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Survey on opportunities for industrial cooperation
(between industrial enterprises,-of a type defined in this text-in Argentina,and potential enterprises from developed countries.)

Introduction.

Manufacturing industries are an important activity in Argentina. As far back as the immediate prewar II period,-over half a century ago the GNP generated in that sector equaled the agricultural one.During long periods,-at least for twentyfive years,-manufacturing industries were the mainstay,the most dynamic and inducing factor for the argentine general economic development.In the peak years(roughly the second half of the 60's and the first of the 70's) it reached close to one third of the overall GNP and gave employement to in excess one fourth of the labour force.Today,it contributes no more than one fourth of the GNP and the employement coefficient has fallen below one fifth.

The growth process took place through a linked succeeaive stages of "import substitution",-each with its own ecconomic logic and sequences,both vertical and radial,-.It started,most naturally,with some mass production and consumption goods,in the foodstuffs and textiles categories,with relatively simple technological processes and, generally,not too large capital investments.They had good capabilities for total vertical integration in Argentina proper.The so-called industrial crops(vegetable seeds for edible oils,cotton,sugar,wine grapes and alike developped rapidly since middle or late thirties,whereas the general agricultural production stagnated.

Later,the dynamic impulse centered around manufacturing and varied degrees of assembling in electro-metal-mechanics and chemicals, to move,-still later,-to basic inputs,such as iron and steel,pulp and paper,some petrochemicals.This process was responsible,not only for a change in the structure of argentine industries-sector wise,- but also very much so within the sector itself;the metals and chemicals are the paramount examples.

Tables 1 and 2 give an overall summary of the general evolution and structural changes in the argentine manufacturing industries,over half century.Their reading tells a very clear story,depicting cycles,structural changes and the upsurge of new activities, particularly germain to the main emphasis in this report,which lies in the direction of technological changes,the need and opportunities for international transfers at various leveles and of variagated kinds.

A brief overview of the corresponding statistical data,- that is out of place to analyse deeply in the present report,-shows not only the wide range of opportunities for establishing future industries,-a sort of a new pahse in the process of import substitution, based on the fact that the bulk of imports are industrial inputs,such as chemicals and to a minor extent metals.-but also a sort of "export substitution".This latter phenomenon is revealed by the increasing proportions of the exports having been through an industrial operation However,bear in mind that major contributors to the argentine non-agricultural exports are " commodities"(consistently oils).

Table 3 gives a rough indication of tee position of the inputs and capital goods industries in Argentina,in the mid-eighties.

If the sever decline in the final internal effective demand,-which is clearly portrayed by the growing regressive income distribution since mid-seventies,and is indeed way below the leveles attained by labour in some older "golden" periods,-is not checked (and there are no indications that it will be so in the near future, all to the contrary),it will impinge upon the structure and character of the argentine industry.

The consumption goods sector will be,probably,of the order of no more than 40% of the total,to the detriment of durable consumer goods,prevailing the indispensable non durable.(food,etc.).

It is also foreseable,judging by recent trends in the character of the gap in international trade and applications for foreign investments.that there will be a sharp downward trend (relative an or absolute) in the traditional inputs,as the non-traditional (particularly the bzsic petrochemicals) will increase,to become the mainstay of the sector.The capital goods may increase to some extent,in absolute values,but perhaps decrease pdrcentage wise.

The latest available data with the coverage of the whole industrial universe,come from the Census of Manufactures of 1985.Since then the situation undoutedly has worsened,but did not change much structurally.The core of industrial activities - judged by the value added,employement,number of establishments, motorization,-continues located in and around the area defined geographically by the city of La Plata(province of Buenos-Aires) and Rosario(province of Santa Fe),with the Greater Buenos-Aires at its center.

The "migration" of industries towards selected location: in the interior of the country,-heavily promoted by special highly permissive legislation,-has not changed the picture significantly. Although it is to be noted that it did so at rather heavy social cost and financial loss to the Government,to the preferential benefit of a group of firms,-whether it was intended or not,- as detailed studies have shown.

Argentina has an index of industrial production and employement since 1970,which is being systemetically continued and published.It encompasses some 1.200 establishments,-mostly large and medium-large,-that represent very sizable proportions of the manufacturing value of production and employement,perhaps as much as two thirds to three fourth of the first and more than half of the second.More will be said about its evolution in later sections of this report.

For the time being it is sufficient to take notice that it is supposed to be a good crosssection of the industrial activity at large in Argentina,and that the most recent figures barely reach the levels registered in 1970,or are below them.

As to the distribution of industrial establishments by size,given the basic importance of this topic to the scope of the present report,it will be given appropriate attention in the section devoted to methodology and cladsification by categories. The same applies as far as very valuable indicators,such as motorization and electrification,are concerned.

Table 1.
Evolution of the main characteristics of the Argentine industrial sector, very rounded up figures.

| | Prewar (1937-39) | 1954 | 1964 | 1974 | 1985 |
|---|---|---|---|---|---|
| Number of establishments, thousands | 52 | 148 | 143 | 166 | 109 |
| Number of employees, thousands | 800 | 1.440 | 1.320 | 1.700 | 1.400 |
| Horsepowe installed, thousand of HP. | 1.280 | 3.750 | 4.920 | 6.750 | 10.000 |

Source: Censuses of Manufacturing.

Table 2.
Structure of manufacturing by large subsectors, in % of the totl equalling 100, approximate values.

| | Establishments | Employement | Value of production | Horsepower |
|---|---|---|---|---|
| Prewar | | | | |
| Foodstuffs, etc. | 30 | 27 | 22 | 36 |
| Apparel, footwear, etc | 15 | 21 | 20 | 8 |
| Electro-metal-mechanical (incl. metallurgy) | 23 | 20 | 14 | 14 |
| Chemicals and allied. | 3 | 5 | 10 | 12 |
| 1954 | | | | |
| Foodstuffs, etc. | 16 | 19 | 30 | 26 |
| Apparel, footwear, etc. | 16 | 17 | 23 | 11 |
| Electro-metal-mechanical (incl, metallurgy) | 34 | 30 | 21 | 25 |
| Chemicals and allied. | 2 | 6 | 12 | 11 |
| 1964 | | | | |
| Foodstuffs, etc. | 16 | 20 | 30 | 22 |
| Apparel, footwear, etc. | 17 | 16 | 16 | 16 |
| Electro-metal-mechanical (incl. metallurgy) | 25 | 33 | 27 | 33 |
| | 4 | 7 | 16 | 12 |
| 1974 | | | | |
| Foodstuffs, etc. | 17 | 21 | 27 | 22 |
| Apparel, footwear, etc. | 13 | 15 | 13 | 10 |
| Electro-metal-mechanical (incl. metallurgy) | 20 | 37 | 36 | 24 |
| Chemicals and allied | 4 | 11 | 19 | 15 |
| 1985 | | | | |
| Foodstuffs, etc. | 26 | 25 | 24 | 23 |
| Apparel, footwear, etc. | 11 | 15 | 12 | 12 |
| Electro-metal-mechanical (incl. metallurgy) | 26 | 32 | 27 | 32 |
| Chemicals and allied | 6 | 12 | 26 | 15 |

Source: Censuses of Manufacturing

General remark.- It must be borne in mind that since 1974 Census certain activities were reclassified as "services". This particularly affects the mechanical repair shops (mostly automotive), meaning heavy incidence in the number of establishments, not so much in employement and even less in value of production. In addition in certain years (196) very small plants were excluded.

Table 3.
Relative importance of industrial inputs and capital goods susectors in 1985,as percentages of the corresponding totals,very rounded up.

| | Value of production | Employees | Horsepower |
|---|---|---|---|
| I.- INPUTS | | | |
| 1.-Traditional(x) | 10 | >15 | 20 (xx) |
| 2.-Chemical and metal | 25 | ≤10 | 20 |
| II.-CAPITAL GOODS | <15 | >15 | >10 |
| TOTAL(I II) | 50 | 40 | 50 |

Source.-Census of Manufacturing,1985.
(x)Foodstuffs,fibers,leather,wood,construction materials.
(xx) Due mostly to the heavy equipment in the sugar industry, cement plants and alike.

Motorization and electrification in the argentine industries.

It is very well known that as the industrialization proceeds so does its motor equipment,revealing the trend toward mechanization and the acquisition of heavy,more power intensive,activities In the case of Argentina,table 1 above shows that since pre-war II th the motor equipment increases eight tomes,with a much more rapid rate of growth in the first twenty years.The same table shows the distribution of the changes,by periods and large classes of goods,while table 4(see further in this chapter) gives the same type of information relative to changes in the power installed compared to employement.Obviously,the latter coefficient is particularly telling,since it points out,simultanecusly,the relative loss of the industrial sector as a whole of its dynamism ~~xxixxixx~~ as a pole of attraction of labour force,as well as the inroads made by new industrial branches, on the road of varying character of import substitution and its different component phases.

Another well established conclusion is the close association of fuel consumption and industrialization.The correlation between fuel consumption(expressed in the total amount of various fuels used,in equivalent units) and the value of production,first climbs rapidly,then levels off and consequently declines.This is due to the combined effect of increased quantities of fuels used and the increased efficiency in its utilization,both for electricity generation and in a number of industries,such as metals,cement,glass,all sorts of grindingmetc.

There is,then,a clear influence of the process of industrialization in different stages of development,for succesive periods characterized by the addition of heavy industries,more diversification and mechanization,etc.Where relatively precise calculations were possible,it was determined that,starting with a rather high elasticity coefficient this has declined over the years,-even in the less developed countries,to less than one.

For the consumption of electric energy(originated in all sources:thermal,hydro and,increasingly since the late fifties,nuclear),the industrial product elasticity is very high,and still climbing,being in the vibinity of 2 for many latinamerican countries.

These relations are born out by detailed studies of very l long series for countries such as the United States,and comparisons i between the behaviour of a sizeable cluster of the less developed countries,at different periods of time.

The data for the electric energy consumption by the manufacturing industries in Argentina,are available in the periodic Census years since the prewar II(where also the value of production is reported.In addition we have a continued series of generation and consumption by sectors for the last quarter of a century,from

information collected by the Secretariat of Energy,in the Ministry of Public Works.

As an interesting historical parameter,it is worth recalling that such data were ascertained for the industries located in th the city of Buenos Aires and the Greater Buenos-Aires in the immediate prewar I years.At that time it was merele some 30 Gwh,five times as much in the mid twenties,about 400 Gwh around 1930 and 1.000 Gwh in pre war II.We should be reminded that,during that time,an overwhelming of the manufacturing activities were concentrated in the above mentionned geographical area.

But more telling is the electrification coefficisnt.This was established and developed by the present writer,for the argentine industry,as the Head of the Institute for Industrial Development,which was located,-since the mid thirties up to early forties,-in the School of Engineering of the University of La Plata,province of Buenos-Aires.

This coefficient is the result of dividing the total electric energy consumption,in kwh,by the labour employed in the same activities,in manhours.Clearly,the result is the combined effect of of an increased consumption of electricity and the savings in manpower both due to modernization and technological improvements in the varios kinds of manufacturing activities.

True enough,the intrinsec value of manhour,its "quality or "intensity" so to say,changes from one time period to the next,particularly if they are sufficiently far apart.It is also true that the proportion of the traditional worker(factory employed) is continuously diminishing in relation to the total labour employed,as happens world over,and can be traced through the last five Industrial Censuses in Argentina.Furthermore,the technological change makes for less workers in the factory proper,and more in the R & D activities,laboratories, designing,etc.

To a much minor degree the kwh consumed also suffer some variations in the "quality" of final use.From the point of view of power intensive operations(motor driven in general and electrometallurgy,electrochemistry and such) the differences are not sizeable.But the whole field of informatics,-with telecommands,robotics,etc,-widely employs electric energy,but consumes considerably smaller amounts than the basic processes.And,obviously,its application is closely related to the use of higher technologies.

All this goes to prove that the electrification coeffi cient is not without flaws.The data for its construction are,however, readily and widely available,and they are reliable.Consequently,we believe that the use of such coefficient does give an insight into the process of technological improvements in industry,and must be used,-not the substitute more profound analysis of technological change,on case studies basis,-but to pave the road for them.

A few final words on the subject.The account of the kwh consumed by the industries in Argentina,is quite accurate.There may be some slight discrepancies between the figures reported by the Censuses and the classification,by type of tariff,of the electric public service companies.I have ascertained that by comparing the two sets of figures for a series of Census years.There may also be some underreporting by the industrial establishments for their autogeneration

In the manhours worked,the situation is less clear.It is well established that there exists a considerable ~~under~~ evasion in reporting sales(to avoid payement of taxations) and,-to a minor degree,-of labour employed,to economize on contributions to pension funds,social securities schemes,etc.

Taking everything into account,there may be a 10-15% overestimation in the electricity coefficients,as calculated for Argentina by the method described above.

The electric energy consumption by the argentine industrial establishments,was constantly well over half of the total.for the last fifty years.In relation to the total consumption by industries

from the public services only(which includes,in addition,the residential,commercial,etc.uses),it was about one third.

These figures gave a glimpse at the weight of self-generation in the factories(some closely linked to the industrial processes employed,as in iron and steel,pulp and paper,cement and similar).In some critical moments in Argentina the self-generation in industry was equal to or more than the energy purchased from the public system.

As far as the overall fuel consumption,industry contributes about one third,or less in certain periods.This is due to the heavy incidence of transport,mainly autocars(situation shared with many latinamerican countries' and also railroads.

There is a marked trend in susbstitution among fuels, toward more and more petroleum derivatives,and more recently,and vigorously,natural gas.

In absolute figures,the industrial consumption of electric energy in Argentina,amounts to about 2.100 Gwh in 1950,to close to 5.300 Gwh in 1960,to 10.000 Gwh in 1970 and to 18.000 Gwh in mid eighties.Very recent figures show decline.

In relation to the overall electric energy consumption in Latin America,Argentina is falling behind,due particularly by the strides made by Brazil and Mexico.In 1960,the argentine consumption of 10.000 Gwh accounted for about 15% of the total,while in the mid eighties its 15.000 Gwh are less than 10% of the latin american total.

To calculate the electrification coefficient,we have the long series of industrial consumption(in kwh) and a much shorter series,-starting in 1970,-of indexes of hours worked in industry.Assuming that its evolution roughly represents that of the totals worked by the whole industrial sector(see above for the scope of the index), a twenty years series can be constructed.

Electricity consumption has been growing uninterruptedly,while manhours worked in industry rose in the first half of the seventies,to fall continuously since,reaching an index of 75(with 100 in 1970) in the second half of the eighties.In 1988 the index for electricity consumption by industry(with the same basis of 100 in 1970) was over 250.

As the result the index for the coefficient rose,from 100 in 1970,to 200 in 1980-81,almost to 300 in 1986,and possibly to 330-340 in 1988 and the first half of 1989.

To more than treble in twenty years must represent increased application of technology.More will be said about the subject later on.At the present point a word of caution is in place.

Due to a variety of reasons,a shortage of supply of electric energy(at times rather severe) ensued since the end of 1988.It has been first almost completely suspended and then discontinued altogether,but there have been indications that it may be reinstituted.

Obviously,such circunstance impinges upon the electricity consumption from public sources,and there were frequent complaints about the limitations it imposes on the manufacturing activity.

Consequently the trend for the last year or so is not characteristic.Furthermore,as has been mentionned earlier,the self-generation represented an important part of the total industrial consumption of electricity at some periods in the past.As the result, there was in the argentine industry a stock of generating capacity, of around 2.000 Mw;according to the Industrial Censuses,the electric motors moved by selfgenerating equipment represented,in many years, about one third of the total.

It is possible that the afore mentionned shortages, made it necessary and convenient to put again in use this important idle capacity,held in reserve.Even assuming that a certain,-not at all insignificant,-proportion of the selfgenerating capacity,was phisically,technically and economically obsolete by the end of 1988 (making generation by these means very inefficient in terms of fuel calories used for each kwh generated),some must have been made to function.

Whether that was or not the case cannot be judged because of the lack of official figures to ascertain it.However,it is only logical to assume that some generation at the plants did take place, to supplement the depleted public supply,thus further elevating the electrification coefficient.At any rate,more precise data will not change the general trend indicated above,which is the main aspec we are interested in underlying.

As motorization goes,measured in HP installed industrial capacity per employed person,it was less than 2 in prewar II period, with no major changes through the middle fifties,and big jumps since It was close to 5 in mid sixties,almost 6 in the mid seventies and about 9 in the mid eighties.

As far as kwh consumed per manhour worked in industry, the prewar level was considerably less than one(about .6 in 1913). It mounts to about 5 around 1970 and perhaps to 15 in mid eighties. The progress is very striking.By way of comparison it could be added that the last mentionned level had been attained by the United State: manufacturing activities only in 1970/

What happens for the main subgroups in the industrial sector in Argentina? There are some figures that refer,-with very good coverage by main supplying systems,-to big consumers in the industrial field(mostly over 50 kw of demand).They contribute to around two thirds of the total industrial consumption.

We have a break down by years and the ten categories of international classification,but to avoid cumbersome tables shall take the average for the eighties.Food and allied products account for a 10% of the total,while textiles and allied for less than 7%: chemicals and allied 15% (increasing its participation during the decade as that type of industries expand,-see first section of this report),basic metallurgy(mainly iron and steel) 40%,the remaining of the electro-metal-mechanic sector about 8%.

These proportions change if the total electricity consumption by main industrial groups is taken;figures are not readily available,and when so with considerable delay.For that total food and beverages contribute closer to 20%,as much as chemicals,while textiles and footwear come up with almost 15%.The electro-metal-mechanical industries(including metallurgy) shows not quite 25%,with marked declines in its share for earlier years,due to sharp fall in production,which can be assesed in high percentages for idle installed capacity,in many cases 70-80%.

An insight into this situation can be gained from the reading of the breakdown for the labour force employed and the hours worked,in the INDEC index of industrial production and employement, referred to above.(see previous section).With 100 for 1970,the years 1987,1988 and first semester of 1989 show employement of not much over70,and falling,while hours worked reached about the same level, having been a couple of points above in 1987-88.

What is the picture for big groups:Foodstuffs and beverages exhibits the best performance,as was to be expected in times of severe economic depression and mounting unequal distribution of income .They level off at a 100,for both employement and hours worked. Textiles and footwear not much than 60(shoes only just over 30):furniture is xxx less than 50,with heavy declines in the hours worked. Chemicals and allied not much over 60 for employement and 70 for hours worked.Metal products a little over 70,with sizeable fall in hours worked in 1989.Machinery is even harder hit,as from a little over 40 it declines for 1989 to just over 35.Pulp and paper shows about 100 in 1987-88,and upwards in 1989,thanks to some exports.

It is quite clear that no much demand for electric energy can be expected in such circumstances.

To round up this section let us point up that the consumption of electric energy from public sources by large enterprises rose from just over 9.000 Gwh at the beginning of the eighties to

added,total figures would mount still further.

The breakdown of the consumption by big consumers,by main industrial groups,during bhe thirties,shows very interesting traits. While foodstuffs and beverages not much mre than doubles,textiles increased almost six times,electro-metal-mechanical prducts trebled as chemicals and allied jumped very much,particularly due to the installation in that period of rubber plants and oil refineries.All this again shows the close relationship between the use of electrici ty and the process of industrialization,in this case in the early phases of import substitution in Argentina.

Turning again to table 3,as far as power equipment is concerned,although considerable progress has been made in the inputs sector,capital goods are badly lagging behind and prospects are not over bright.Various reasons can be brought to bear as an explanation:the general recession in the industrial sector,lack of c capital for new ventures,a very marked decline,-which still contiues,-in public works.It is to be noted that basic infrastructures in Argentina,,-such as transport(roads and railroads),communicatio, power,hydraulic works,etc.-,which would normally call for heavy equipment,are insufficient and in great disrepair,

Table 4 further underlines the various paths followed by main representative sectors of argentine industry,in its power equipment relative to employement.The behaviour of the different sectors is clearly at variance,and the differences as to time periods,for different branches,is also to be noted.

Table 4.

Changes in the motor equipment of the argentine manufacturing industries,since prewar II(HP/personnel),with an index of 100 for 1937/39,very rounded up figures.

| | Immediate post-war (1946/50) | 1964 | 1974 | 1985 |
|---|---|---|---|---|
| Total manufacturing | 150 | 250 | 270 | 450 |
| Foodstuffs,beverages. | 100 | 140 | 180 | 220 |
| Textile apparel,footwear. | 120 | 210 | 220 | 350 |
| Electro-metal-mechanical (incl.metallurgy) | 140 | 340 | 280 | 700 |
| Chemicals and allied | 110 | 170 | 200 | 270 |

Source: Censuses of Industries.

Methodology and classification.

It is required (see letter from UNIDO March 1989) that case studies be conducted for "small/medium sized companies".I consider this to be a very apt evaluation of the kind of establishments that require,and are more able to recieve,a transfer of new external technology.But,what is a small/medium sie establishment?

There here arise methodological,as well as statistical questions to be posed,pondered and answered concretely.We shall in what follows to contribute to the definition of the limits of the field to bo covered and indicate the problems that arise in Argentina.

The simplest,and most commonly and widely adopted,definition refers to levels of employement per establishment,below which the firm is "small".This clearly is insufficient,incorrect(as the only criterium applied) and,-what is worse,-misleading,when used without enough analytical criticism.

An establishment employing,say,20 persons in the chemical process industries is an entirely different sort from one at the same level in a mechanical shop,or apparel,or woodworking.In order than this kind of exercise be conducive to practical action and Government policies designed to sssist and foster the development of the strata wanted,there must be much more insight,thought and precision in the definition and selection ,especially as applied to the Third World.

There is much too mechanical transposition of concepts developed and used in the First World nations(in many of which,a firm employing several hundreds persons is "small") without a critical analysis.Additional indicators must be employed,such as value of production,motorization,electrification(we have dealt at length with the latter two in the preceeding section) for general grouping,-all of these data are easily available;some other parameters are required for case studies.

Even more disturbing is the fact that the new,rapidly changing trends in technology,management,organizatic,application of electronic and informatic,flexibilization and alike,-which improve small scale operations if properly used,-do not usually transpire in the simplistic approach for the studies of small/medium size industrial establishments in the less developed countries.

The experience shows that the universe of manufacturing industries in our types of countries is made up by a multitude of very small firms,a few dozens or hundreds of large and very large factories(very often branches of foreign companies or making part of national economic complex)all of them with easy access to [illegible] technologies).Between these two extremes(rather easily defined) lies a field populated by industrial firms of varying sizes,characteristic products,types of management,etc.This is precisely the field which we must be concerned with;and we shall devote to its analysis the present section,on the basis of latest available figures for Argentina,drawn from the Industrial Census 1984-85.

The result of the so-called First Phase of this Census became available not so long ago;from these data conclusions can be drawn for groupings according to levels of employement and value of production..e were succesful in securing some additional information as to the motor equipment.But that is about all at present;promises have been made by official sources(such promises have not been always fulfilled in the past) that additional information concerning electric energy consumption in kwh and a few other interesting aspects will become available some time in the first half of 1990.

The large firms take care of their technological problems without need for external help.The hure strata of micro,or proto,or semi industries(whatever they may be called),pose an altogether different set of problems from the ones faced by industrial firms proper. In the past,I have advanced some ideas in this relation in the reports on United Nations missions to a few Indien based latinamerican countries

According to the 1985 Industrial Census figures, such under-

takings accounted for about two thirds of the number of establishments registered as "industrial",about 5% of the total employement, less than 5% of the value of production and 2% of horsepower.

In addition,there is an increasingly large number of establishments engaged in "informal" activities (as revealed by official studies),occupying the ill defined field between industry and services They also do not lend themselves easily to incorporating technological advances,all along t' line.

On the oppo. e extreme,the medium-large,large and very large establishments(wit employement in excess of 200 persons each) are less than 1% of the total number,but gibe employement to about 40% of the total industrial labour force and generate close to 55% of the production.Clearly their productivity is high.

The small,an particularly the medium-small,have advanced most in numbers and employement between the Censuses of 1974 and 1985. They make up the most promising field for transfers of technology,although not a few already operate foreign licenses and established external contacts.particularly in the fields such as automotive parts, since they are primarily designed to supply the large assembling plant

The value of production is available for Argentina,and may be preferable criterion to a mere level of employement.Let us underline again that a combination of parameters must be employed to define more homogeneous groupings.

The plants producing each less than 50.000 US$ in 1984,as the result of statistical comparisons of the Census data we made,probably fully correspond to the "microindustries",with the addition of a segment of plants employing more than 5 each but less than 10-15.Due to logical overlapping,-in view of the attempt to reconcile two different basis for measurement(employement and vale of production per establishment),-which are furthermore uneven according to various industrial branches,x there is a certain proportion of these plants that produce perhaps up to twice as much as the lower level of 50.000 US$ indicated above.

The large plants generate 3.500.000 US$ and more,per establishment in 1984,and could mostly be,-in a very general way,- assimilated to plants employing more than 100 persons each,or thereabout.Three fourths of the total value of industrial production in the Census year was originated in them.

The "small-medium" sized plants,by this measurement, would have been producing from about half a million $ up to the vicinity of 3.5 million,but in practice much below.

They,probably contribute less than 20% of the overall industrial production,and employ about 40% of the labour force.

These overlappings and inconsistencies in the groups of establishments falling in any category according on what basis they are measured,are further accentuated when the analysis is done for more homogeneous groups of industries.There emerges.however,a sort of a general contour,which must be usefully complemented by the help of motorization and electrification coefficient(see above),and by more specific insights for case studies.

Keeping in mind all these limitations and remarks,we shall concentrate on the strata employing more than 10 and less than 100 persons.This was the most dynamic group in creating new firms and providing additional employement between 1974 and 1985.The rise in the power installed was not too far off,percentagewise in absolute figures,from the field of manufacturing as a whole.But a gap took place in motorization per person employed,due to a higher level of employement for the said stratum in 1984.

The falling behind in motorization of the 11-100 group can be gauged from the following:In 1964 their motorization coefficient was less than 15% and in 1974 less than 10% below the general level, but it was closer to 25% in 1984.

In relation to their own sectors(foods,clothing,chemicals, etc.)a decline of about 20% prevails,with very sharp falls and variations according to sectors

Table 5.
Participation of the strata employing 11-100 persons per establishment, according to industrial classification, % of each sector, rounded up figures.

| | Establishments | Personnel (x) | Horsepower installed |
|---|---|---|---|
| Foodstuffs, beverages, tobacco | 35 | 29 | 31 |
| Textiles, apparel and leather | 28 | 43 | 38 |
| Wood and products | 10 | 44 | 34 |
| Paper and products, peibring | 20 | 35 | 13 |
| Chemicals of all kinds, rubber, plastics | 32 | 38 | 26 |
| Moneral non metallic products, except coal and oil derivatives | 10 | 30 | 24 |
| Basic metallurgy | 50 | 15 | 7 |
| Metal products, macinery, equipment, vehicles | 21 | 39 | 35 |
| Total industry | 20 | 38 | 27 |

Source: Industrial Census 1985; except for personnel figures are for April 1985
(x) monthly average for 1984

Table 5 gives the parameters for the major 8 industrial groups. Studying a more minute breakdown (which is not given here), additional interesting conclusions can be drawn.

Employement wise, the leaders in each sector were, in this order: metal working, foodstuffs and textiles. They also lead in horsepower installed: over one third of each sector is concentrated there. But percentages vary from less than 30% to over 40% of the corresponding sector employement, pointing out the profound differences within each sector between the industrial branches making them up and type of firms (from large oligopolies to clusters of plants).

An illustrative example is woodworking, where the proportion of number of plants employing 11-100 per plant, is very low, but is similar to the leading sectors in employement and power capacity.

Also striking, is the case of basic metallurgy (mostly iron and steel, and to minor extent, -except for aluminum, -smelting of non-ferrous metals) where the proportion of firms is unusually high, almost 50%. accompanied by a very low proportion of the sector's employement (15%) and insignificant in power (7%). Obviously, in that particular sector, the type of plants we are concerned with are far from significative and dynamic, which was to be expected.

Perhaps it is worth adding that, in the brackets of establishments employeing 11 to 50 persons each, they represent about 15% of the plants and give employement to 38% of the labour force.

There are available in Argentina a considerable amount of research documents involving case studies of plants. They are conceived with varying coverage, representation, depth of analysis, etc. Some are of official origin and others undertaken by private sources. Few of them are widely and readily available. There has been no systematic collation and analysis of results, which is very unfortunate, given the wealth of information that has been collected.

Among others, there is underway a very comprehensive coverage of representative firms in all significant branches of industrial activity (about 800 of them). The provisional results show a definite upsurge of technological innovations being applied, since early 80-s.

The application of various technical parameters, the close reading of the abundant material on case studies, the pragmatic approach of maintaining working contacts with industry, would lead to an interim conclusion that technological improvements did take place in the argentine industry, particularly since mid seventies. But, however important in some firms, it has generally been haphazard, piecemeal, not at all evenly distributed among sectors or branches, much less so, plants.

In fact, not often was the application of new technologies in enterprises, the result of a deliberate, systemic approach, -encom-

passing the whole:product,process,management.It is well known that to be most effective and bear the best results,the modernization process, acquisition and application of modern technologies,-must embrace simultaneously the whole chain of operations.Naturally,this not only applies to industries but also to construction,communications,services,administration,etc.,where the similar failures can be traced.Possibly UNIDO contribution should aim in particular at such wider scope.

Although in many cases (particularly in medium and larger size plants) the acquisition and improvement of technologies were important the prevalent feature was segment by segment or machinery by machinery approach.The introduction of one piede of modern equipment rather than improving the industrial operation deters from efficiency, as many examples in local scene show.

Consequently,it is strongly emphasized thst in the contacts to be established with foreighn plants,effort should not be spared to make the transfers,-as far as possible,-all inclusive,without forgetting the manpower training,at all levels.

Perspectives for industrial development in Argentina and some promising key fields.

There is no doubt that the dynamic technical,-economic-social political paradigm has changed in the world,and Argentina is no exception.With center and axis in manufacturing industries(modified in many respects and along different or new paths,but industry nonetheless) is branching off in many directions in the society,invading and revamping new fields,as services,commerce,administration.

It would be just a truism to affirm that it has to be closely,inextricably knit with historical and cultural background and given current conditions in each country.And it so happens that the complex background is not very conducive at the moment in Argentina.

A great deal must be still analyzed,but inescapable fact is that the argentine economy and society as a whole has been subject to severe shocks,even now at full work.The industrial structure has been badly shaken(with some dispersed positive effects,but lacking an overall model of development),with branches and stages of vertical industrial integration locally,dismantled.

As was pointed out in previous sections,there still are some very important gaps in production of industrial inputs and capital goods of varied sort.

In the first field,important inroads have been achieved,and more is underway or envisaged.Iron and steel industry has been fairly modernized and integrated,and is exporting some products. Pulp and paper is now fully integrated domestically (it is to be noted that for iron and steel most of the ore or pellets or sinter are imported),new important projects are underway and it is also exporting. Petrochemical industry is advancing with projects totalling several billion dollars in investment(mostly foreign,many associated with big local concerns),a few of them advanced.

What are the promising fields in the industrial structure,with possibilities of transfer or both ways flows of technology? A couple could be singled out;among them we mention:informatics with its many components(due to its strategic importance both to the industry itself and elsewhere),some chemical process industries and biotechnology based operations.

In the first case,there exists an Industrial Chamber, which used to be very active,not so much lately.For the chemical processes the corresponding Chamber is very dynamic and could be used,in the future,as channel for transfer or at least for useful contacts. As far as biotechnology is concerned,there is at present very little industrial activity,but a Forum has been organized,which congregates industrialists,technicians,scientists,that is very promising.

The informatic industry,in its various sub-fields and scope of use,has a particularly important and far reaching effect on all branches,sectors and levels of society.It deserves,then,a few special paragraphs.

Towards the mid seventies there was in Argentina an incipient industrial technological system of sorts,-incomplete and weak but a system nonetheless.The economic reforms introduced after 1976,-particularly the drastic and very fast pace of lowering custom duties on imports competeing with domestic manufacture,-changed that situation profoundly.The "system" became a series of islands,or "enclaves",for little expextation for real internal integration;the pre-existing one,incomplete as it was,retrogressed.There took place marked backward trend in technological advance,prevalence of assemblying of mostly imported components.etc.These were serious blows to an integral and coherent development of the sector. and maturity

Thus it happened,-unlike other countries f.e.Brazil-that in the decisive moment of domestic growth,the "electronic" industry in Argentina found itself weak,disorganized,little integrated,without clear governmental policy to assist,in subfields and at leveles required(inspite that some official measures were taken).

In the first half of the eighties.the sales were mostly destined for internal markets,double amount for private enterprises than for the public sector,although in capital goods the latter represented by far the highest percentage(mostly telecommunications plus industrial electronics and scientific and medical equipment).The exports amounted merely to 10% of the total,with some increases towards the end of the period.

Concerning the structure of the industry,it was made up for almost equal parts vy consumption and capital goods(with slight edge by the second) and about 10% for inputs.It is to be reminded,xx that all this was happening at a very depressed leveles of production accompanied by massive transfers of big plants to other locations, privileged by promotional laws(mostly to Tierra del Fuego,in the far Sout).They continued to operate and expand there,with a very high proportion of imported components.

There is in Argentina,at this moment,an ongoing survey of the electronic industry,for the purpose of updating the information gathered at an earlier stage,but it is not yet available.

A very great deal can be accomplished in this field,if appropriate measures are taken.The complexities and varieties of industrial operations involved are great,and so are the potential customers in all sectors of argentine society.The preparation and training of technitians at all level is to be stressed.Unfortunately no such overall,comprehensive approach seems to be seriously envisaged by the Government circles in Argentina.

Thus ,the interplant connection offered by UNIDO may yield particularly positive results.

Policies and institutions.

There is no one public or private agency in Argentina solely devoted to the purpose of transfers of technology.Some private organizations,-such as Chambers or assocciacions of industries of various kinds and imports,are relatively active in some fields. As examples improvement of quality of production and managerial ability can be quoted;this is done to rather limited extent although with plausible results.

I may also mention that myself,in my capacity then as advisor to the President of Argentina,tried to establish such contacts, in various occasions,with little success.

Many operations or contacts between firms,consisting in or leading to transfer of technology,are being conducted and implemented by commercial attaches of embassies of some foreign countries in Argentina or the corresponding officers in Argentine embassies in these countris,particularly in a few industrialy advanced ones.Although some practical results can be mentionned,in general, this work is to no much avail,with slightly more significance,-but no widespread effect,-on the part of representative of such foreign countries in Argentina.

The public agency which is central in the field of

National Industrial Technology Institute),and has as an hitorical predecessor a Technological Institute,established around 1950 as part of the National Directorate of Industries.

INTI was created in the last days of 1957,by a provisional Government,and ratified by the constitutionally elected authorities by law 14.467.It has been entrusted by law to keep a Register for contracts involving transfers of technology and exercises certain "screening" functions derived thereof.Law 20.794 spelled out the functions of this ?Register of Contracts of Licencing and Transfer of Technology

In addition,INTI carries out many other significant functions in assistinfg technological improvements for argentine manufacturing industries,through Institutes,regional offices,contracts with private firms,etc.

The law in force is N.22.426 of April 1981,which supersedes earlier legislation and is more permissive.Starting with authority emanating from September 1971 INTI is keeping a Register for Transfers of Technology,having registerd about 6.000;about 10.000 if modifications to original contracts are counted.

The yearly movement is irregular,with the maximum of more than 500 per year in the period 1979-81,corresponding also to the maximum amounts in value.Since then,the anumber of contracts and their values diminish,but not sensibly;variations are of the order 350 and 450 yearly in the eirhties.INTI also estimates an average yearly value of contracts of 250 million $ for the 1977-86 period.

There seem to exist a wide concensus of opinions among industries,-shared by t chnitians of INTI,-that improvements in the law should be put forward,particularly pertaining fiscal and exchange aspects.Some such modifications to the legislation currently in force have been submitted in Congress,by representatives of both leading political parties,and is awaiting treatment,which does not seem to be forthcoming in the near future.

There are two distinct classes of contracts for transfer of technology;those that are celebrated between independent parties and intrafirm or "linked".Obviously the first is the one of special interest to UNIDO and,as it happens,it covers the majority of the contracts in the 1977-89 period:85% in numbers and 63% in value.It has to be borne in mind,however,that,-as has been detected,-the sizeable proportion of the transfers in the "linked" category,does not necessarily go through official channels,the external payements being implemented in other ways.

In addition,transfer of technology is rarely a pure transfer as such,since it often comes associated with delivery of inputs,financial or commercial arrangements,etc.,in a package so to speak.Similar remarks can be made concerning the licencing of trademarks.

INTI has estimated the value of contracts registered for the recent twelve years to the tune of an average of 250 million $ yearly.The actual sums are not known and there are no reliable figures available.From the Balance of Payements of the argentine Central Bank can be gathered that from less than 70 millions in 1975 the payement for royalties climbed to 420 million $ in 1986,and is probably closer to 500 million of late.The receipts ,for the same item in that period, went from 18 million to 16 millions,with some peaks in the early eighties.

The truth probably is that real payements for the use of foreign technology(the open as well as hidden) amounts to considerably more.Other ways have been devised,-and are widely used,-for transfering foreign exchange due for its use;thus circunvening the payement of taxes and longdrawn administrative procedures through the Central Bank.

The estimates given by INTI as to the percentage of royalties to sales,for the aforementionned period,amount to 3% for the "linked" category(3.5% for 1977-83 and barely 2% for 1984-86) and 1% for the independent,throughout the twelve years period.

The law defines as transfer or imports of technology as licencing of the know-how required for the fabrication of a product or use of a service and the right of industrial ownership,such as patents

models,designs and trademarks.There is no obligation to register a contract of this type,but if it has been registered the firm accedes to certain benefits in the fiscal field(taxes) and is authorized the payements in foreign exchange.

The registering of independent firms is authomatica and solely for information purposes.For the economically linked(when the economic value of the contract is more than 49%) it is subject to close scrutiny and approval by the technical personnel of the Register of INTI.In fact,a high proportion of such contracts submitted has been denegated.The evaluation is based on technical,economical and juridical grounds,and is painstaking.

The payement by argentine firms must not exceed 5% of the net value of sales of products or of the services rendered.

The figures provided by INTI also show that contracts entered into by private firms goes from 72.5% in value in the period 1977-83 to over 86% in 1984-88,with the corresponding decline for the public sector.The average duration of the contracts is less than 4 years for the independent firms and close to 4 and a half for the linked.Obviously,contract can,and are usually,renovated.

For the same two periods mentionned above,the contracts originated in the USA fell from 41% to 34%,while the next in line(West Germany)goes from almost 13% to 14% and France from 8% to 11%.Follow Italy and Switzerland,just keeping their historic proportions:7% and 5.5%.Brazil goes from almost 2% to 3%.

The last case illustrates the intralatinamerican transfers of technology,where Mexico appears to a much minor extent.These transfers,in addition,usually applies to smaller size ventures,as possibly the percentage in money value is much below the one mentionned.

As to the destination by industrial groupings,INTI indicates the automotive industry as a leader.From a little over 7% in 1977-83 of the total it climbs to 13% in 1984-88,coinciding with the consolidation and concentration of that industrial branch in Argentina.Next in line comes apparel;from close to 2 to close to 7% in the same period.The pharmaceutical products maintain their almost 5%,as well as plastics and synthetic resins,with about 3.5%.

Spectacular changes take place in cosmetics,with 1.7% to 4.4 % and of opposite sign basic industrial chemicals,that slide from 6% to 4.2%.Electrical machinery and equipment goes slightly up:3.5% to 4.5%.

All this gives valuable insights into the inner movements of the system,defining promising sectors.More has been said about the subject in some preceeding section of this report.

Case studies.

Before describing briefly the specific case studies chose a general remark,-and a warning,-is in order.

Argentina is on the wake of a severe economic depression and hyperinflation.The latter has been temporarily checked some months ago(but now reappeared),but the decline in general economic activity, high rate of un and under employement,diffuse informal activities(of very low productivity),unheard of fall in real disposable income for an extremely high proportion of the population,are at work and gaining momentum.with social spreading effects and paralysis of industries.

Industrial sectors has been particularly hard hit,especially many small/medium scale firms,that are going out of business.

Such situation does not lend itself to obtain information for detailed case studies,which,-in the opinion expressed by many persons in charge,-may(or may not)yield results in the future.They are trying to survive through the present juncture and,psychologically, are ill disposed to anything outside of the daily routine.Sorry as it may be,industrial managers are reluctant to waste time answering questionnaires of no immediate interest,for the time being.

Consequently,the task of eliciting information has been very slow a d difficult.Additional delays were due to our desire to cover,to some extent,also a sample of industrial undertakings located away from the area of Greater Buenos-Aires.

A good many questionnaires(see my interim reports) have been distributed and followed up in the measure possible.Some screened answers are presented below,some of them indirect information.

In view of the foregoing remarks,only a briefest summary is given.Most firms are willing to provide more detailed information at the request of a foreign firm,concretely interested in entering into business contacts of various sorts,to be defined in due time.

Due to the paramount importance of informatic and electronic in modern technology,and the particular situation and recent history in Argentina( see the corresponding section of the present report special effort was made in this area.Some results are reported.

Finally,as I mentionned in my first comments on January 1989,the South-South transfer of technology is promising and should be encouraged.INTI's and Central Bank's figures (see the chapter on Policies and Institutions) also bear this out.

In this field I have chosen an excellent example of a firm of consulting engineers of long standing,with vast international experience,directed by high level proffessionals,particularly the engineers Jorge Albertoni and Eduardo Fernandez,with very good international experience and performance.

South-South transfer.
Case N.1.- "Estudio ALSZ y asociados" Ingenieros consultores.
Avda Roque Saenz Peña 1142.-1 piso Buenos-Aires.
Established over 20 years ago.
In addition to the two directors,mentionned in the introduction to this chapter,this consulting firm draws on a number of proffessionals of wide experience in their particular field of engineering(industrial chemical,mechanical,electrical,etc.),economics,administration,system analysis,sociology,agronomy,law,etc.It has had many projects developed in Argentina,directly or through banks Organizations,-public and private,-at all levels.It specialises in advising the small/medium sized industries in technology,management,programming,etc.,with a view to domestic and,especially,international markets.

It is perhaps worth emphasizing that,in many occasions, a combination of industrial operations in two or more countries,- through multiple technological cooperation,complementation of phases of fabrication,etc.-yield optimum use of resources.

This firm worked extensively with many international organizations interested in this field.Of international scopetheir participation or leadership in ventures in the following countries could be mentionned:Brazil,Bolivia,Mexico,Peru,Venezuela,Panama,Nicaragua, Honduras,Paraguay,Colombia,Cuba,Uruguay,Spain,Italy,China,Japan,USSR.

Electronics,informatic and allied.
Case N.2. Kyklos Sacif.-Cañada de Gomez 1837.-Bs-As.
Established about 20 years ago.National private capital.Employs about 30 persons,mostly qualified workers and technicians.
Manufactures various electronic components for television sets and electrodomestics.
The value of production was close to 4 million australes.
It does not conduct R.& D.activities.
Case N.3.- Tecmes Instrumentos Especiales SRL. Neuquen 1123 Bs-As.
Established 15 years ago.National private capital.Employs about 30 persons (big jump from previous years) mostly qualified workers and technicians,plus some engineers and other professionals.
Manufactures equipment for a variety of metheorological and hydrological purposes.
The value of production was over 3 million australes.
It engages,to some extent,in R.& D.activities.
Case N.4.-Ahonicron electronica medica SA.-M.Hernandez 2408.-Bs-As.
Established over 40 years ago.National private capital.Employs about 15 persons,mostly qualified workers,technicians and some engineers.
Manufactures equipment for medical uses.
The value of production was about 1.5 million A. of which some 10% is

exported.
It engages in some R.& D.activities.
Case N.5.-ESI Electronica S.A.-Migueletes 1740 Bs-As.
Established some 10 years ago.Naticnal private capital.Employe about 25 persons,around half of which have technical training.
Manufactures and sells various electronic component,mostly for photocopying.The actual production is a very small proportion of the overall activity.It exports about 10% of the total.
It engages in some R.& D.activities.
Case N.6.- Laboratorios Electronicos Argentinos S.A.I.C.I. Alvarez Jonte 2265 Bs-As.
Established over 20 years ago.National private capital.Employs about 40 persons,with a big jump in recent years,but to the detriment of technicians and engineers.
Manufactures components for telebision sets.
The value of production is about 17 million A.
It engages in some R.& D.activity,through the only engineer employed and one technician.

Textiles.
Case N.7.- Lautaro Tejidos SACIFI. Monteagudo 730. Bs-As.
Established over 30 years ago.National private capital,family owned x with sons getting higher education and working in the factory.
Employs close to 40 persons,with little technical personnel.
Manufactures woolen garments for ladies and gentlemen,of various xxxxs kinds and flexibility of types,mostly knitted goods of high quality.
It is exporting variable proportions of its productio,depending on the domestic markets;it has established some contacts in foreign countries.As it transpires,the highest priority is accorded to improving and increasing exports.For this purpose,it was specifically stated that a proposal for a joint venture,or any other suitable form,would be acceptable.
Case N.8.- This case was selected in purpose,in spite of its rather large proportions,because being located in an Industrial Park,in the mid-south of Argentina,with many other establishments devoted to textiles,if succesful,it would serve as an example for others.
The value of sales was 170 million A.,of which 3 million us.$ exported.
It employs about 200 persons and manufactures a variety of products.

Various industrial branches.
Case N.9.-Farquimia.-Belzu 1150 Vicente Lopez. Provincia Buenos-Aires
Established close to 30 years ago. National private capital.Employs x more than 20 persons.
Manufactures agroveterinarian products;sales for more than 100 million A. and exports 300.000 $.worth.
Case N.10.-Sika Argentina. Wenceslao de Tato 5251 Caseros Provincia de Buenos-Aires.Employs about 100 persons.
Manufactures chemical products,with sales for 80 million A.Does not export.
Case N.11.-Tankey S.A.- Maipu 471,piso 2.- Bs-As.
Employs about 100 persons;manufactures oils and juices.
Sales value is 110 million A.of which exports over 6 million $.
Case N.12.-Carballo y Cia.-A.C.Morris 563.-Villa Martelli.-Provincia de Buenos-Aires.
Employs 100 persons;manufactures machinery for bottling liquids.
Sales amount to 30 million A;exports 2 million $.
Case N.13.-Fortuny Hnos.-Diogenes Taboada 1592.- Bs-As.
Established 40 years ago,with a new factory almost 30 years ago.
Employs 40 persons in production and almost double for sales,administration,etc.
Laminates steel,manufactures agricultural spare parts.
Sales for 110 million A.;negligible exports.
Case N.14- Establecimientos Darle.- Pogoya 1271. Bs-As.
Recently established;employs about 50 persons.Manufactures machine tools.

Case N.15.-Medidores Argentina.-Agustin Magaldi 5741.-Bs-As. Recently established.Employs 90 persons.Manufactures electric meters. Sales for over 60 million A;does not export.

Final remarks.

Probably the lack of managerial capabilities and mentality is the single major handicap for a better development of small/medium size manufacturing industries in Argentina,and pehhaps elsewhere in many countries of the Third World.It is definitely a critical deterrent for faster and more profitable assimilation of new paths in technology.

The access to information on a world basis,maybe next in order.It refers to knowledge of and familiarity with the opportunities opened internationally(the "niches"),regulations governing foreign trade and multiple aspects related to this point,contacts with appropriate partners,etc.In this connection it is to be mentionned,and praised the work being done in the Secretariat of Industry and Foreign Trade, at the level of Undersecretary for Small and Medium Plants.This is achieved in close cooperation with INTI,National Bank for Economic Development and several other gobernmental agencies at national and provincial leveles.Furthermore INTI is connected with an important network of data banks in many advanced countries and some in Latin America.

Considerable advances have been achieved,and more is in progress,in computerizing,by way of a system of data bank,a wealth of useful information,and establishing good and widespread working relations with such plants throughout the country.

Unfortunately,the whole institutional order is being revamped at present,and little is known of what will become of this area.

Also to be mentionned is that INTI undertakes,jointly with private industrial firms,research in various fields,covering practically the whole industrial spectrum,through 32 centers specialized in specific areas,as for example meat,dairy products,electronics and informatics,machine tools,plastics,rubber,pulp and paper,textiles,efficient use of fuels.It also maintains a list of industrial advisors and assists in many ways argentine industrial firms.

We believe that along such lines,in addition to assisting plant to plant cooperation and transfer of technology as it is here envisaged,much will be gained if UNIDO contributed to ensuring contacts on a more general,-but always concrete,-basis for Chambers associating the corresponding industrial activities,sufficiently disagregated by branches to be more effective.

The creation of new technologies,however,is lagging in Argentina,and there is little or no encouragement at the public and private leveles in general,with few excentions.

The existing evidence on a couple of well organized multidisciplinary groups,and a scattering of smaller undertakings in various industrial fields,shows that possibilities are plentiful for considerable advance in this direction in Argentina.Often the results of such ventures were not as fruitful as otherwise could have been, due to adverse circumstances of various kinds.

Furthermore,as is well known,there is massive exodus from Argentina of trained scientists and professional technicians,many of whom occupy very high positions in other countries of the Third World and even in the industrialized countries of the west.

All of the foregoing underlines the "wasted" local capabilities,that properly and imaginatively assisted,could contribute much to argentine industrial development at the present stage,particularly in the expanding sector of "brain intensive" new technologies.