s strengths for competitiveness and external rivalry on innovation (OECD 2007).

Besides the above, the challenge is that clustering means “localizing”, as apparently opposite to **“globalizing”**. Nevertheless, “...whether globalization-

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<sup>i</sup> *Does Geographic Proximity Matter ? Evidence from Clustered and Non-clustered Aeronautic Firms in Germany*. Regional Studies, vol. 37, pp. 453-467

*localization nexus provides opportunities or threats seems to depend on where one sits. Those who study innovative high technology clusters, industrial districts that have succeeded in international competition and dynamic metropolitan clusters tend to focus on the advantages of localization and the opportunities of globalization. Those who study regions that have declined, have lost branch plants, and have difficulties in regenerating their economies focus on the loss of local industries...” (Enright 1998).*

## **2. Policy approach**

### **2.1 Theory and policy**

Policy **motivation** bases on (strong) evidence that: many industries remain concentrated in regions, firms within clusters out-perform similar firms outside clustering, the “new-economy” large firms might tend to clustering together, clusters become pools of: skilled labor, specialized suppliers and their networks, high competitiveness and external rivalry against other regions and competitors. Besides these, there are needs for restructuring industries and activities, especially in periphery areas, for partnerships, as for their advantages, that clusters favorably respond to and last, but not least the employment problem. There is also easiness on the public sector and policies side to act on and/or cooperate with. And clusters prove equally appropriated to issues like: regional policies, science and technology (R&D sectors) implementing. **Controversy** stands since *clusters emerge even in the absence of policies* – authors though argue that this cannot quite de-motivate policies for clustering, meaning both supporting existing and encouraging new clusters creating. **Risks** are not to be omitted, as well. This aspect is about limitations on industrial sectors and flexibility degree (changing objectives) that impede on long term investment programs, as about public sector’s policy measures, as directly available to firms and other actors.

### **2.2 Initiation of clusters**

Table 2 relates by itself on the clusters pooled about their objectives, aims and targets.

There are so far two programs initiation **methodologies** to talk about. The one is called **statistical** (“top-down”) – initiated by the public policy subject, as the result of available data and it is when the goal is reaching support for economic growth-development drivers and national strategies limit to general lines. The other is **self-selection** (“bottom-up”) – e.g. calls for proposals: when national strategy/programs are missing and/or just in way to be built.. Effective **procedures** are statistical, negotiation as well as some mixtures of the two. Three groups of **instruments** act in this respect (OECD 2007, pp. 92):

- **Engagement of factors** regards role of facilitators, level and type of interaction, formal cluster’s initiative(s) and/or other cluster’s considerations. Clusters are identified, namely conducting mapping studies (quantitative and qualitative) and using facilitators and other brokers to identify firms that could work together. Effective clusters or their networks are supported, namely awareness raising events

(conferences; cluster education) are hosted, financial incentives for firm networking organization are offered and firm networking activities sponsored. Performance is benchmarked and cluster relationships mapped.

**Table 2. Cluster's initiative-objectives, as classified from (A) common (up) to (B) rare (down)**

Common (A)	Initiative-objectives	Rare (B)
1	Foster networks among people	28
2	Promote expansion of existing firms	27
3	Establish networks among firms	26
4	Facilitate higher innovativeness	25
5	Promote innovation and new technologies	24
6	Attract new firms and talent to regions	23
7	Create brand for region	22
8	Promote exports from clusters	21
9	Provide business assistance	20
10	Assemble market intelligence	19
11	Analyze technical trends	18
12	Improve firms' cluster awareness	17
13	Promote formation of spin-offs	16
14	Provide technical training	15
15	Provide management training	14
16	Diffuse technology within cluster	13
17	Enhance production processes	12
18	Lobby government for infrastructure	11
19	Improve FDI incentives	10
20	Improve regulatory policy	9
21	Provide incubator services	8
22	Lobby for subsidies	7
23	Study and analyze the cluster	6
24	Co-ordinate purchasing	5
25	Conduct private infrastructure projects	4
26	Establish technical standards	3
27	Produce reports about the cluster	2
28	Reduce competition in cluster	1

**Sources:** (1) *Global Cluster Initiative Survey* (GCIS); Sölvell et al.(2003)

- **Collective services<sup>i</sup>** do improve capacity, scale and skills of suppliers (mainly SME<sup>ii</sup>s). These will be: (i) SME business development support, through brokering services and platforms between suppliers and purchasers, compiling general market intelligence, purchasing coordinating and technical standards establishing; (ii)

<sup>i</sup> E.g. business advice, skill development, joint marketing, but not to substitute private initiatives.

<sup>ii</sup> Small and medium size enterprises.

increasing external linkages (FDI and exports) through labels and marketing of clusters and regions, assistance to inward investors of the cluster, market information for international purposes, partner searches, supply chain linkage support and export networks; (iii) skilled and labor force in strategic industries, through collect and disseminate labor market information, specialized vocational and university training, support partnerships between groups of firms and educational institutions and educational opportunities to attract promising students to the region.

- **Large-scale collaborative R&D:** collaboration extension among several universities and R&D centers and between these and productive companies here considering R&D funding by productive and profit-producing activities. These will be: (i) increased links between research and firms that needs: support for joint projects among firms, universities and research institutions, to co-locate different actors to facilitate interaction (i.e. science parks, incubators), university outreach programs and technical observatories; (ii) commercialization of research, through ensuring appropriate intellectual property framework laws, overcoming barriers to public sector incentives in commercialization and technology transfer support services; (iii) access to finance for spin-offs, through advisory services for non-ordinary financial operations, public guarantee programs and venture capital and framework conditions for private venture capital.

Let us conclude this paragraph by **formalization and forms** of clusters. These forms usually are: non-profit association, university or similarly nominated agents and public agencies (OECD 2007, pp. 94).

### 2.3 Common features, quantifying, evaluation, selection mechanisms and government

**Common features** for clusters are: **lagging region(s)** – as targeted by clustering programs, after originating from regional policies --, **smaller firms** – due to usually limited regional policy resources --, broad **innovation and sector** approach – almost compulsorily involved in clustering – and **regional** dimension – sometimes programs basically miss such dimension and reach it in the events developing.

**Quantifying** clusters implies two approaches, according to the literature (Sölvell et al. 2003). The first one is *comparing cluster regions with national averages on identified, chosen and convenient criteria* and results into assessing (at least): a sector's under- or over-representation at the national scale and performance levels between regional and individual firms' economic activities. The specific **drawback** of this is depending on the industry classification, meaning more adapted to traditional and less to new and dynamic industries (e.g. biochemistry).

The second approach is targeting *productive linkages between firms* within a specific **sector** of different sectors within the **same region**. The specific **drawback** would be that this is a more difficult task and priory needs intimate knowledge about value-chains.

**Evaluation** is viewed as individual and web-based, see *Cluster Initiative Performance Model* (CIPM/Sölvell et al. 2003), for three groups of performance drivers that are: social, political and economic **setting**, initiative **objectives and development process**, like in Table 3 and for corresponding **performing** results.

**Table 3 Cluster competitiveness report, as cluster's evaluation**

<b>setting</b>	<b>objectives</b>	<b>process</b>	<b>performance</b>
Business environment	Research and networking	Initiation and planning	Competitiveness
Policy	Policy action	Governance and financing	Growth
Cluster strength	Commercial cooperation	Scope of membership	Goal fulfillment
	Education and training	Resources and facilitators	
	Innovation and technology	Framework and consensus	
	Cluster expansion	Momentum	

**Source:** (Sölvell et al. 2003); OECD (2007), pp. 128

**Selection mechanisms** - "matching goals with targets" of the programme – criteria classify into: (i) competitive (open competition based, see calls for proposals) and non-competitive (designating recipients) and (ii) "top-down", versus "bottom-up" (Table 4). To be here noticed that different selection mechanisms entail different levels of transaction costs to be compared to specific benefits.

**Table 4 Basic selection mechanisms for clustering**

<b>mechanism</b>	<b>rationale</b>
Competitive	When best participants not clear upfront Gauge motivation of participants Value of labeling effect Longer term spillovers for groups not selected
Limited number	Clear prioritization of resources Value of labeling effect
Top-down	Clear targets (as strategic, quantitatively identifiable) Coherence with other programmes
Bottom-up	When best participants not clear upfront Information best obtained by self-identification Gauge motivation of participants
Combination	Best choice in a pre-defined universe Lower level of government best placed to select Collaboration across levels of government required Special additional considerations in cluster selection

**Source:** OECD (2007), pp. 82

And let us conclude one more paragraph with other preliminary conclusions to be drawn. In theory, there are specific evaluation methods for clusters' activity, but not enough robust, as appropriate – e.g. assessing performance of (i) a cluster's initiative; (ii) a policy implemented etc.

Then, cluster-type programmes stay vague, general, even unclear (e.g. increasing competitiveness, economic growth, productivity, employment), as compared to the activity developed, so evaluation might suffer, but equally other dimensions and



characteristics (e.g. resource engaged, so financing dimension etc.). The same evaluation suffers as much as clusters evolve in different economic-business cycle periods.

As for **government involvement**, there are both (a) policy coordination (i.e. specific for the cluster with other policies in way and action) and (b) hierarchical coordination on acting, all of them as related to reliable resources/ political risks:

(i) The private sector’s involvement, as a very unknown – e.g., its presumable highest capacity of reacting to market changes, during the program; its interest of continuing activity and performing when program ends

(ii) The public sector’s ability to “pick winners” in the interest of program performing

(iii) Locking technologies inside a cluster, i.e. making them unavailable to others

#### 2.4 Policy (policies) on/of clusters

Just let us approach this paragraph from several points of view: government, areas and types of policies and finally the EU involvement.

**2.4.1 Government & policy level(s)** involved philosophy is that despite limited space development of clusters, all authority level might be here involved (e.g. macro-national, federal, sub-national, regional, local, EU...). Inter-ministry and inter-agency committees are here supposed to work as actively (Table 5).

**Table 5 Cluster intervention policy level considerations**

<b>Rationale for level of program responsibility</b>	<b>Government level involved</b>
Spatial dimension of regional innovation actors	Supra-national
Natural spillovers and their spatial implications	National
Institutional framework	Federal
Financial resources (availability, redistribution issues)	Regionalized unitary
Knowledge of actors and their relationships	Decentralized unitary
Technical capacity	Centralized unitary

Source: (OECD 2007, pp. 111)

**2.4.2 Areas and types of policy** are two, namely **science, technology (S&T) and innovation** on the one hand; **industry and enterprise** area on the other. Both are pushed by multiple changing orientation and the previous one makes it work: from purely scientific goals and criteria to innovation and strategic-structural criteria; from individual R&D projects, managed by also individual institutions, to joint projects and research themes; stronger marketing of linked competencies across actors involved (business, research, governance) (OECD 1999a, 2001).

**Industrial and enterprise** policy is conceived on sustaining groups, not firms. Its changing orientation in its own way: small firms and infant industries used to be sustained – mutation on regards country real resources, as such; taking into account links among: firm, industry and S&T.

### 2.4.3 EU specific policies

There isn't about a specific pattern in such an area, so these policies (examples in Table 6) classify into:

(i) **regional** policy: assisting economic & social development of the EU's less favored regions – see the concrete example of working with (through): structural funds, Rural Development Funds and PHARE.

(ii) **enterprise and industry** policy – that help create an environment in which firms can thrive and meet objectives of the Lisbon Agenda

(iii) **R&D** – regional research-driven clusters, through “Regions of knowledge” pilot actions ([http://cordis.europa.eu/era.regions\\_knowreg2.htm](http://cordis.europa.eu/era.regions_knowreg2.htm)).

**Table 6. Some selected EU programs supporting clusters and regional specialization**

activity	objectives	Started in*
Euro info centers	To serve as a network and provide advice, information and assistance <a href="http://ec.europa.eu/enterprise/networks/eic/eic.html">http://ec.europa.eu/enterprise/networks/eic/eic.html</a>	1987
Innovation Relay Centers (IRC)	To support innovation and transnational technological cooperation throughout Europe with a range of specialized business support services, mainly between small and medium size companies (SME) <a href="http://www.innovating-regions.org">www.innovating-regions.org</a>	1995
PAXIS (Pilot action on the mechanisms to set up and develop innovative firms)	To boost the transfer of local and regional excellence in innovation and to have an instrument for the cooperation and the exchange of tacit knowledge and learning among local innovation stakeholders, profiting from the each-other's experience. <a href="http://cordis.europa.eu/paxis/">http://cordis.europa.eu/paxis/</a>	1999**
IRE working group on clusters	This programme helped regional authorities in developing innovation strategies, in which clusters played significant roles and a working group was set up for this specific (cluster) policy <a href="http://www.innovating-regions.org/network/whoswho/">www.innovating-regions.org/network/whoswho/</a>	2004
Thematic network ACENET (accelerating the establishment of clusters)	This network brings together regional organizations interested in developing processes and methodologies to set up and manage clusters and company networks <a href="http://www.innovating-regions.org/network/whoswho/">www.innovating-regions.org/network/whoswho/</a>	2001
Observatory of European SMEs report on “Regional Clusters in Europe”	To focus on the knowledge of clusters and compare 34 European clusters. <a href="http://ec.europa.eu/enterprise/enterprise-policy/analysis/observatory_en.htm">http://ec.europa.eu/enterprise/enterprise-policy/analysis/observatory_en.htm</a>	2002
2002 MAP Project on enterprise clusters and networks	To analyze to what extent clusters and networks do really offer a favourable framework to SME; to identify examples for good practice related to clusters and to identify future possible actions <a href="http://ec.europa.eu/enterprise/entrepreneurship/support_measures/cluster/map_project.htm">http://ec.europa.eu/enterprise/entrepreneurship/support_measures/cluster/map_project.htm</a>	2002
Regions of knowledge initiative	To support transnational mutual learning and cooperation between research-driven clusters; bringing together regional authorities and development agencies, public research organizations, industry and other relevant	2003

	stakeholders <a href="http://cordis.europa.eu/era/knowreg_about.htm">http://cordis.europa.eu/era/knowreg_about.htm</a>	
Clusters in the EU 10 new member States report	To learn more about cluster development in EU10, since no systematic mapping of European clusters had yet been done; drawing a new systematic mapping, as correcting the previous ones. <a href="http://www.europe-innova.org/">www.europe-innova.org/</a>	2005

\*Some of the following identified programmes might be on-going.

\*\* During up to 2005

Information source: EC: *Entrepreneurship Action Plan Key Action 6-B – Fostering Innovative Clusters*<sup>i</sup>

### 3. Conclusions and future research references

Cluster policy, as appropriate, explicitly identifies what the national level's interests and the barriers of achieving those goals are and how cluster approach can help overcome these problems. It equally weights the relative merits of active intervention from the national level, versus framework conditions and facilitation. It equally considers that cluster-type policies can be valuable as a practical tool, and not only to respond to conceptual models. Concomitantly, it is to be realistic with respect to clarity of targets and funding and duration. As regarding program (priority established) goals, the same policy ensures that a program have a range of instruments for adaptation across the targets (for cluster and region types and so on). Policy **coherence**, in context, determines a cross-ministerial strategy for national level intervention and works in consort with regional levels in program development for capacity building, coherence and complementarities. **Risks**, in cluster policy, **are of** picking winners and lock-in and other examples.

**Future research** might focus on issues like the following:

- Do cluster policies have an influence on industrial transformation under globalization?
- Since innovation includes plenty of activities in the area, what are goals & instruments of appropriate policies on (innovation)?

What is the long term impact of these policies? (OECD 2007, pp. 131-138).

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