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Cluster Economics:

Elements for Program Evaluation

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1. Introduction

The Inter-American Development Bank (IADB) in the last years has been pursuing a relatively new form of approach to Regional Development Programs – programs focused on fostering economic development in a given geographical area. The new form of intervention falls generally under what has been named **the cluster approach,** or the **value chain approach.** These programs share the common feature that the focus is on improving productivity and performance **of a group of companies**, emphasizing the cooperation between them and the cooperation with public entities, regional, or national. Another common feature is the emphasis on the **system** in which those companies are embedded – sometimes the emphasis is on the "value chain" to which those companies belong --, the general view being the focus on improving **system functioning**, rather than particular aspects of the system. Hence, there are two basic central elements: competitiveness, and the notion of productive conglomerates, or clusters. Thus, while the purpose is to elevate the competitiveness of a given geographical location, the key instrument-target to achieve this is a set of companies and the system in which they are embedded.

All projects share also the following three steps of implementation. In a first step, a complete set of "Plans to Reinforce Competitiveness" ("Planes de Refuerzo de la Competitividad", PRC´s) is laid out for different "clusters" or "productive chains". These plans outline a competitive strategy, and a set of actions to be pursued. Actions are further categorized by their different degree of externalities involved: some actions may render benefits for the system or cluster as a whole, and may be difficult to be appropriated by a single company, even if that company is the one doing the action ("proyectos estructurantes"); while some others, are more suitable for private appropriation by a given set of beneficiaries. In a second step, through various degrees of partial subsidies, the actions identified by the PRC´s are promoted and executed. To access to these subsidies, companies need to belong to the identified clusters, fulfill some requisites and present a project that bears some strategic priority in the context of the PRC´s competitive strategies. Finally, in a third step, the complete program is monitored and institutions working with the clusters are strengthened.

The emergence of this new approach to regional development, has highlighted the need to have an evaluation system so as to measure or estimate the economic impact of these interventions. The evaluation system has to be sufficiently general to be applied to all programs of this type. Also, it must take into account the potential data constraints that may be found in practice. The objective of this paper was to outline an evaluation methodology fulfilling these objectives.

"Clusters" and "Cluster Programs" are by their own nature highly complex and heterogeneous, and therefore, the design of a common methodology had to avoid the undertaking of a single perspective of the problem. This paper greatly benefited from a high-level discussion and comments provided by different readers to the first two versions of it, a discussion that was coordinated and promoted by the IADB coordinating team of this research. The result of that discussion has been a certain degree of consensus in that the evaluation of cluster programs should carefully look at three different angles: **the economic impact**, **the fulfillment indicators**, and **the performance indicators** (the latter of a rather qualitative nature).[1]

I contend that while the two latter aspects have had a significant attention in both the existing literature and in practice, the former, the economic impact of the cluster programs, appears to be in a more primitive stage of advance. Hence, a great part of this paper has been devoted to the analysis of how to measure the economic impact of the cluster programs. In doing so, I have come to the conclusion that the economic impact of any program cannot be assessed without a proper **baseline of comparison** and that basic economic considerations, call for the explicit formalization of a **dynamic baseline** that, among other things, takes into account the influence of third intervening factors (exchange rate, market demand, etc) in the results achieved by the cluster under study. In turn, this leads the methodology to a somewhat not-so-common usage of econometric instruments and econometric models. Yet, it must always bear in mind that this unavoidable sophistication of the analysis is by no means to be meant a complete discard of the other two angles of the problem: fulfillment indicators and performance indicators. In some cases also, it has to be reckon that an integral and

[1] I thank Harald Furre from Oxford Research for suggesting this useful way of synthesizing the analytical discussion; see the comment note by Harald Furre dated March 11, 2007.

comprehensive appraisal should generally be combined with specific case studies. Whenever possible, I suggest along the paper the areas where those case-studies should also be undertaken. Only the combination of these three different angles of the analysis will eventually lead to a comprehensive appraisal of what a given cluster program did finally to a given economic and geographic area.

I contend also that one cannot rigorously derive an evaluation methodology with emphasis on the economic impact of the program without first understanding "the economics" underlying this kind of intervention. A long and respected tradition in economic thought puts the emphasis on **"market failures"** as the main basis for justifying economic intervention. What are the (underlying) market failures that this type of approach deals with? It might not be advisable to jump on to a methodology of evaluation, without first understanding the economics of the problem and the justification for the cluster approach just outlined. That is the purpose of the next section. It must be said at the onset that the core of the literature on clusters and cluster development borrows from research done by Porter (1991) and an ample myriad of researchers and consultants, but generally, the link between that literature and the core of modern economic thought is rather weak if not inexistent altogether. The next section is just a modest attempt to make a small contribution in terms of making a bridge between the cluster literature and its main ideas and the more established modern economic thought, particularly in the realm of industrial organization and international trade. Based on the economic analysis thus developed in the next section, section three proposes an evaluation methodology with a strong emphasis on the economic impact of the programs. As is argued there, the wide heterogeneity of cases suggests avoiding a single framework that fits all cases; rather, the emphasis is on suggesting alternative avenues of evaluation depending on the cases being studied and the available data. In turn, section four provides an additional set of indicators that are intended to uncover the "performance indicators"´s angle of the problem, borrowing heavily from research done elsewhere. Section five provides concrete guidelines to field-researchers and evaluators so as to ease their task when applying this methodology to particular cases. Finally, for the sake of completeness, and for various references along the discussion, the Annex of this document summarizes the main features shared by seven "cluster programs" currently in the phase of implementation under the sponsoring of IADB.

2. The Economics

Sector and regional development programs sponsored by both governments and multilateral agencies have experienced numerous shifts and changes in conception along the years. Decades ago, the emphasis used to be on particular inputs to be financed or subsidized – irrigation, credit, agricultural research and extension --- or in particular products to be promoted --- "livestock development plans", "forestry development plans" and the like ---. With the advent of market reforms and deregulation in the past two decades, a drastic shift took place, and most programs moved from being more or less narrowly focused on some inputs or sectors, to being "horizontal": the failure of past interventions prevented policy makers and international organization from anything that resembled a "picking the winners" approach.[2] In that context, at least at the IADB level, there was a strong move in favor of structural-reform loans of a "multi-sector" nature: typically, a loan aimed at strengthening public institutions in exchange of some key market reforms. In that context, most of such programs avoided "strategic" sector decisions: neither the government, nor the multilateral institutions were supposed to have any privileged knowledge regarding the key areas of a region or a sector that had to be promoted. Implicitly, it was assumed that at the bottom of the failure to achieve satisfactory growth levels were some key market distortions or market failures: the removal of such distortions would bring by itself better growth rates. Exceptions to those schemes were areas in which it was recognized the existence of some externalities, like Research and Development. But even in those areas, the general approach was in favor of "horizontal" programs, where funds were to be allocated by demand preferences according to a non-biased evaluation system. To a large extent, the advent of market reform seemed to leave little room for specific sector or regional "development programs": were those special "programs" needed once market distortions were on their way to being completely removed?

Notwithstanding the fact that there is plenty of consensus regarding the importance of having non-distorted markets in function as a key **necessary** condition to achieve satisfactory

[2] The "picking the winners" strategy was to be avoided in its most ample sense: not only avoiding the picking of a given firm or company, but also, and as important, the need to avoid the picking of a supposedly winning sector.

growth rates, there has been some disappointment with the pure "horizontal" approach and with the exclusive emphasis on traditional "market failures" as **the only** justification for some form of public intervention **in sector or regional development.** Lagged regions or sectors seemed to need more than broad market reform to change their status. On one hand, it had to be reckon that it was not always possible to remove all the identified market distortions: some specific sector or regional program might find some room, even as a sort of "second best" alternative in the absence of more deep market reforms. On the other hand, the international empirical evidence tended to show that some form of export promotion – as opposed to pure "free trade" -- was an accompanying factor in several of the successful cases of rapid growth observed in the recent history: this suggested some form of active intervention reinforcing the given international price signals, and specially reinforcing an outward-oriented approach to economic growth. Also, a long history of a negative business climate made often difficult to achieve substantial and rapid effect deriving from the removal of market distortions only. Last but not least, there was the sense that a myriad of multiple "horizontal" programs very often failed to achieve **critical mass** in any single sector at all. Those developments open the way to the more recent approach to sector and regional development programs: **The Cluster Approach.**

But the "Cluster Approach" was not developed by multilateral institutions, neither by the economic tradition linked to the literature of trade and development. The initial development of that literature stems from the seminal work by Porter (1991), who was among the first to call attention to the fact that companies operating close to each other in a given geographical location tended to derive benefits from being close to each other, and that those benefits – competitive advantage – was economically relevant. It was suggested that those competitive upgrades derived from close inter linkages between those companies helped in many cases small companies to succeed in a competitive global market (the case of small businesses in Northern Italy was a case in point). Borrowing partly on the work by Reve and Jakobsen (2001), Furre (2006) states the existence of five upgrade mechanisms: complementarities (critical mass that allows to benefit from an improved factor market in a given locality), innovation pressure (companies compete between each other and one´s action influences another), development and spreading of knowledge (spillover in knowledge through copying, adoption, etc), collective learning (conscious coordinated action to learn and adopt a

given technology), and global pipelines (the impact that a particular company with better-than-average links to outside network has on neighbor companies). The three former are necessary ingredients in smaller, step-by-step innovations; the two latter are thought to be of importance for more radical changes in growth and development in a given locality.

The cluster approach appears attractive for practitioners in need of providing concrete advice to regional development agencies, and to that extent, the development of the literature on clusters bears a significant appeal to institutions such as the IADB. But what is the relationship between the identified driving forces that emerge from the "cluster literature" and the basic modern economic thought?

To begin with, it must be said that the **cluster approach**, does not appear in contradiction with previous market reform efforts: non distorted markets continue to be considered as a basic necessary condition for achieving growth and development. Also, the emphasis continues to be in export development rather than an inward-approach strategy. The removal of distortions, inefficiencies, and barriers to trade and investment continues to be seen as a key ingredient for an adequate business climate, a pre condition for dynamic cluster appearances and development. Yet, the cluster approach does bear some distinctive features.

Generally, the cluster approach emphasizes the need to support and push forward **all the components** of a given "value chain" in a given sector or region to be developed. Unlike the "horizontal" approach, it seeks to achieve **a critical mass of support** to jump-start a sector development program: it does not impose itself the straightjacket of horizontal distribution of resources, and to that extent, it does imply some sort of "picking-the-winners" kind of approach, although in a much subtler way. Yet, unlike the earlier approaches to development, it also avoids the emphasis on a given input, be it "irrigation" or "credit": the cluster approach typically diagnoses **multiple failures and lack of investment along the complete value chain**, and consequently, it seeks to improve the complete chain, in an effort that usually involves working with different economic agents – entrepreneurs, suppliers, banks or credit providers, public and private sector --- and with different segments of the value chain – market development, technology transfer, credit, etc. Underlying this approach, there is the vision that one cannot improve the profitability of any given economic agent or segment of the

chain without tackling the complete value chain: the vision is that it is not single companies that compete in the global market but **"systems":** when a single company faces the global market, it is competing with the whole support (or lack of support) **of the system in which it operates,** which include the human capital and human skills readily available for the firm; the technology for which the firm has proper access; the general sanitary and agro-ecological conditions in which the firm operates – which includes the working of the corresponding responsible institutions, etc.

What about "the economics" that provides support to this form of policy intervention? Although the cluster approach is typically associated with the name of Michael Porter, stemming from his influential work on competitive strategies for both companies and countries[3], I contend that the underlying economics seems to be as old at least as Rosenstein Rodan´s *"Big Push"* type of model, later refined by the modern work associated to Paul Krugman[4, 5]. The arguments and models of the latter, invariable revolve around the notion of **external, dynamic, economies of scale.** Under economies of scale, or increasing returns to scale, **size matters**, hence, the emphasis on **critical mass.** With some form of monopolistic competition in the provision of some key inputs, and with increasing return to scale, an increase in size may allow a decline in input prices, reinforcing the general competitiveness. Furthermore, if economies of scale are dynamic in some sense – as in the case of "learning-by-doing" -- an early, strong, increase in output, may lead further cost declines, bringing as a result the notion of "virtuous growth cycles" and also the notion of "strategic entry". A virtuous growth pattern emerges when more output, far from decreasing profitability, as a typical Neoclassical production function with decreasing marginal returns would suggest, increases it, thereby fostering additional investment and growth. Strategic entry in turn, suggests the importance of **timing and opportunity:** the global market space may not allow many suppliers at any given moment of time, and under some form of dynamic economies of scale,

[3] Michael E. Porter, The Competitive Advantage of Nations (New York: FreePress, 1990).
[4] Rosenstein-Rodan, P. (1943), "Problems of the Industrialization of Eastern and South Eastern Europe". Economic Journal, June-September, 1943.
[5] Krugman (1993) formalizes a model in which, under the prevalence of increasing reutrns to scale to the firm in a given industrial sector, the sector will not emerge unless all firms engage in investments. If only one firm does it, demand for its product will be too small to justify the investment. But a "big push" that pushes investment upwards in a large number of firms will do it. See Krugman (1993) "Toward a Counter-Couterrevolution in Development Theory". Proceedings of the World Bank Annual Conference on Development Economics. !992, Washington D.C.)

the early entrants may enjoy competitive cost advantage that may not be easily emulated by later followers. If such is the case, we say that **"history matters".**

The theoretical elements just outlined combine in practice with other aspects, most notably the notion of **"coordination failure"** as opposed to **"market failure"**. With increasing returns to scale, economic equilibrium may not be unique, but multiple equilibria may prevail[6]. With several, but not an infinite number of economic agents, the equilibrium is not a competitive equilibrium but some form of "Nash equilibrium", or "Nash solution". Typically in that context, some equilibria may be preferred to other; a special effort designed to coordinate agents in one direction may then prove useful and beneficial; hence, the emphasis of cluster programs on the issue of association along the chain and the importance of a shared vision for future development wherever those types of programs are being implemented. One cannot help to emphasize the crucial importance of coordination, especially in regard to the coordination between the private and the public sector, and especially in light of the fact that lack of state reform in many countries in the region render as a result a state sector highly rigid, segmented and without the necessary incentives and clarity of purpose.

In sum, "the economics" of the cluster approach focuses on the different **spillover** mechanisms that at the end imply that **the productivity and performance of a given participant in the cluster is deeply dependent on the functioning on the system as a whole.**[7]

One example may help us to understand how these concepts work in practice. In a given region (e.g. San Juan, Argentina), agro ecological conditions may be optimal for grape exports. There are already some plantations, part of them the result of early tax-incentive

[6] The existence of a unique equilibrium is intimately connected to the convexity properties of production functions and preferences. Under those conditions, the equilibrium not only is unique but it has optimal properties from a welfare perspective. Since the seminal work by Krugman emphasizing models with fixed costs of entry and or increasing returns to scale, a number of interesing possibilities have arised for multiple equilibria. Under those conditions, some equilibira may be preferred to others, and the market outcome is not necessarily optimal.

[7] One, additional spillover effect which is worth mentioning concerns knowledge diffusion: the success of a group of pioneers participants, induce emulation by others, the followers, generating thus a diffusion pattern, be it in respect to the adoption of a certain technology, or the adoption of a certain crop or product. Those diffusion patterns tend to generate a logistic curve, a feature as old as Griliches´ findings in his seminal research regarding hybrid corn adoption in the Corn Belt (Griliches, Zvi (1957). "Hybrid Corn: An Exploration in the Economics of Technological Change. Econometrica, volume 25, October 1957).

programs (the wrong focus: one segment, and some disregard with respect to market signals). Yet, the area lacks investment in the cold chain and fruit packing, which is subject to scale economies: a given, large investment, if fully used, renders lower unit costs than units of smaller size. The lack of adequate post-harvest facilities preclude existing and incoming farmers from risking more investments in grape orchards; the absence of those investments in turn, does not signal to anyone the need for investment in such facilities (coordination failure: the system is trapped in a sub-optimal Nash equilibrium of lack of investment). In turn, since activity is reduced, the credit system does not make the necessary investment in knowledge and screening to potential grape projects because it simply does not pay to incur in the lumpy investment in such knowledge (economies of scale). As a result, the few projects that do take place face high financial cost (to pay for the asymmetric information gap) or simply lack of credit which impairs potential growth and investment. With a sluggish growth performance, skilled technicians and valuable human capital that may help to achieve better competitiveness levels look to somewhere else, or fail to migrate to the region, leaving the sector with higher production costs than otherwise.

Under this diagnosis, the **cluster approach** suggests a line of work pretty much along the early Rosenstein Rodan´s recommendations: the need for **a big push.** Under the cluster approach, one would have to work on each and every step of the value chain: credit, market promotion, technology transfer, some special line of support for shared investment facilities (e.g. post-harvest facilities), etc. Once investment in some segments begin to take place, so the argument goes, the risk for doing investments in other segments gets reduced, thereby generating a virtuous cycle: for example, investment in a "shared facility" like an export packing house, will reduce the risk of new investments in grape orchards.

Having said that, it becomes clear that **under the aforementioned conditions** -- external, dynamic, economies of scale -- a cluster approach, that puts emphasis on critical masses of intervention, and on all the segments of a given value chain, may have better chances of success that an alternative, "horizontal" approach to sector and regional development. The horizontal approach risks failure since it may not achieve the necessary critical mass for a jump-start in the system. However, on the other hand, it should be clear that the conditions for a cluster approach to be successful, or at least, to be the right remedy

for a particular situation, are far from universal. Many production functions do not necessarily exhibit increasing returns to scale on a relevant economic range; dynamic scale economies may not necessarily conform an important part of the underlying economic structure; and the ultimate cause for a sluggish growth performance may lay in more profound market failures -- such as a long history of rent seeking and opportunistic behavior – instead of alleged "coordination failures and the like. In those cases, a cluster approach may help growth only for a short period of time, and only to the extent that some direct subsidy goes with the program being implemented, but long-lasting effects will not be observed. The mere fact that several companies work in a given locality and that there are some external economies from which they benefit from each other activity, does not provide any warranty that a regional program aimed at fostering the cluster will be justified from a strict social economic evaluation. It is at this point where the recurrent optimism of practitioners clashes with more rigorous economic analysis. In turn, this raises two salient issues:

a) How can we be sure that the conditions for a cluster approach actually prevail in a given particular situation?

b) What other determinants of the economic environment may help, or be a hindrance of, a given program?

The first issue is quite problematic, since one can "make a case" for the need of a "cluster approach" in almost any instance, except those of quite consolidated sectors (that seldom need any special development program at all). When are increasing returns to scale, "learning-by-doing" effects, external economies, and coordination failures strong enough to beat on a cluster approach? When are those effects sufficiently important so as to overcome the potential mistakes of a "picking-the-winners" strategy? When, some basic market failures and undetected business climate features are in effect the actual responsible for the lack of growth and investment? (as opposed to "coordination failures" and the like). That is very difficult to know in advance and there is no substitute for in-depth economic analysis on a case by case basis with a strong emphasis on the economic history of the place: lack of investment might be the simple result of a long history of rent-seeking culture that always looks for public subsidy to foster development. Or, unless some form of public involvement takes place,

economic agents will not trust the existing price incentives. For the purposes of this paper, we assume that such an in-depth analysis has already taken place, and the program is already on its way to being actually implemented. Hence, we can posit the opposite question: How can we tell, from the actual, ulterior, performance of the sector being targeted whether the cluster diagnostic was the right one?

To be consistent with the underlying assumptions upon the cluster approach rests, the main indicator of success for a cluster program is **the sustainable increase in the growth rate of the cluster.** The cluster approach is supposed to unleash dormant economic forces by resolving some key bottleneck segments of the value chain, and by correctly addressing the existing coordination failures; once those bottlenecks and failures have been taken care of, significant growth should follow: the system would have reached the critical operation level at which economies of scale would begin to make a difference, and learning-by-doing effects and other virtuous dynamic feedbacks would be supposed to begin operating. Therefore, we come to a second important conclusion: **the increase in the growth rate of the cluster is supposed to arise as the result of some key structural changes that will take place in the system in which the companies of the cluster are embedded.** When coming to the evaluation of cluster programs, we will emphasize again the structural change aspect of the problem.

It is interesting to notice that very often, in cluster development programs, a distinction is made between "beneficiaries" and "non beneficiaries" of the program (see Annex). Beneficiaries could be selected by some pre-stated conditions ("eligible beneficiaries") or either by some form of self selection (those who voluntarily choose to participate). In any case, **it may be misleading to focus on the comparison between "beneficiaries" and "non beneficiaries" to measure the success of the program:** precisely because of the underlying assumptions of the cluster approach, productivity and performance of a given economic agent within a cluster is more the result of the functioning of the complete **"system"** or **"cluster"**. Hence, if the cluster program has effectively been a success, most probably, due to the external economies effect, performance of "beneficiaries" and "non beneficiaries" could even be similar; actually, that is what should be expected if **the cluster** is to improve! Hence, the primary focus should be in the sustainable growth performance of the cluster as a whole,

rather than on the comparison between beneficiaries and non beneficiaries of the program. If growth is to be sustainable, rather than the result of a once-and-for-all increase in investment due to subsidies, and additional feature that should be observed, is an increase in productivity, and more specifically, an increase in **total factor productivity growth.** However, the performance of the cluster is not only the result of the program being implemented, but also the result of other determinants, which leads us to second issue raised above.

In effect, the actual growth performance of a given cluster depends on a number of different factors. We can quote the crucial ones: a) prices of the main outputs (includes the real exchange rate effect); b) general technological spillovers exogenous to the cluster that affects it; and, c) the past history. Therefore, when analyzing the impact on growth of given program, the resulting growth rate needs to be controlled by these factors, or additional ones that may be deemed relevant for the case under study.

3. Measuring Economic Impact: Methodology

A quick review at the projects presented in the Annex reveals that in effect, an in line with our previous discussion, output increases and productivity increases typically conform the main indicators of success with respect to the "end" or final objectives of the various programs. However, the proposed measures generally do not correct for other intervening factors that may affect output or productivity: it is common to read phrases like "output increases" without special references to a controlling variable that can suggest which part of output increases is expected to be actually "caused" by the program. In this regard, there seems to be some confusion with the comparison between "beneficiaries" and "non beneficiaries" of some programs: it seems that in some instances, the proposed evaluation identifies success of the program with a better performance of the "beneficiaries" (as the average annual sales increment of the group of enterprises that took advantage of activities to reinforce competitiveness of the Mendoza program), while, as stated before, such distinction should be a minor one, and probably not relevant at all, in the context of cluster development

initiatives[8]. If the program has finally a positive impact on the cluster, we should observe better performance of the cluster as a whole, and not exclusively focused on the beneficiaries.

Finally, and especially in relation to the objectives of the different "Components" of the program, there is a great prevalence of **indicators of fulfillment** instead of final objective achievement. For example, in the same case of Mendoza, the proposed indicators of succress include, the "number of IRCs developed" or the "number of agents trained in courses on the use and harnessing of information"; in the case of Minais Gerais, one proposed indicator is. the number of enterprises beneficiaries of basic industrial technologies activities of the Minas Gerais program iself.. Those indicators are fulfillment indicators, in the sense that they monitor the various means (activities) to obtain a result, but not the result itself. We assume that those "indicators" will continue to be in place **more as a way to check that the activities in the plan were actually performed, than as a way to measure economic impact.** Hence, while agreeing with the idea that those indicators need always to be in place, they are an important and relevant angle of the evaluation, we understand that they are not indicators of economic impact in any useful sense but only indicators that the proposed activities and components were actually carried over. Therefore, our focus here is on indicators that monitor the final objectives pursued by the programs, not the means to achieve them.

In sum, as a first general approach to the problem we posit:

a) Emphasis should be given to output and productivity increases **of the complete cluster**, but controlling by third intervening factors so as to isolate the impact of the program only. The current proposed indicators of success fail to adequately deal with those third factors.

b) The control by third factors should not be confused with the comparison between "beneficiaries" and "non beneficiaries". If the sets of "beneficiaries" and "non beneficiaries" are obtained by self

[8] For more detail see Dehejia y Wahba (1998), "Causal Effects in Non-Experimental Studies: Re-Evaluation of Training Programs".

selection, the comparison between those two groups is far from trivial, and most probably there will be lack of data to apply acceptable methodologies of comparison[9]. If those sets are conformed by some a priori conditions, then the simple comparison may also lead to error. Last but not least, that is not an interesting comparison since a success of the cluster program is supposed to increase output and productivity of the cluster as a whole, and positive spillover effects from beneficiaries onto non beneficiaries should be a welcomed result, not something indicating that the program had no effect. **What we really need to do is to compare one complete cluster with another.**

c) We understand that beyond success measures, all programs will need a set of fulfillment indicators that tell us that the identified activities were actually performed. Yet, analyzing or discussing those indicators is not the objective of this report. In any case, the proposed fulfillment indicators, typically located at the "components" level, seem to be sufficiently obvious and sufficiently exhaustive that no further analysis is needed there.

Consequently, in what follows, we focus on how to measure success of the cluster program as a whole, and to do that, we put our attention in how to compare on cluster with another.

Digression 1: The Concept of a "Baseline"

Common evaluation methodologies revolve around the notion of a "baseline". A given program, a its beginning, is supposed to have a concrete an detailed picture of a number of indicators – production, productivity, exports of a given quality, etc. Later on, the program can be evaluated to see whether it had any sensible impact on the

[9] The obligatory reference on this issue is the seminal paper by. Heckman, J. (1979). "Simple Selection Bias as a Specification Error". Econometrica 47, 153-161.

chosen indicators. The evaluation can be a **midterm evaluation** or a **final evaluation**, the former, taking place while the program is still in place, and the latter, once the program has ceased to operate. Of course, some indicator may need time to show effect of the program, and final evaluation may be more telling than a mid term evaluation (which probably will tend to focus more on fulfillment indicators) in those cases. The **baseline** of the program is typically associated to the set of indicators measured at the beginning of the program and corresponding to the variables on which the program is supposed to have a future effect on.

Having said all that, it is pretty clear that the conceptual definition of the baseline, particularly in the case of programs aimed at improving economic performance of companies is far from trivial. If we are working in a cluster of poultry producers in Brazil for example, what should be the baseline? Would the current export levels prevailing at the beginning of the program be a sensible baseline? Would that be sensible given the fact that poultry exports have been growing at almost two-digit rates for the last 5 years? Would that be sensible given the fact that poultry exports in Brazil exhibit a high sensitivity to exchange rate competitiveness? On the other end of the spectrum, if we were evaluating a cluster program in the area of shoes and textiles in Uruguay, two sectors that have been under significant competitive stress and in frank decline (see report by Gustavo Baruj), the correct baseline would most probably be one of decreasing output; "success" in that context would be identified with the stopping of that trend, e.g., the "defensive consolidation" of the cluster.

It is clear then that when working with companies the produce, trade, invest, and so on, the **static picture** of production, export, or productivity at the beginning of the program will seldom be a sensible baseline, no matter how simple and appealing may that be for the program evaluators. A static baseline will be a sensible baseline only if history tells us that production, investment, and so on have been stagnant, for, say, the last decade. And even in that case, one would have to examine whether that stagnation has or not been a result of third intervening variables (like a high interest rate or an appreciated currency).

The sections that follow focus precisely on this issue, **the definition of a sensible baseline**. It turns out that in a dynamic environment, it is advisable to speak about a **dynamic baseline**, not a static one, and to establish **the main third controlling exogenous factors that affect the baseline.** We begin with the case where we have other cluster with which we can compare the cluster program we are working on. Then we move on to the more interesting case where that comparison may not be possible.

Comparing Similar Clusters of Different Geographical Locations

A given cluster program is, by definition, focused on **one particular geographic location,** that we identify with the sub index $i=1,2,...N$. Hence, for any given program, we implicitly assume that there are "N" potentially comparable locations that host similar clusters. This assumption may be realistic in some cases. For example, when talking about the "San Juan" cluster program for Argentina, we notice that "San Juan" is just one of several provinces of the country; the wine cluster of the region could be compared with the wine cluster of some other. On the other hand, within each geographical location, a typical program will identify several value chains or clusters. We identify those productive chains with the sub index $j=1,2,...M$. Now, associated to each value chain, we contend that one can identify a key **"result variable"**, that we identify generically with the letter q. Thus, adding a time index t, the variable q_{ijt} measures the level of the chosen result variable, in the geographical location i, for the value chain j, at year t.

The "result variable" may be tricky to choose. At least two considerations must be bear in mind when choosing an adequate result variable:

a) **Time-to-build constraints**: "output of grapes" for example is not a perfectly adequate result variable because it is, to a large extent, the reflection of earlier planting decisions, which is the real result variable

to look at: an increase in next-year output may have little to do with a cluster program initiated this year. For a **mid term** evaluation, area planted would be a better choice; for a **final evaluation** grape exports is a sensible choice provided the program lapses enough time to show up in this variable.

b) **Past Distortions**. On the other hand, total plantations in a given area may be the consequence of earlier tax-incentive policies (as is the case in San Juan), and therefore, using time series of plantations as a result variable may also be misleading in that case.

In some cases, the result variable may be the fraction of total production sold as a high-value production (e.g. bottled wine against wine sold large containers; fresh fruit against low-value pulp production, etc), or even the average export price itself. In some others, we may identify a productivity factor as a result variable. Yet, if that is the case, it must be stressed out that the ideal indicator should be **total** factor productivity, and not a partial productivity measure (e.g. labor productivity) that may be a biased indicator of performance. However, total factor productivity is a typically difficult indicator to build and we may expect that in most instances, there will not be sufficiently rich data to do it.

In any case, once an adequate result variable is chosen, the problem becomes to estimate the impact of the cluster program in such variable. To this end, we propose an econometric approach. Our starting point is to estimate **a conditional statistical model for the result variable. The conditional statistical model is our (more sophisticated) baseline against which we will measure the impact of the program.** We speak of a "conditional" statistical model to reckon the fact that the performance of the result variable depends on several factors. There are several possibilities to estimate such a relationship. One generic possibility is something like:

$$\ln(q_{ijt}) = \alpha_0 + \alpha_1 \ln(Q_{jt}) + \alpha_2 t + \varepsilon_{ijt} \qquad (1)$$

where:

$$Q_{jt} = \sum_{k \neq i}^{N} q_{kjt} \qquad (2)$$

and ε_{ijt} is a **stationary shock** with unconditional mean 0 and variance σ^2. A relationship like (1) establishes that the result variable in a given cluster j belonging to a geographical location i may be a function of an exogenous trend (technology perhaps) that is captured by the t variable; and also a function **of whatever is happening to similar clusters in other regions of the country**, Q. This latter effect is intended to capture similar nation-wide effects that affect all clusters alike, like, for example, real exchange rate shocks, price shock, and so on. **The possibility of comparing clusters between different regions allows us to avoid a more informational exigent model for the baseline.** If ε_{ijt} is in fact stationary, then, with sufficiently large data (more than 10 observations), equation (1) can be estimated by ordinary least squares (OLS) and the estimates of the vector $\alpha = (\alpha_0, \alpha_1, \alpha_2)'$ are consistent in an asymptotic sense. More sophisticated dynamic formulations, stemming from (1) can be expressed in terms of "error correction" specification, that is:

$$\Delta \ln(q_{ijt}) = \beta_0 + \sum_{l=0}^{L} \beta_l \Delta \ln(Q_{jt-l}) + \sum_{l=1}^{L} \gamma_l \Delta \ln(q_{ijt-l}) + \delta \varepsilon_{ijt-1} + \nu_{ijt} \qquad (3)$$

where L is an arbitrary number of lags (in an annual regression probably one lag should suffice), ε_{ijt-1} is the lagged residual from equation (1) and ν_{ijt}, if (1) and (2) are correct specifications, should actually be a **stochastic innovation** (independently distributed over time).

In general terms, the robustness of the system (1) – (3) can be checked in the following manner:

a) Beginning with (1), one must be sure that ε_{ijt} is actually a stationary shock. One way to check this is to perform a Dickey-Fuller test on the errors of the OLS estimate of (1). Another test, could be to check for structural changes in (1). Very often, absence of normality in the errors of this equation may signal the existence of a structural change and therefore, normality tests such as Jarque-Bera or Kolmogorov tests on the errors of (1) are also advisable. Once the equation is estimated, absence of statistical significance in any element of α should prompt us to delete the variable from the equation since, as a general rule, ε_{ijt} will exhibit serial correlation, meaning that standard "t" tests are upwardly biased. For example, it could be the case that α_1 is significant but not α_2 or the other way around.

b) Unlike (1), specification (3) should be free of serial correlation in ν_{ijt}, this should be carefully checked (not only by looking at D.W. statistics but also looking at correlations of higher order and other complementary tests to make sure that we are in presence of truly innovations). The key final test to asses the robustness of the posited relationship should be given by the statistical significance of δ in (3): if that parameter estimate is significant, and negative, it means that the previous relationship (1) has truly statistical meaning (the "error correction" mechanism).

c) In general terms, the estimation should proceed as follows: OLS estimation of (1); recovery of the estimated errors of the regression, and the substituting those errors in (3)[10].

[10] In formal terms, the traditional specification of an error correction model is as follows:

$$Y_t = X_t^{`}\alpha + \varepsilon_t \qquad (1)$$

$$\Delta Y_t = c + \sum_{j=0}^{n} \Delta X_{t-j}^{`} \beta_j + \sum_{i=1}^{m} \Delta Y_{t-i}^{`} \delta_i + \tau \varepsilon_{t-1} + \upsilon_t \qquad (2)$$

Assuming the above estimation has been performed with historical data, previous to the application of the program under evaluation, one can make a few interesting inferences:

- A value of α_1 positive and significant, is indicative of some common effects shared by the cluster under study, with other comparable clusters in the country. A positive value but significantly lower than one, is indicative that, while a relationship with similar clusters exists, there is evidence of a sluggish performance in the cluster as compared with the others.

- A value of α_2 positive and significant, is indicative of an underlying exogenous trend of growth

After estimating this system, the same system can then be estimated **after** the program has been in place. Typically, one would need at least three years of additional data to carry a new estimation and derive some statistical conclusions. Ideally, one would like to carry over the new estimation assuming, first, that the α vector has not changed,

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Here, *Y* is the variable to be explained; *X* is a vector of explanatory variables (GDP, gasoline price, Diesel fuel price); ε and υ are the residuals from equations (1) and (2) respectively, and the "Δ" operator denotes the first difference of a variable. Typically *Y* and vector *X* are natural logarithms of the actual variables, such that ΔY_t and ΔX_t approximately correspond to percentage changes in *Y* and *X*.

Equation (1) corresponds to a long term relationship which is called the ***cointegration equation***. On the other hand, equation (2) describes the short term dynamics of variable *Y* as a function of the behavior of the explanatory variables, the lagged values of *Y* itself and of the deviations of *Y* with respect to its long term equilibrium value, one period ago (ε_{t-1}). There is no a priori restriction regarding the sign of the parameters to estimate, except for the coefficient that goes with ε_{t-1}, which is expected to be negative. This, because if the current value of *Y* is greater than its long term value given by equation (1), then $\varepsilon_t>0$ and thus it should be expected that in the next period the forces which determine the behavior of *Y* will tend to correct these deviations. For example, if the value of the coefficient that goes with ε_{t-1} is -0.25, such value is interpreted as follows: deviations between the long and short term values of *Y* today will be corrected in 25% of their magnitude in the next period, the deviation observed then will be corrected by 25% towards the equilibrium corresponding to that moment and so on for every successive period. Hence, this kind of model is termed *error correcting*. Technically, they are the most flexible dynamic linear models, able to accommodate a large variety of situations. For more detail see Engle, R. F. y Granger, C. W. J. (1987) "Co-Integration and Error Correction: Representation, Estimation and Testing". Econometrica 55, 2: 251 – 276.

and then, assuming that it has changed. The hypothesis that α has not changed can be done by means of a standard "F" test, or alternative, by means of specific hypothesis testing. The questions then that can be posed would be:

a) Has α_0 increased after the implementation of the program? "Increases" are assumed to be measured in a statistically significant way, e.g. the new α_0 would have to be higher and statistically different from the previous estimate. If that is the case, we could conclude that, as a result of the program, a once and for all increase in the level of the result variable took place.

b) Has α_1 increased after the implementation of the program? (again, "increases" meant to be statistically significant ones). If that is the case, one can conclude that the program improved the capacity of the benefited cluster to access natural spillover effects from similar clusters from the rest of the country.

c) Has α_2 increased after the implementation of the program? If that is the case, one can conclude that the program allowed a more rapid exogenous growth in the target cluster.

Adding these three effects, one could **decompose** the growth in the result variable as the sum of two components: changes in growth due to **historical trends, e.g. the correct "base line" for comparison**, and changes in growth due to **structural changes** that we can attribute to the implementation of the program. Specifically, from (1) we get:

$$\Delta \ln(q_{ijt}) = \alpha' \Delta X + \Delta \alpha' X + \Delta \alpha' \Delta X \qquad (4)$$

where $X = (1, \ln(Q_{jt}), t)'$, and therefore, the first term in (4) estimates **the change in the result variable consistent with "the base line";** the second estimates, **the change in the result variable as consequence of "structural change",** and the latter measures an interaction effect between the two.

A few remarks are necessary at this point:

a) In this approach, **"the baseline"** is not a "given, static, level" of the result variable, but it allows the possibility that the base lines increases as time passes: one cannot attribute **all** the increase in the result variable as the sole consequence of the cluster program. Being "within" the base line means growing under the system that historically has characterized growth in the target cluster. That is much better than assuming a static base line, as seems to be the implicit assumption in most of the programs described in the Annex. Yet, having a more sophisticated base line comes with a price: the imposition of a richer statistical structure to the data – such as equation 1 --, which will be reasonably only if the assumed model (or an alternative one that the evaluator may impose) is a good fit to the historical data. Hence, the need for the various "statistical checks" outlined before.

b) Underlying the above change estimates, there is the notion of **statistically significant changes**. For example, one can assume that an increase in α_0 has effectively taken place, only if the new estimate is statistically different from the previous one, and that can be carried over through standard hypothesis testing. Yet, as is well known, standard hypothesis testing focuses on "type I" instead of "type II" errors, and as a consequence of this, tends to be very exigent in terms of evidence requirement to reject the null hypothesis, the null being that **the parameter has not changed**. One possible remedy for this is to somewhat relax the confidence levels required to reject the null, say

from the standard 95% to something more in line with 75%. This may be particularly necessary if the program is being evaluated only after three years after implementation, when not all expected effects can be completely observable for the evaluator.

c) The emphasis on the evaluation is posed on **the structural changes** that may have taken place in the cluster as a result of the program. We do not pay attention to "any" change in result variables but mainly to changes due to structural changes in the performance. We attribute those structural changes to the program implementation. The yardstick is exigent.

d) There is nothing too fundamental associated to the usage of an equation like (1) for the application of this methodology. Particular definitions of the result variable may result on some different equations to work with, and the particular specification of (1) should be left to the evaluator, although for any choice that the evaluator makes, there will be a corresponding error correction specification like (3) with the corresponding statistical checkups. The crucial thing though is that whatever equation is used in replacement of (1), it must be a sensible statistical representation of the **conditional performance** of the result variable, that is, any variable that may be deemed to be a significant conditioner of performance, should be properly included (weather is another candidate). The artifice of including the "aggregate" Q_{jt} as a conditioning variable has the advantage of summing up a possible very extensive number of conditional variables: real exchange rate, international prices, trade treaties, etc. All those variables are supposed to influence the aggregate Q_{jt} and through this way, q_{ijt} .

e) If sufficiently cross section data were available, one could proceed in a more sophisticated way by estimating (1) as a "panel estimation".

Then, a more rich set of results could be obtained, like the differences in the α vector across different geographical areas.

f) One cannot fail to emphasize the importance of performing this evaluation with time perspective. Three years would be a minimum time frame to make any sensible evaluation for the suggested result variables. Since what is going on is structural change associated to the implementation of the program, such change can be better appreciated and observed with more years under scrutiny. Probably 5 years would be the optimal time frame for a rigorous evaluation.

Digression 2: Clusters at Different Stages on their "Life Cycle".

Commentators to an early version of this paper called attention to the fact that cluster comparison might be somewhat misleading because different clusters (producing the same core output of course), could be at different stages of their life cycles: some clusters could be mature, while others could be at their initial stages of development. I contend that the above methodology is relatively free from such critique. Precisely because we allow the α parameters to be **cluster-region specific**, we are in no way imposing the requirement that clusters should be growing at the same rate or affected in the same manner by nation-wide shocks and changes. A cluster in its early stages of development, could exhibit a low value of α_1 and a high value of α_2 for example (rapid initial growth, less affected by factors that do influence more mature clusters in the country).

Comparing Different Clusters in the Same Geographic Location

As it most probably will be the case, the application of the previous methodology will result in different impacts for the different clusters included in a given program. In some cases, we will observe structural changes that have fostered growth in the target result variables; in some others, we will observe that performance stays consistent with the base line. This rich amount of variance in the data provides an opportunity for learning. Are there systematic effects that may explain the observed differences in performance?

The first place to look at should be the **"fulfillment indicators"** to which we have made mention earlier in this paper. As explained before, virtually all programs summarizes in the Annex identify a set of indicators, measured at the "components" level of the program, that are not success or impact indicators but merely indicators that the planned activities within each component were actually performed. Therefore, a first explanatory variable for the various degrees of success – the measurement of growth in result variables – consists on the different degrees of accomplishment of the fulfillment indicators. A systematic analysis of the effect of each of these indicators in the observed result variables could be performed by standard binary models such as probit or tobit models. In those models, we can identify a binary variable y_j that takes a "1" in case of success (the result variable growing above the baseline) and "0" otherwise. The effect of the "fufillment indicators" can be estimated accordinf to the equation:

$$Yj = B_0 + B_1 FU_j + u_i \qquad (5)$$

where B_0 and B_1 are paremeters to be estimated, FU_j is a vector with fufillment indicators and the sub-index j represents a given cluster. In this way, the sign, magnitude and statistical significance of parameter B_1 will ndicate if the fufillment indicators are useful leading indicators to anticipate the success of the program.

An additional problem that may emerge with this method is the potential possibility that the completion of the fufillment indicators be correlated with toher characteristics of the cluster -- e.g, different educational levels of entrepreneurs, etc. If that is the case, the success of the program would be more the result of the specific characteristics of the clusters instead of the completion of the fulfillment indicators (reflecting the identified actions of the plan). One way to evaluate if that is the case is to incorporate the chararacteristics of the cluster as an independent variable in (5), that is:

$$Y_i = B_0 + B_1 FU_j + \lambda X + u_i \qquad (6)$$

where X is a vector that summarizes a set of variables exogenous to the program and idiosincratic to the clusters.

However, the main problem with the above methodology will most probably be lack of sufficient degrees of freedom for the estimation. Typically, total number of clusters in a program are less than 15, and very often, less than ten (see Annex). Under those conditions, the estimation of either (5) or (6) may become troublesome, unless some arbitrary aggregation is imposed (e.g., aggregation of levels of fulfillment in different activities). This leads us to an alternative approach, the approach **at the firm level.**

Measuring Success at the Firm Level

The methodology just outlined aimed at measuring success or impact of the program with an emphasis on **aggregate variables**: "result variables" are aggregate indicators of performance for the whole cluster. Yet, the aggregate indicator is a function of individual outcomes. Thus, starting from system (1)-(3), one could define, for a particular sample of firms, whether the sample has evolved along the lines of the aggregate or not. Presumably, the sample to be used pertains to the "beneficiaries" of the program, while the aggregate indicators of the result variable include the complete

region. The first question to be asked then is whether the sample of beneficiaries outperformed or underperformed the aggregate. To this end, at the beginning of the program, we should have defined in a very precise way **which result variables will be considered for evaluation,** so as to have the beneficiaries, fill the corresponding information at the moment they register as participants to the program. In addition to that, one should have a set of **firm-specific information** that we may deem potentially relevant for determining future success. Possible variables to be considered are: a) education level of the CEO; b) total fixed assets (size); c) total number of employees; d) years in operation; etc. Then, a model could be fitted to the data, relating the evolution of the result variable for each firm, as a function of the firm-specific data. This could be done **for each cluster included in the program.** The collection of results, combined with the analysis of the baseline derived from system (1)-(3) could then look as follows:

a) There may be a majority of clusters exceeding the baseline according to system (1)-(3) (SUCC=1), or only an "average result": some of them exceeded the base line, some others were below, all in, the complete region behaved more or less "average" as compared to other regions in the country (SUCC=0).

b) There may be a high degree of correlation between the performance of the cluster as a whole and the performance of the sample of beneficiaries (Corrr =1) or may be not (Corr = 0).

c) The goodness of fit for the equation explaining individual results and individual characteristics of the firm could be high (GF=1) or low (GF=0).

d) The characteristics that explain success at the firm level could be the same for different cluster (CROSS=1) or different beween them (CROSS=0).

The above possibilities give rise to potentially 12 different combinations. Some combinations have a straightforward interpretation while some other do not. Some interesting cases are the following:

i. If SUCC = 0, CORR = 1, GF = 1, and CROSS = 1, there is a good chance that the program had no significant effect in the region, and whatever "successful cases" may be have emerged they are most probably the result of firm-specific advantages rather than a consequence of the program.

ii. If SUCC = 1, CORR = 1, GF = 0, and CROSS = 0, then there is a good chance that the program had a significant effect in the region and that this impact had more to do with the intrinsic design of the program and the clusters chosen, rather than with the characteristics of the firms.

iii. If SUCC = 1, CORR = 1, GF = 1, and CROSS = 1, then the evidence is mixed: the program was a success but this may have been a combined result of the characteristics of the program and those pre existing characteristics of the beneficiaries.

Evaluation when no Comparable Cluster can be Found

The previous methodology attempted to construct a dynamic baseline, by proposing the formulation of statistical model of **conditional performance** of the result variable. The result variable was to be conditioned to both, an exogenous growth factor, and to the aggregate performance of comparable clusters in other regions of the country. Yet, such comparison may not always be possible to conduct: it may be the case that no comparable cluster exists within the country (e.g. salmons in Chile, all located in a given single cluster). If such is the case, and if the result variables are investment, output, exports, or exports of a given quality or to a given market, we suggest that the evaluator uses as a baseline **the supply curve** of the cluster. The supply curve could be more or less easily estimated in the case of cluster oriented to exports, for in such case, the price can be taken as exogenous.

Thus, in replacement of equation (1) above, one would have something like:

$$\ln(q_{ijt}) = \alpha_0 + \alpha_1 \ln(P_{ijt}) + \alpha_2 t + \varepsilon_{ijt} \qquad (1')$$

Where P_{ijt} is a **relevant relative price**. For example, it could be the export price expressed in real terms by appropriate usage of a local or national deflator (national CPI being the most simple-minded option). If the left-hand side variable were exports allocated to a target segment (hig-valued segment), P_{ijt} could be a relative price: the ratio between the unit revenue obtained in the target segment and the price obtained in the overall market. As in the previous formulation, the key thing to look at is not whether ε_{ijt} is free from serial correlation, it most probably will not, but instead, to see whether ε_{ijt} is or not a stationary random shock. If that random shock is actually stationary, then the relationship has economic content, and one can proceed with similar extensions as equation (3) above, and comments a) to c) of page 19 apply equally as well.

What would we be looking after the cluster program? Essentially, **a positive shift in the supply curve,** reflected either in an increase in α_0 or α_2, meaning, more of the result variable controlling for the prevailing export prices. The decomposition of effects suggested by equation (4) could be conducted equally as well in this case. The **contemporaneous relationship** suggested by (1´) is better applied when the result variable is an investment-related variable (e.g. new plantations in year t); If it were being an output-related variable (output, exports, etc), one might expect that prices enter with some lag depending on the life cycle or time-to-build constraints (a couple of years in the case of fruit or wine; one year in the case of most aquacultures, etc). The appropriate dynamic relationship would be the decision of the evaluator, based on ground-based knowledge from the economic agents themselves.

If the result variable were a price, as it could be the case if the final objective is to increase the average price by introducing quality improvements and better marketing, then the left-hand side variable would be a price, and possible instruments for the left hand side variable could be overall supply to the market (assumed to be foreign). The analysis done by Gustavo Baruj for the case of Argentina, indicates that in many instances, given the agri-business nature and export orientation of the cluster programs in this country, this approach would be perfectly doable (Baruj, 2007, p. 10).

Field Researchers that analyzed the viability of applying this framework to particular cluster programs in Argentina, Brazil, and Uruguay, called the attention to some difficulties regarding specific export sectors that do not export a "commodity" but a heterogeneous array of products. Clearly, in that case it would be more difficult to identify a given supply curve and, of course, it would be somewhat misleading to speak about "the" export price. My suggestion in that case would be to focus on "effort variables" such as investment (possibly using imports of specific capital equipment as proxy) instead of trying to identify the supply curve of the sector.

A much more complicated case arises if the cluster is oriented to the local or national market, and no comparable cluster is at hand. That appears to be the case with the cluster program of shoes and textiles in Uruguay, and some of the cluster programs in Brazil. In those cases, the price might be endogenous to the own supply of the cluster, and we are talking about a risky program: subsidies given to some "beneficiaries" could expand **their** own supply, decrease national prices, and negatively affect the non-beneficiaries of the program. In that case, the supply curve has to be estimated through more sophisticated estimations techniques (e.g. 2 stage least squares) that take into account the endogeneity of prices through adequate usage of pertinent instruments. It is extremely difficult if not impossible at all to suggest a sensible way of proceeding in that case short of a case-by-case analysis. Yet, in that case, at least a non-parametric approach should be attempted. Under that approach, one would take the historical sample of all beneficiaries (many companies, several years) and one could use that as a "basis sample". Then, one could record the output observations for the same sample in the coming years and make a non parametric comparison, e.g., to test

the hypothesis of whether the mean output has or not increased after the program (the null being that mean output has remain unchanged). Such an approach might be advisable in case of a stagnant sector, as it seems to be the case with some of the cluster programs that have a domestic market focus ("defensive" cluster programs as Baruj terms them).

4. Performance Indicators

So far, we have focused entirely on result variables because those are the main concrete indicators of the **economic impact** of the programs. Yet, the cluster programs typically aim at upgrading the competitiveness of a region by putting special emphasis on collective learning efforts, improved coordination between competitors, improved coordination between the public and the private sector, increased spillover of relevant R&D efforts, behavioral and organizational changes in regard to innovation, and so on. In other words, part of the objective of any cluster program is to induce an attitudinal change in the firms, in particular with respect to the issues of cooperation and innovation. Hence, those are particular "result variables" whose main difference with the result variables discussed so far is that they are not easily measured nor they have an obvious impact on immediate economic performance (but they are believed to improve long-term competitiveness). They differ from the "fulfillment indicators" in that those are instruments to achieve an end result, while an attitudinal change can be thought of as an end by itself, to the extent that such a change increases the competitiveness of the cluster in the long-run. The measurement of the attitude changes thus helps to provide a more complete picture of the impact of the program.

Yet, attitude or conduct changes are hard to measure. One typical approach is to rely on surveys, questionnaires and interviews performed within the group of beneficiaries of the project. A usual pitfall of such approaches is that what matters for economic performance is the actual behavior of agents, not what agents tell other people about themselves. And interviews, questionnaires, and surveys, while rich in terms of uncovering opinions, tend to be relatively poor in reporting actual behavior. The

evaluator should consider surveys, questionnaires and interviews as part of the qualitative appraisal of the program. But those instruments need to be carefully designed in order to avoid the usual pitfall. The recording of concrete examples of cooperation between firms, probably uncovered through in-depth interviews and detailed case studies should be preferred to the more open question of whether the program helped the interviewed to learn about cooperation between firms. The recording of concrete cases of improved coordination with the public sector should be preferred to the vaguer mentioning of "better coordination and cooperation". The -- usually generalized – positive evaluation of the program by beneficiaries who in some way or another received some subsidy from the program should be looked suspiciously as a starting working hypothesis for the evaluation.

Having said all that, in what follows I provide several examples of possible questions that could be included in a survey aimed at evaluating those attitudinal changes, trying at the same time to avoid the aforementioned pitfalls.[11]

Innovation Activity

- Number of companies that have introduced products (goods and services) that are new or considerably improved to the market during the last 3 years. In case they have done so, state the result from a profit perspective.
- Number of companies that have introduced new or significantly improved processes over the last 3 years. In case they have done so, state the result from a profit perspective.
- Number of companies that have open new destiny markets over the last 3 years. In case they have done so, state the result from a profit perspective.
- Number of companies that have introduced organizational changes over the last 3 years.

[11] The following list of questions borrows heavily from the comment note by Harald Furre dated March 11, 2007.

- Number of companies with innovation cooperation, including R&D, with other companies or institutions.
- Major factors that limit innovation activity in the companies.
- Number of companies that their innovation cooperation as consequence of the cluster program (self assessment).
- Number of patent applications if any (probably not relevant for the current cluster programs I have analyzed).

Work Force

- Number of specific training programs in which the company involved their employees over the last 3 years.
- Share of work force with higher education. Did it increase in the last 3 years?
- The companies´ assessment of the availability of competent local, national, and foreign work force. Has it changed over the last 3 years?

Knowledge Resources

- Share of turnover spent on R&D last year.
- Man-labour years in R&D institutions directly involved in the operations of the cluster.
- The companies´ assessment of the access to R&D resources and institutions and the perceived quality of those.

5. The Methodology at Work

This paper developed a number of different avenues to tackle the problem of cluster program evaluation. The suggested methodologies were meant to be useful for their application on several programs currently under implementation by IADB. Local consultants in different countries checked whether the proposed methodology could be effectively applied, given the availability of information and the potential cost of acquiring new one if that is deemed necessary (particularly on the economic impact angle of the problem). The results of that research were generally positive, in that the methodology could effectively be implemented, at a reasonable cost (see reports by Baruj and Suassuna). The methodology related to the **economic impact** (section 3), should be combined with the analysis of **fulfillment indicators** (included already in the preliminary proposals of the programs themselves), and the **performance indicators,** generally described in section 4, to achieve a comprehensive and integral appraisal of the various cluster programs under implementation.

In what follows, I focus on a couple of specific issues that emerged from the field research done by local consultants so as to provide further guidance in the overcoming of some particular difficulties.

- **Statistical "Secrecy".**

  Field researchers brought up the issue that in many countries, statistical secrecy might impede the systematic recording of some key result variables of the cluster. They did provide though alternative avenues to tackle this problem. Here is just another way of coming around this issue. Statistical secrecy, generally seeks to impede the obtainment of information that is **firm-specific**, and firms, in general, have good reasons to keep things like that. Yet, for the purpose of measuring economic impact, what we need is not firm-specific measurement but aggregate information regarding result variables (the

aggregation of result variables for a given cluster, e.g. total exports of the cluster, not the export of each specific company). The office in charge of executing the program, should therefore attempt to obtain a release from participating firms, in order to have access to particular **aggregate result variables**, thus maintaining the confidentiality at the firm level, but gathering at the same time the relevant information for the cluster as a whole.

- **Cluster Programs with Focus on the Domestic Market**

We already discussed the particular difficulties arising with this kind of program (section 3). Supply curve estimations may be difficult to obtain; it was suggested that a non parametric approach be followed instead. Such an approach might be appropriate in case of a previous history of stagnant production and performance, a feature that seems to characterize many of the cluster programs that are focused on the local market instead of the international one.

- **Control Variables as Opposed to Result Variables**

From the reading of the reports by Baruj and Suassuna, it becomes quite evident that the estimation of supply curves may present some difficulties. I suggests that whenever possible, the supply curve estimates be combined with estimates regarding "effort" or "control" variables. It might be easier to estimate in some instances the investment decision side of the problem (area planted, new equipment purchased, etc) rather than the supply curve itself.

Finally, and just for the sake of completeness and future usage of this report, I repeat here the Guidelines I proposed in the 2nd version of this paper for the usage of field researching having the task of putting this methodology at work. This is proposed in the form of sequential questions/answers and suggestions.

The underlying context is one single program taken place in a given region where $j = 1,2,..M$ clusters have been identified. For each of the identified clusters address the following:

COMPARING CLUSTERS

a) **What would be a sensible "result variable"?** The result variable has to be intimately related with the ex-ante diagnosis of the cluster. If the main problem identified was lack of investment, then investment and output should be the result variables to look at. If the main problem addressed was inefficient quality and marketing, then, probably, the result variable should be unit export price, or the fraction of export accruing to high-price markets.

Suggested result variables (there can be several others):

- Total Output
- Related Investment (area planted in case of fruits).
- Fraction of High-valued exports (e.g. bottled wine against wholesale exports).
- Total exports of the cluster output going to specific target markets (presumably of higher price and better growth prospects).
- Unit export prices

b) **Are there available time series for the chosen result variable?** If so, how many years (or quarters)? (10 or more than 10 would be the optimum; 5 would require specific adjustments to the model).

c) Can we find similar clusters in different parts of the country for which we can measure the same result variable, with a similar time span? Please name them.

THE CASE WHEN NO COMPARABLE CLUSTER EXISTS

d) **If c) is responded negatively, what are the key relative prices that may explain supply?** Or put in more general terms, what are the key (no more than two) driving forces that affect the result variable?. Are there sufficient time series for them? Please explain why you think they are relevant driving forces.

MEASURING SUCCESS AT THE FIRM LEVEL

e) **Thinking now in all the firms adhered to the cluster program (all clusters in the region, all firms beneficiaries), what are the chances that the following variables could be tracked down in a survey (at the firm level): i. result variable (whatever it be); ii) age of the firm; iii) education level of the controller; iv) sales of the firm; v) capital of the firm (balance sheet); vi) number of employees; vii) education level of the employees (by category); viii) total debt of the company.** Please provide an estimate of what the cost would be of such a survey.

PERFORMANCE INDICATORS

f) **Qualitative Appraisal/ Case Studies.** Thinking now in the main activities considered in the program and their intended effects, please name for each cluster, three major events (possible future case studies) that in your view would signal a success of the program (e.g. investment in the region by a large firm from the outside; trade agreement with a large trader abroad; a specific change in technology; etc).

g) **Attitudinal Indicators.** Refer to section 4 of this paper.

ANNEX

Brief Summary of Cluster Programs and Their

Proposed Evaluation Methodology

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ANNEX

The IADB Cluster Support Programs

The purpose of this annex is to provide a **very synthetic description of the cluster support programs** developed by the Bank.

This annex will broadly identify the **initial situation** upon which program implementation is based, as well the **industries or products involved** in the clusters being supported.

In addition, the **activities planned** for each program are described.

Finally, a **brief description of the proposed evaluation mechanisms** is included for the different existing cluster support programs.

1. General Description of the IADB Cluster Support Programs

1.1 Seven South American Programs for US$302 Million

The programs discussed here correspond to the seven programs co-financed by the Inter-American Development Bank in three South American countries (Argentina, Brazil, and Uruguay). The programs are financed with the specific objective of helping to increase the competitiveness of business groups from different industries. These enterprises are geographically grouped and can be called productive conglomerates, productive chains, or clusters.

The general and specific objectives of the seven programs are listed below in Table 1.

Table 1
IADB - CLUSTER SUPPORT PROGRAMS
GENERAL AND SPECIFIC PROGRAM OBJECTIVES

Program	Location	General Objective (goal)	Specific Objective (purpose)
AR-L1003	Mendoza	Contribute to the **development of a competitive provincial economic structure** focused on value chains linked within a strengthened public-private environment.	Increase the sustainable competitiveness of the **value chains** located in the province's seven productive circuits.
AR-L1022	San Juan	Support **economic growth and job creation** in the Province.	Increase the **productive chains'** competitiveness in order to create investment projects financed by Program resources.
BR-L1016	San Pablo	Increase the **competitiveness of the enterprises in the APLs** selected to participate in the Program in the state of San Pablo.	Increase coordination between enterprises and institutions to ensure that **enterprises in the APLs** supported by the Program adopt competitive practices.
BR-L1020	Pernambuco	Increase the **competitiveness of the enterprises in the LPAs** from the sectors in the state with comparable advantages.	Support the development of a mechanism for producing and disseminating innovations and for coordination among s**takeholders (enterprises, related institutions, etc.) of the participating LPAs**.
BR-L1021	Minas Gerais	Increase the competitiveness of the enterprises in the participating LPAs.	Strengthen the instruments and mechanisms for innovation and coordination between **local stakeholders** and state and federal levels (**enterprises, support and research institutions, etc**.)
BR-L1023	Bahía	Increase the competitiveness of the enterprises in the LPAs in the State of Bahía.	Coordinate different support instruments for enterprises promoting competitive and sustainable practices among the enterprises in the participating LPAs.
UR-L1020	Uruguay	Contribute to the **sustaible development of the conglomerates and productive chains (COPs)** in Uruguay.	Increase the competitiveness of the **supported conglomerates and productive chains**.

Overall, the budget for the seven programs amounts to US$332 million, 61% (US$202 million) of which is financed by the Inter-American Development Bank. The remaining funds are provided by the governments in each country and location, as show in Table 2. Disbursement periods vary between three to five years, and a provincial or national government is always appointed as the loan executer.

Table 2
IADB - CLUSTER SUPPORT PROGRAMS
FINANCING AND IMPLEMENTATION

Location	Loan Recipient	Guarantor	IADB Fin. (US$Mil)	Local Fin. (US$Mil)	Total Fin. (US$Mil)	Disbursement Period	Executor
Mendoza	Province de Mendoza	Republic of Argentina	120,0	79,7	199,7	5 years (Phase I)	Provincial Ministry of Finance (MH)
San Juan	Province of San Juan	Republic of Argentina	32,6	20,4	53,0	5 years	Ministry of Production and Economic Development of the Province of San Juan
San Pablo	San Pablo State Government	Republic of Brazil	10,0	10,0	20,0	3 years	Secretary of Science, Technology, and Economic Development (SECTDE)
Pernambuco	Pernambuco State Government	Republic of Brazil	10,0	6,7	16,7	3 years	Secretary of Science, Technology, and the Environment of the State of Pernambuco (SECTMA)
Minas Gerais	Minas Gerais State Government	Republic of Brazil	10,0	6,7	16,7	3 years	Secretary of Economic Development of Minas Gerais (SEDE) via the Euvaldo Lodi Institute of Minas Gerais (IEL)
Bahia	Bahía State Government	Republic of Brazil	10,0	6,7	16,7	3 years (2.5 Exec.)	Secretary of Science, Technology, and Innovation (SECTI)
Uruguay	Republic of Uruguay	Republic of Uruguay	9,0	0,0	9,0	5 years	Development Project Division (DIPRODE) of the Planning and Budgeting Office (OPP)
Total Financing			**201,6**	**130,1**	**331,7**		
			61%	**39%**	**100%**		

1.2 Background Information and Prior Experience

In general terms, all of the programs have received prior support from the national and provincial or state governments through local business competitiveness-promotion policies.

Six of the seven programs co-financed by the Bank have been preceded by targeted studies to clearly identify the main issues facing enterprises eligible for the programs. The studies also identify the clusters (productive conglomerates, productive chains, local productive arrangements, etc.) targeted by the programs. In Mendoza, for example, the study on preexisting clusters was conducted by a Spanish firm. The criteria recommended by the firm have been used to prioritize and select the clusters supported by the current program. In San Juan, a project sponsored by the Ministry of Production (Study 1.EG.54: "Study for Promoting SME Competitiveness and Increasing the Value Added of San Juan's Productive Chains") identified 11 active chains in the Province. In Minas Gerais, the state government has made a great effort to map and analyze its LPAs. In 2000, together with the firm McKinsey & Company, the state carried out the Cresce Minas study which identified 47 LPAs based on an analysis of the most important economic activities, their locations, business platforms, access to technology, and growth forecasts.

Similar problems were found in practically all of the programs:

a) In some cases, there are labor and infrastructure (roads, energy, or technology) failures.

b) Serious difficulties in accessing adequate financing according to their terms, security, and financial cost;

c) Lack of strategic planning;

d) Lack of inter-enterprise cooperation;

e) Lack of cooperation with the public sector;

f) Redundancy, dispersion, and lack of coordination and depth of public institutions;

Likewise, all of the new competitiveness programs claim to be designed based on prior experiences and a series of lessons learned, such as:

(i) The efficiency of competitiveness programs is maximized if they are designed and executed with the help of financing programs;

(ii) These programs should include feasible tools: technical assistance for competitiveness aimed at helping firms reach creditworthiness; technical assistance for financial intermediaries in overcoming certain market failures (problems in credit assessment or high loan costs); or long-term funding that presents unacceptable or unwanted or undesirable mismatches for intermediaries;

(iii) Notwithstanding, the target should be for any competitiveness program to lead to the creation of enterprises with business plans and investment projects and that these enterprises receive private credit financing which can prove the soundness of the business plans and investment projects;

(iv) The private sector should play a leading role in determining business demands and in designing the competitiveness programs. This means considering business awareness measures even during early development stages. The public sector's role is that of a strategic partner;

(v) It must be guaranteed that the group of enterprises benefiting from the program (productive conglomerate, productive chain, or cluster) shares a strategic vision guiding program interventions;

(vi) It is very important that some form of prior collaboration exists among the enterprises forming the groups that will benefit from the programs;

(vii) A robust monitoring and assessment system must be developed to guide and provide feedback for the implementation of existing and future programs.

1.3 Clusters Supported by the Programs

The clusters targeted for support in each of the areas where a program is being studied are described below.

1.3.1 Clusters in Mendoza

The program will support only nine of the 19 clusters identified, grouping them into seven productive circuits. The selected clusters are part of value chains within the productive circuits that concentrate the Province's value and export production. The selected clusters are:

Four food and agriculture	olive oil, fresh fruit, fresh produce, and dried fruit;
Two tourism	Adventure-trekking-mountaineering tourism, rural and nature tourism (including vineyard tours);
Three manufacturing and services	textiles for clothing, graphics, and oil services (extraction-refinement of oil and related services).

1.3.2 Productive Chains (PCs) in San Juan

Eleven active chains in the Province were identified:

(i) fresh fruit;

(ii) fresh produce;

(iii) differentiated wines;

(iv) Basic wines;

(v) raisins;

(vi) grape juice;

(vii) industrial produce;

(viii) mining;

(ix) olives and olive oil;

(x) seeds; and

(xi) tourism.

1.3.3 Local Productive Arrangements (LPAs) in San Pablo

In San Pablo, Brazil, the Program will include enterprises from the 15 selected LPAs:

(i) jewelry in São Jose de Rio Preto;

(ii) furniture in Mirassol;

(iii) clothing industry in Ibitinga;

(iv) red ceramics in Vargem Grande do Sul/ Tambaú;

(v) clothing industry in Cerguilho/Tietê;

(vi) women's footwear in Jaú;

(vii) men's footwear in Franca;

(viii) children's footwear in Birigui;

(ix) white ceramics in Porto Ferreira;

(x) wooden furniture in Itatiba;

(xi) medical / hospital products in Ribeirão Preto;

(xii) semi-precious stones in Limera;

(xiii) red ceramics in Itu/Tatuí;

(xiv) clothing industry in Jundiaí, and

(xv) "Tahiti" lemons in São Jose de Rio Preto.

1.3.4 Local Productive Arrangements (LPAs) in Pernambuco

In Pernambuco, Brazil, seven LPAs were selected to be included in the Program.

(i) Clothing industry (Caruaru, Toritama, and Santa Cruz do Capibaribe) (initial LPA);

(ii) Plaster (Araripe Region) (initial LPA);

(iii) Goat and sheep breeding (Serra Talhada);

(iv) Dairy Products (Garanhuns);

(v) Culture (Recife);

(vi) ITCs (Recife), and

(vii) Wine, grapes, and byproducts (Petrolina, Valle de San Francisco).

1.3.5 Local Productive Arrangements (LPAs) in Minas Gerais

In Minas Gerais, Brazil, seven LPAs were selected to be included in the Program:

(i) Footwear (Nova Serrana) (initial LPA);

(ii) Electronics (Santa Rita do Sapucaí) (initial LPA);

(iii) Furniture (Ubá);

(iv) Artisanal drinks (Salinas);

(v) Clothing industry (Muriaé Region);

(vi) Smelting (Divinópolis, Itaúna, and Cláudio); and

(vii) Biotechnology (Belo Horizonte Metropolitan Region).

The Program will initially support the implementation of activities proposed in the Plans to Improve Competitiveness ("Planes de Mejoramiento de la Competitividad," PMCs) prepared for the initial LPAs: electronics (Santa Rita do Sapucaí) and footwear (Nova Serrana). Following this, activities included in the PMCs to be prepared for the remaining five LPAs will be co-financed.

1.3.6 Local Productive Arrangements (LPAs) in Bahia

In Bahia, Brazil, the following LPAs were selected for the program:

(i) fruit production;

(ii) information technology (IT) (pilot LPA, with an immediate Competitiveness Improvement Plan, CIP);

(iii) metalmechanics;

(iv) plastic transformation;

(v) marble and granite;

(vi) ecotourism;

(vii) clothing industry (pilot LPA, with immediate CIP);

(viii) fish farming;

(ix) sugar cane byproducts; and

(x) goat and sheep breeding.

1.3.7 Productive Conglomerates (COPs) in Uruguay

The program will work through strategic interventions defined in a Plan to Reinforce Competitiveness ("Plan de Refuerzo de la Competitividad," PRC) for each COP. The PRC will map the enterprises and institutions that belong to the conglomerate, present existing coordination problems, and describe the conglomerate's competition bottlenecks. By identifying the COPs' demands, resource allocation can be guided for both Program funds and those of other available public instruments.

1.4 Activities Included in the Cluster Support Programs

The activities in each cluster support program are described below.

1.4.1 Activities in the Cluster Support Program in Mendoza

Table 3.1
MENDOZA - DESCRIPTION OF ACTIVITIES

Component 1	**10**		**Public infrastructure supporting productive activities (US$75,560,000)**
		11	Infrastructure (US$74,300,000)
		12	Strengthening Institutional Infrastructure (US$1,260,000)
Component 2	**20**		**Improving conditions for access to financing (US$19,210,000)**
		21	Financial Services (US$17,040,000)
		22	Non-financial Services (US$2,170,000)
Component 3	**30**		**Technical-Professional Training (US$7,280,000)**
		31	Technical-Professional Training / Adult Education (US$6,490,000)
		32	System Strengthening (US$790,000)
Component 4	**40**		**Cluster Promotion (US$4,020,000)**
		41	Cluster Characterization and Invigorating (US$1,990,000)
		42	IRC Implementation (US$1,510,000)
		43	Institutional Strengthening (US$520,000)

IRCs Initiatives to Reinforce Competitiveness

1.4.2 Activities in the Productive Chains (PCs) Support Program in San Juan

Table 3.2
SAN JUAN - DESCRIPTION OF ACTIVITIES

Component 1	**10**			**Financial Support (US$18,500,000)**
		11		**Creation of a Financial Facility (US$14,000,000)**
			111	Appointment of a regulated entity to act as a trustee
			112	Creation of a Trust where the Province will act as a trustor
			113	Medium- and long-term financing through intermediary financial institutions (IFI), acting as first-tier banks
		12		**Financing Promotion, or eligible promotion activities (US$4,500,000)**
			121	Training for specialized credit officers and transaction costs associated with Program participation
			122	IFI participation in creating strategic plans for the chains
			123	Structuring costs for the associated vehicles receiving credits
			124	Costs of creating and revising loan proposals of eligible credit recipients
			125	Program follow-up costs
			126	Consultants' fees for loan creation sucesses
			127	Dissemination and training seminars to access Program credit
			128	Trust operating costs, including the Trust's fees
			129	Expenditures of IFI guarantee assignment to the Trust.
Component 2	**20**			**Non-Financial Support for Productive Chain's Competitiveness (US$10,000,000)**
		21		**Strategic planning for productive chains. Diagnostic, awareness, and strategic planning for the chains (US$2,000,000)**
		22		**Implementation of activities and projects, PMC Implementation (US$6,700,000)**
			221	Technical assistances, training, and market access
			222	Structuring Projects
		23		**Other actions supporting CP competitiveness improvement, Implementation of parallel actions supporting the Productive Chains' competitiveness improvement, which will be carried out by the San Juan Agency (US$1,000,000)**
			231	Gathering and disseminating general information about interest market access for the Provincial chains
			232	Coordination, collaboration, and the provision of information and support for enterprises about programs and other financial sources.
			233	Investment promotion and attraction
			234	Creation of a database of consultants offering services related to Program components
		24		**Scaling up the Clean Production and Sustainable Development Program**
Component 3	**30**			**Institutional Strengthening (U$S1,960,000)**
		31		**Competitiveness support via coordination with national, provincial, and international efforts to promote public-private collaboration**
			311	Creation of a competitiveness promotion agency called the San Juan Agency (coordination center/implementation of the different CP's commercial and productive strategies (US$460,000)
			312	Creation of the Program Executive Board (UEP) (US$400,000)
			313	Provision of technical and professional services
			314	Identification of and aid in creating public policies supporting the productive sector
			315	Creation and dissemination of statistics controlled by the Economics and Statistics Research Institute (IIEE)
			316	Financing of measures promoting a better business atmosphere in the Province

CPs	Productive chains ("Cadenas productivas")
IFIs	Intermediary Financial Institutions ("Instituciones Financieras Intermediarias")
UEP	Program Executive Board ("Unidad ejecutora de programas")
PMCs	Plans to Improve Competitiveness ("Planes de mejoramiento de la competitividad")

1.4.3 Activities in the Local Productive Arrangement (LPAs) Support Program in San Pablo

Table 3.3
SAN PABLO - DESCRIPTION OF ACTIVITIES

Component 1	**10**			**Awareness-raising and mobilization of entrepreneurs and local stakeholders (US$ 1,871,000)**
		11		Self-diagnosis of management and enterprise dynamic
		12		Training and awareness in business cooperation and socio-environmental issues
		13		Short-term action planning workshops
		14		Implementation of short-term actions.
Component 2	**20**			**Creation of Plans to Improve Competitiveness (US$ 1,456,000)**
		21		**Series of diagnostics and sector-based studies to support the creation of PMCs**
			211	Management studies
			212	Market studies
			213	Agent behavior studies
			214	Mapping of productive chain, emphasizing the relationships between enterprises in the local chain
			215	Agenda for negotiating with and estimating links in the chain beyond LPAs
		22		**Participatory planning for strategic alignment**
			221	Workshop for presenting the diagnostic results to entrepreneurs and local groups
			222	Workshop for Program participants to explore the needs openly expressed by the entrepreneurs
			223	Workshop with DAFO17 analysis for the LPA and discussion of results and ramifications
		23		**Final draft and approval of the Plans to Improve Competitiveness (PMCs)**
			231	Creation of the PMCs by the enterprises in the pilot group, with the support of an outside consultant
			232	Identification of the actions that will be financed by Program funding
			233	Formalization of the Agreement of Results (AR) by the entrepreneurs and other local institutions involved in the PMC as well as representatives from other institutions linked to the Program ("parceiras": the Brazilian Support Service for Local Micro- and Small Enterprises, SEBRAE-SP, and the San Pablo Industries Federation, FIESP)
			234	Annual reviews of each PMC conducted by the pilot group with the support of a specialized consulting team.
Component 3	**30**			**Implementation of the PMCs (US$14,555,000) with financing via shared cost mechanisms**
		31		Financing of technical assistance activities that are related to and help fulfill each PMC's objectives
		32		Financing of training activities that are related to and help fulfill each PMC's objectives
		33		Financing of market access activities that are related to and help fulfill each PMC's objectives
		34		Financing of parallel actions for the entire LPA
Component 4	**40**			**Monitoring, assessment and dissemination of lessons learned (US$522,000),**
		41		**Launch of monitoring and assessment system for the Program, run by the Program Management Unit (UGP)**
			411	Data gathering plan for follow-up and assessment of the outlined indicators
			412	Follow-up system for the activities implemented in each LPA through the SEBRAE's outcome-based management system (SIGEOR)
		42		**The Program's Learning Strategy**
			421	Learning Workshops (at Months 6, 12, 18, 24 and 30 during Program implementation) attended by entrepreneurs, public employees, staff from support institutions, members of the local government (CG), and consultants.
			422	Biannual meetings of the Strategic Council
			424	Program activities and events to publicize the outcomes achieved
			423	Analysis, discussion, and dissemination of the lessons learned by the Program
		43		**Outside assessment strategy that complements the UGP's monitoring and assessment system**

LPAs	Local productive arrangements ("Arreglos productivos locales")
PMCs	Plans to Improve Competitiveness ("Planes de mejoramiento de la competitividad")
ARs	Agreement of Results ("Acuerdos de resultados")
CG	Local governance center ("Centro de gobernanza local")
UGP	Program management unit ("Unidad gestora del programa")
SIGEOR	Outcome-based management system ("Sistema de gestión orientado por resultados")

1.4.4 Activities in the Local Productive Arrangement (LPAs) Support Program in Pernambuco

Table 3.4
PERNAMBUCO - DESCRIPTION OF ACTIVITIES

Component 1	**10**		**Development of a public-private model to support competitiveness improvement among the APLs (US$1,000,000)**
		11	Definition of Shared Development Strategies for the APLs (US$100,000)
		12	Diagnostic of ICT use and needs in the APLs (US$100,000)
		13	Definition of the PMCs in the APLs (US$800,000)
Component 2	**20**		**Implementation of the APLs' Plans to Improve Competitiveness (US$12,165,000)**
		21	Implementation of the APLs' shared development strategies (US$ 350,000)
		22	Implementation of the PMCs in the seven APLs (US$ 11,815,000)
Component 3	**30**		**Strategic applications of information and communications technology (TICs) for the APLs (US$1,700,000)**
		31	Conceptualization and development of CRP architecture and applications (US$1,200,000)
		32	Support for the placement of CRP components in two APLs (US$500,000)
Component 4	**40**		**Program follow-up, assessment, lessons learned identification system (US$380,000)**
		41	Placement and launch of the follow-up, assessment, lessons learned identification system (US$262,000)
		42	Dissemination of Program outcomes (US$118,000)

LPAs	Local productive arrangements
ICTs	Information and Communications Technologies
PMCs	Productivity Improvement Programs ("Programas de mejoramiento de la productividad")
CRP	Cluster Resources Planning

1.4.5 Activities in the Local Productive Arrangement (LPAs) Support Program in Minas Gerais

Table 3.5
MINAS GERAIS - DESCRIPTION OF ACTIVITIES

Component 1	**10**		**Development of a public-private model to support competitiveness improvement among the LPAs (US$640,000)**
		11	Diagnostic of consulting projects for the LPAs (US$489,000)
		12	Preparation of PMCs (US$151,000)
Component 2	**20**		**Implementation of the LPAs' competitiveness improvement plans in six areas of support (US$13,786,000)**
		21	LPA-level governance management, and administration (US$715,000)
		22	Training and consulting for enterprises (US$2,698,000)
		23	Basic industrial technology and technological and organizational innovation (US$5,617,000)
		24	The environment and social development (US$1,632,000)
		25	Logistics (US$786,000)
		26	Commercialization, market exploration, and exports (US$2,338,000)
Component 3	**30**		**Development of a follow-up, assessment, lessons learned identification system (US$639,000)**
		31	Placement and launch of the follow-up, assessment, lessons learned identification system (US$314,000)
		32	Preparation and implementation of a communications and dissemination plan (US$325,000)

LPAs Local Productive Arrangements
PMCs Productivity Improvement Programs ("Programas de mejoramiento de la productividad")

1.4.6 Activities in the Local Productive Arrangement (LPAs) Support Program in Bahía

Table 3.6
BAHIA - DESCRIPTION OF ACTIVITIES

Component 1	**10**		**Awareness, mobilization, and coordination between the LPAs (US$2,552,000)**
		11	Diagnostic and Improvement Plans for enterprises in the LPAs (US$697,000)
		12	Consolidation and Strengthening of the OGLs (US$97,000)
		13	Training and Strengthening of the Associated Networks (US$1,140,000)
		14	Creation of Plans to Improve Competitiveness (US$609,000)
		15	Creation of TORs for Learning Networks (US$8,000)
Component 2	**20**		**Bridging the gap between business services supply and enterprises' demand in LPAs (US$855,000)**
		21	Implementation of the Open Records (US$133,000)
		22	Implementation of Information and Communications Services, disseminating the Program's outcomes and opportunities on a global scale (US$722,000)
Component 3	**30**		**Direct actions to strengthen LPAs' competitiveness (US$10,551,000)**
		31	Implementation of Structuring Projects (US$7,514,000)
		32	Implementation of the Associated Networks' Business Plans (US$3,037,000)
Component 4	**40**		**Program dissemination, follow-up, and assessment (US$585,000)**
		41	Program dissemination (US$422,000)
		42	Implementation of the Follow-up and Assessment System (US$163,000)

LPAs Local Productive Arrangements
OGLs Local Governance Organizations ("Organizaciones de gobernanza locales")
TORs Terms of Reference

1.4.7 Activities in the Productive Conglomerates (COPs) Support Program in Uruguay

Table 3.7
URUGUAY - DESCRIPTION OF ACTIVITIES

Component 1	**10**		**Preparation of the Plans to Reinforce Competitiveness (PRCs) (US$730,000)**
		11	Summoning COPs
		12	Selecting 12 COPs
		13	Invigorating COPs
		14	Creating PRCs and IRCs (COPs, consultants, facilitators, and support and follow-up groups)
Component 2	**20**		**Implementation of PRCs (US$6,060,000)**
		21	Quarterly submission of projects
		22	Project preparation ("*estructurante*", open or closed) with program support
		23	Approval of project co-financing
		24	Resource allocation and disbursement
Component 3	**30**		**Strengthening and coordination with business support framework (US$715,000)**
		31	Coordination workshops
		32	Institutional strengthening activities with related public agencies
		33	Follow-up and Assessment System (SSE)
		34	Information system for productive sector

COPs	Productive conglomerates ("Conglomerados productivos")
PRCs	Programs to Reinforce Competitiveness
IRCs	Initiatives to Reinforce Competitiveness
SSE	Information system for productive sector ("Sistema de información al sector productivo")

1.4.8 Summary of IADB Support Program Activities

A preliminary breakdown of activities shows an overall panorama of the programs and the priorities laid out for each type of activity. Table 4 shows each activity broken down by type and its corresponding direct costs to be financed by the different programs.

Table 4.1
IADB - CLUSTER SUPPORT PROGRAMS - DIRECT COST DISTRIBUTION
(values are expressed in thousands of dollars)

Type of Activity Generating Operating Cost	Mendoza	San Juan	San Pablo	Pernambuco	Minas Gerais	Bahía	Uruguay (*)	Total 7 Progr.
Training	6.490							6.490
Strengthening institutional training	790							790
Physical infrastructure	74.300							74.300
Reinforcing physical infrastructure	1.260							1.260
Environmental plans		300						300
Reinforcing environmental framework								0
Financial facilities	17.040	14.000						31.040
Promoting financial and non-financial services	2.170	4.500						6.670
Strengthening cluster regulations	520	1.960					300	2.780
Cluster diagnostics	1.990	2.000			489	697	230	5.406
Cluster awareness and invigorating		1.000	1.871			2.101	315	5.287
Preparing cluster plans			1.456	1.000	151	609	300	3.516
Implementing cluster plans	1.510	6.700	14.555	13.865	13.786	10.551	6.060	67.027
Evaluations, follow-up and dissemination of results			522	380	639	585	300	2.426
Total Direct Program Costs	106.070	30.460	18.404	15.245	15.065	14.543	7.505	207.292

(*) Where values are not broken down, distribution has been assumed based on the proposed program text.

Table 4.2
IADB - CLUSTER SUPPORT PROGRAMS - DIRECT COST DISTRIBUTION
(values are expressed in thousands of dollars)

Type of Activity Generating Direct Cost	Mendoza	San Juan	San Pablo	Pernambuco	Minas Gerais	Bahía	Uruguay	Total 7 Progr.
Regulations reinforcement, awareness, and prep. cluster plans	2.510	4.960	3.327	1.000	640	3.407	1.145	16.989
Implementing cluster plans	1.510	6.700	14.555	13.865	13.786	10.551	6.060	67.027
Evaluations, follow-up, and dissemination	0	0	522	380	639	585	300	2.426
Cluster-oriented financial support programs	19.210	18.500	0	0	0	0	0	37.710
Cluster-oriented non-financial support programs	82.840	300	0	0	0	0	0	83.140
Total Direct Program Costs	106.070	30.460	18.404	15.245	15.065	14.543	7.505	207.292

Table 4.3
IADB - CLUSTER SUPPORT PROGRAMS - DIRECT COST DISTRIBUTION
(values are expressed in % of total direct costs)

Type of Activity Generating Direct Cost	Mendoza	San Juan	San Pablo	Pernambuco	Minas Gerais	Bahía	Uruguay	Total 7 Progr.
Regulations reinforcement, awareness, and prep. cluster plans	2,4%	16,3%	18,1%	6,6%	4,2%	23,4%	15,3%	8,2%
Implementing cluster plans	1,4%	22,0%	79,1%	90,9%	91,5%	72,6%	80,7%	32,3%
Evaluations, follow-up, and dissemination	0,0%	0,0%	2,8%	2,5%	4,2%	4,0%	4,0%	1,2%
Cluster-oriented financial support programs	18,1%	60,7%	0,0%	0,0%	0,0%	0,0%	0,0%	18,2%
Cluster-oriented non-financial support programs	78,1%	1,0%	0,0%	0,0%	0,0%	0,0%	0,0%	40,1%
Total Direct Program Costs	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

As shown, the funding allocated to activities directly linked with competitiveness promotion policies varies considerably in the different clusters. For example, while it accounts for only 3.8% of direct costs in the Mendoza program and 48.3% in the San Juan program, in the other five programs it accounts for 100% of direct costs. In these latter five programs (in Brazil and Uruguay), program implementation ranges from 72.6% (Bahía) to 91.5% (Minas Gerais) of direct costs. Furthermore, the amount allocated to plan implementation in the Uruguay program is equivalent to only 22% of the direct costs devoted to plan implementation in the San Juan program.

1.5 Brief Discussion of Existing Evaluation Mechanisms

In general terms, one can distinguish evaluation indicators that are focused on "fullfilment indicators" from tose that are focused on end-results of the programs ("Impact indicators"). The former put emphasis on cheking whether the identified activities within each component were effectively carried out, while the latter put emphasis on the ultimate objective of the program (production increases, productivity increases, and so on).

At the end of this Annex and to illustrate the proponed evaluation indicators, we incluye a summary of the proponed indicators for a number of existing programs (Mendoza, San Juan and Pernambuco, in tables Nº 5-1, Nº 5-2 y Nº5-4).

1.5.1 Impact Evaluation

Most programs have as main success indicators the following:

a) Regional Macro Variables that are intended to be affected by IADB programs

They incluye a wide array of posible variables ranging from regional GDP and regional investment rates to regional export growth rates, regional employment, and regional labor productivity. These is a characteristic of programs in Argentina. In all those cases, success is meant to be "an increase" in those indicators but no special consideration is given to the possibility that part of the observed future increases might not be fully attributable to the programs in place. Hence, the approach is essentially a "static" one. Indicators are proposed to be measured at the end of the execution of the program or two years after that.

We notice also that in these cases, even if the static approach were correct, which is not, measurement is proponed to take place at the macro region level, with no regard to the specific clusters whose growth is to be fostered by the program.

b) Cluster Performance Variables

In these cases the proponed indicators are either total sales, total exports, as well as employment and value added in the companies belonging to the cluster. Programs in Brazil and Urugua emphasize these kind of indicators, but some of them are also shared with the San Juan and Mendoza Programs. There is no clear cut distinction between "companies belonging to the cluster" and "beneficiaries" of the program and one fears that some indicators of success (sales per employee; value added per employee) may at the end be available only for the sample of beneficiaries, which may not necessarily coincide with the cluster itself.

1.5.2 Fullfilment Performance

There is great abundance of fulfillment indicators, which are evidently indicators of "jeans" rather than of final ends. We understand that they are a necessary part of the future monitoring of expenses rather than of direct usefulness to measure the success of the program. Fulfillment indicators include, among several, the effective creation of some institutions (consortiums, associations, etc); allocated loans (when aplicable); participation of beneficiaries

in the difieren activities, etc.