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Technological and Employment Changes, and the Demands for Skills Development: Institutional Framework and Dynamic for the Development of Collective Capabilities

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Production diversification in the direction of more technologically complex segments of the economy is considered a pathway towards development and the generation of quality jobs. Strategies that encompass the construction of collective skills and institutional abilities are essential to setting off virtuous dynamics of territorial development.

The concept of collective skill rests on the notion of organizational capacities, individual skills, and institutional capacities activated to ensure that territorial transformation is indeed structural. It refers to the knowledge system—and ways of using it—held by individuals, workers, companies, and institutions in a local or regional space, or in a country. Collective capabilities are constructed endogenously on the basis of the development of virtues and the accumulation of dynamic learning processes resulting from different types of efforts and interactions between actors. They are strengthened by the productive complementarities of companies and of sectors. Collective skills are difficult to transfer or to imitate due to the tacit nature of the knowledge and practices they entail.

This document attempts to identify the dimensions and processes key to the construction of collective capabilities and institutional capacities in a number of specific cases: the information and communications technology (ICT) and software cluster in the city of Tampere, Finland, and the biotechnology cluster in the city of Munich, Germany. Those production conglomerations are compared with experiences in analogous sectors in Argentina, specifically with the bionanotechnology cluster known as Parque Tecnológico Litoral – Centro (PTLC) and the software and computer services cluster in the city of Tandil. On the basis of the description of frontier cases, we attempt to identify the limits and potentials of local cases.

A cluster or productive conglomeration is a space of interaction that goes beyond commercial exchange. It is associated with the existence of relatively immobile assets, such as institutions, knowledge incorporated by persons and organizations, the existence of business chambers and technology centers and universities, and others. Underlying these spaces is a variety of externalities. On the one hand, the concentration of businesses leads to a specific production demand great enough in size and effect to fuel the development of specialized local suppliers and workers with specific skills. On the other, within each specific realm there is a considerable—if heterogeneous—distribution of

knowledge thanks to channels of interaction like collaboration agreements, joint technology development projects, and supplier-customer and like interactions.

To understand how the aforementioned clusters function we must consider different dimensions: the processes by which each cluster took shape; the regulatory and institutional framework that guided the development of the activity in each territory; the identification of the cluster's assets, understood as the physical infrastructure and connections required to develop the activity; the funding of new interactions between supply and demand; and the formation of collective activities that enable a dynamic of transformation and change in the territory's production structure.

The origin of the biotechnology cluster in Munich lies in national policies geared to fostering such clusters. The policies revolved around, first, the regulation of that specific sector and, later, making funds available to further its development. The cluster includes both leading international firms and local companies, which are interconnected in a dense network. In terms of institutional infrastructure, the region is the site of a number of training and polytechnic institutes and universities. Particularly significant is the coordination and cooperation between different levels of governance, with high levels of complementarity between national and regional policy initiatives, and the role of organizations and institutions key to supporting business-to-business and university-to-business interactions. While in the incipient bionanotechnology cluster in Santa Fe there are positive interactions between public policies and university initiatives in relation to technology transfer, the cluster still lacks access to funding, stable regulatory norms, and a common project for the region's biotechnology development. This cluster is rooted in a strong university-business relationship, specifically an incubation project at the Universidad Nacional del Litoral [National University of Litoral, UNL] where Argentine researchers trained in Germany would create a company specialized in the production of active biotechnology ingredients for medicines. In other words, there was no explicit state policy active in the cluster's origin. Notwithstanding, the role of the UNL, a public university, was crucial to the later development of individual skills; specific university programs were developed for training in the areas of knowledge required for the biopharmaceutical sector.

The experience of the city of Tampere, Finland, is an example of how important it is to develop skills for production diversification and innovation prior to international insertion. Unlike the analogous case in Tandil, Argentina, Tampere deployed a much sounder strategy for insertion in global chains. Early on, the Finnish state played a key role in designing programs geared toward the development of regional technology clusters. In Tampere, like in Munich, there was a wide institutional network for the formation of collective capacities and skills, namely three universities, technology research centers, and open innovation platforms. The cluster in Tandil, on the other hand, is more geared to export than to the local or national market, more specifically to the growing global software outsourcing market. The Universidad Nacional del Centro de la Provincia de Buenos Aires [National University of Central Buenos Aires Province, UNICEN] played a key role in the history of this cluster due not only to the importance of information technology on its curricula but also to the university's initiative to bolster, in conjunction with the city government and a local development agency already active in the region, an IT pole. All of that took place in the absence of national or provincial policies for the creation of local technology clusters. A combination of the worldwide delocalization of the IT sector and a set of local skills generated mostly by the UNICEN were, then, crucial factors in the development of the cluster.

In our comparative study, we have detected some similarities and a number of differences between local and international experiences. In Argentina, unlike in the European cases, there is a lack of funding, of a consistent regulatory framework, of comprehensive regional planning, and of a national policy to foment clusters. While local experiences can be described as successful in terms of

technology transfer and the creation of new firms, jobs, and exports, their trajectory is hindered by limited resilience and slow expansion—in the case of Santa Fe—and insertion in low-value segments of global value chains—in the case of Tandil.

In terms of conditions that enable the successful construction of collective skills in the technology clusters analyzed, a few points are particularly salient. First, the formation of individual skills is a necessary condition for the emergence of clusters and for expanding production diversification. Complementary sources of learning are essential to the construction of skills. Second, universities and other educational and training centers must interact with the productive sector in order to avoid dissociation between the supply of and demand for individual skills and to incentivize on-the-job training, a space where specific knowledge and competencies are constructed.

In terms of organizational skills, it is essential to build a network of local companies of all sizes. Larger companies are able to limit the technological and commercial risks associated with innovation (flexibility), while a large number of small companies provide dynamism (the creation and destruction of firms) and the ability to respond to contexts of rapid technological change. Furthermore, crucial among institutional skills are those that ensure the coordination of actions undertaken on different territorial scales (national, regional, and local) and between different actors, drawing clear objectives for territorial development and structural change. In this context, an organizational network is key insofar as it helps to coordinate a diverse range of actors and to construct a common vision of the cluster and its future.

Last but not least, the role of public policy must be taken into account for the later success of a cluster. Government intervention is necessary to orient and oversee funding and to sustain the demand that structural change requires. Such policies allow regions to undergo production transformation processes with less volatility and risk. Finally, public actors are decisive to coordinating the activities carried out by the cluster, and to reinforcing, planning, and ensuring stable trajectories for both the training system and the production and innovation system.

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