Concealed Unemployment in Ukrainian Industry: A Statistical Analysis

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1. Introduction

The difficulty in defining concealed unemployment is partly due to its inherent paradox: concealed unemployment may be said to describe the situation of the worker without work. This puzzle covers a whole cluster of actors, ranging from the worker to the employer who, without providing work yet maintains a relationship with the worker. Another paradox is related to the expression itself, because the need to evaluate the volume of concealed unemployment rises when concealed unemployment is getting more and more "visible" due to the number of people it is affecting.

Concealed unemployment lies somewhere at the interface between employed and unemployed, and also at the interface between inactive and the unemployed. It can also designate those unemployed workers who are disheartened or discouraged, who are included in the inactive figures (because they are no longer registered as unemployed), but who would, if given the chance, be ready to take up an employment again. In the Enterprise Labour Flexibility and Security Survey, these are the objective elements of concealed unemployment. But there are also more subjective aspects of concealed unemployment in Survey. For instance, when a manager evaluates the extent of "labour surplus" in his enterprise, that is the amount of labour that could be reduced to produce the same output as previously, he may be taking account of people already in concealed unemployment. The expression "workforce surplus" reflects the managerial subjective perspective. Furthermore, the manager may also be designating vulnerable workers, exposed to the risk of unemployment in either an open or a concealed form. In Ukrainian industry, concealed unemployment partly proceeds from a strategy of employment flexibility developed by the enterprise, which can take different forms, to improve its survival capacity in a context of high levels of labour market insecurity.

In this economic sector, concealed unemployment signifies several different situations. In some cases, workers are obliged, by the administration, to leave their work. Most of these workers lose their pay, some are partially remunerated, and very few maintain a reasonable part of their pay. In others, workers are put on a "shortened regime" (shortened working week or reduced hours). Even maternity or parental leave can be seen as concealed unemployment when the leave is prolonged.

The following pages analyse not so much the situation of concealed unemployment, but rather its reasons, insisting on the different forms of employment flexibility within the enterprises, thus shifting the focus to the process at the interface between employed and unemployed.

With this in mind, the recent macro-economic analysis of the Ukraine (Economist Intelligence Unit, 2000), which agrees with the analyses made by Standing and Zsoldos (2000 and 2001), put forward three main reasons for the phenomenon of concealed unemployment. Firstly, many workers have very little motivation to declare that they are out of work, as the benefits and the measures to help the unemployed are so meagre. Secondly, a significant number of workers are on administrative leave without pay, but have not actually broken off contractual relations, because this rupture would mean, for the worker, the loss of all the social benefits that subsist from the time of the socialist economy. Finally, mobility of the population for work reasons is a recent phenomenon which only came into being with the abolition of the travel permit enabling a person to re-locate (system of *Propiska*). This relative low mobility was seen as a restraint on the operation of the labour market.

One situation that can be specifically monitored is the situation of women, especially with regard to maternity and parental leave which is becoming longer and which has been

noted by Standing and Zsoldos (2000 and 2001) and by Evans-Klock and Samorodov (1998) in a regional comparative study.

In general, the statistics on concealed unemployment are based on surveys of individuals. For example, surveys of the workforce conducted in Europe have been used for a number of studies, particularly in the 1980's and 1990's, which were years of economic recession and growth of unemployment. It is much less common for statistics to be constructed on the basis of enterprises, where the institution is used as the unit of analysis for concealed unemployment.

The official statistics in Ukraine for the year 2000, based on registered unemployment, indicate nearly 5 per cent of the workforce as being unemployed, but this would seem to be much lower than the real figure. However, the estimated figure, based on labour force surveys and other sources, which take into account non-registered unemployment, indicates levels of unemployment four times higher than this (Economist Intelligence Unit, 2000).

Using the concept of concealed unemployment makes it possible to target this area of "grey" statistics. Therefore, in order to approach concealed unemployment statistically, work, employment, job, occupation and activity should be distinguished as precisely as possible (see Hussmanns, Mehran and Verma, 1990).

Concealed unemployment, because it does not clearly identify the situation of an individual, may turn out to be a source of uncertainty and therefore a source of insecurity on several levels, affecting not only the person concerned and his family, but society in general. If we take account of the concept of socio-economic security we can then achieve a multi-dimensional and multi-factor approach to concealed unemployment as proposed by Standing (2000, p.34).

2. Employment security and concealed unemployment: a multi-dimensional framework

The socio-economic security of a person is made up of all the resources he has at his disposal and that he applies in the course of his actions in order to face up to situations that are uncertain, risky or dangerous.

Within the context of socio-economic security, employment security is defined as "protection against arbitrary dismissal, regulation on hiring and firing, imposition of costs on employment, etc." (ILO, 1999a, p.2). Nevertheless, although the concept of concealed unemployment involves the question of employment security, it cannot be reduced merely to that, as it also includes other, interrelated, aspects of socio-economic security.

2.1 Three dimensions of socio-economic security

Because of the "continuous" (i.e. indivisible) nature of socio-economic security, and also because of the challenge posed by the task of centring the concept on security, three dimensions are involved in a statistical representation of this concept: the morphology, the dynamics and the representation of the socio-economic system.

First of all, the degree of security from which the actor benefits and, arising out of that, the efficiency of the underlying mechanisms, depends not only on his individual security but also on that of the structures and supra structures of which he forms a part. A first dimension therefore takes into account the morphology of the socio-economic system.

As mentioned by Dasgupta (2001, p. 8) "Employment security may be assessed at three levels - national or macro level, enterprise or meso level and individual or micro-level". This statement can be extended to other forms of security.

Thus it should be possible to break down the indicators that describe the socio-economic security of an actor into a component based on security related to his/her own vital characteristics, those of the person's family and/or the circumstances of her/his daily life, of the workplace, of the region, of the economic and social universe in which she/he exists, etc.

Equally, we can describe the level of security of a more complex unit, composed of sub-units, using not only a measure[1] that takes account of the levels of security of the sub-units, but also a component that includes the element of security that may be imputed to the transitions and interrelations of the sub-units.

The three level approach, macro, meso and micro, is also consistent with and complementary to the cybernetic approach proposed above to organize the indicators of socio-economic security: "We have tried to categorize as 'input' indicators (policy measures, regulatory systems, etc.), and 'outcome' indicators (proxy measures of various forms of security and insecurity). Although they could be subsumed under 'input' variables, it may also make sense to think of a third type - process indicators" (ILO, 1999a, p.2).

The first dimension articulates with a second, temporal dimension, in which for instance we inscribe the actor in a course of action. Thus, each of the levels identified in the first dimension is inscribed in the second, thus making a particular temporal scale correspond to each level (macro, meso and micro). The specificity of these synchronic scales may be understood for example in the way in which the actor applies in the course of one action a whole collection of resources in order to face uncertainties, risks and dangers, depending on the socio-economic level at which these present themselves.

Finally, the articulation of these two dimensions may be understood in a relationship of duality, between "behaviours and attitudes", "realisations and representations", and "objective security and subjective security", which leads us to define a third conceptual dimension complementary to the first two, related to subjective social and economic security for a country (the highest level of the structural dimension) and its trends over time. This national representation of social and economic security exceeds the aggregation of subjective security at the individual or micro level, and the enterprise and institution or meso level. To formulate a proper indicator at an aggregated level, a pure additive procedure is not sufficient. Interactions between units at the same level and between different structural and temporal levels should be taken into account.

2.2 Uncertainties, dangers and risks: some questions concerning prediction

To take an example, basic security may be defined as all the resources applied in an active or passive manner by the actor in order to face the uncertainties, risks and dangers that threaten his physical, social and economic existence. For this, it seems reasonable to say that he has recourse, either actively or passively, to a certain volume of material and

[1] The term "measure" is used in the statistical sense: an individual metric attribute is a "measure" if the attribute corresponding to the sum of the parts is reached by addition. But if the attribute corresponding to the sum of the parts is reached by averaging, we designate it as a "variable". Thus we can say that at a higher aggregate level than the statistical unit "we add up measures and average variables". For example, the population of a commune (village/district) is a "measure", its density is a "variable". For more details see Rouanet and Le Roux (1993).

symbolic capital (food, lodging, education, income). On the disposition of this material and symbolic capital and on the active or passive recourse to this capital will depend his degree of basic security.

Recording and identifying this volume of capital provides only an indirect indicator of the security of the actor; we still need to know in what course of action these resources are applied. Finally his experience enables him to visualise (rightly or wrongly) what is going to happen. Uncertainty (the term is used here without any value connotation) and the subjective evaluation that the actor makes of an objective process enable him to apply certain resources that guarantee his objective as well as subjective security.

This evaluation of the unknown therefore puts order into uncertainty, danger and risk. Thus it is that the predictability of a course of action, underlines the necessity to integrate the temporal dimension into the dimension of behaviour, realisation and representation and to produce indicators, which take account of these interrelations.

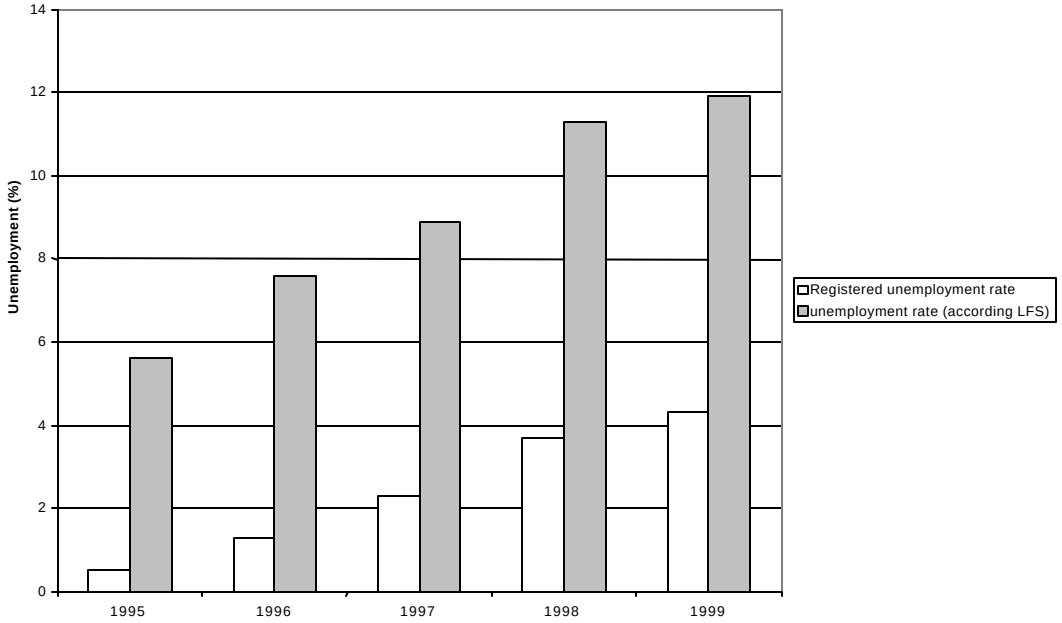
In the presentation developed below, centred above all on the application of indicators, we have further underlined the morphological as well as the temporal dimensions of the socio-economic system.

3. Unemployment and concealed unemployment in Ukrainian industry

3.1 Global data on unemployment

In spite of the considerable changes that have taken place in the economy of the Ukraine, the rate of registered unemployment remains low (figure 1).

Figure 1. Unemployment rates in Ukraine, 1995-1999 (percentage of unemployment)



Sources: Registered unemployment rate: Unemployment rates in Ukrainian States Statistics Committee of Ukraine (1999). Estimated unemployment rate (according to the Labour Force Survey): State Employment Centre, Ministry of Labour and Social Policy of Ukraine in State Statistics Committee of Ukraine (1999) and IMF (2001).

This seems odd until one takes into account the phenomenon of concealed unemployment and its estimated contribution. Figure 1 compares two sets of employment figures. For the registered unemployment rate, the statistics record the number of people who do not have an income from work, are registered at the state employment service, are actively looking for work and are prepared to work if they are offered employment. The unemployment rate is estimated according to the Ukraine Labour Flexibility Survey (LFS), using the same definition. The difference between these two figures is due both to the type of statistic (the estimated rate has a certain percentage of error), and also to one of the components of concealed unemployment: the workers who are unemployed but have not necessarily registered.

Apart from this difference, there are other concealed unemployment forms that are not recorded here. These constitute the "grey" statistics on people out of work who have not been recorded under the status of unemployed.

3.2 Concealed unemployment

According to the report prepared by the ILO Central and Eastern European Team in 1998:

> In 1996, the number of workers put on administrative leave equalled 3.4 million, or 23.8 per cent of all workers. In 1997, this number slightly decrease to 2.9 million persons, equal to 21.9 per cent of total employment, of whom almost one-third were on a leave for more than one month. Other workers are forced to work part-time, either temporarily at the initiative of enterprise management or permanently when they are unable to find a full-time job. In 1997, altogether 2.1 million persons (16.1 per cent of the workforce) worked part-time. This mean, that in total, 38 per cent of all workers were in fact partially redundant or unemployed in a hidden fashion in 1997. In 1996 the total number of man-days (full days without intra-shift losses) lost due to administrative leave or part-time work amounted to 232 million, or 25 days per worker. One year later, as many as 23 billion man-hours were lost, corresponding to roughly 287 million man-days. The sector hardest hit by hidden unemployment was industry, with 32 lost days per worker in 1996 and 39 lost days (309 lost hours) per worker in 1997.

Administrative leave and shorter working hours are used by many employers as they offer the possibility of moderating social pressures associated with directs layoffs during a period of economic difficulties and of avoiding severance pay, while keeping those workers who are important for the enterprise (ILO, 1998, p. 27).

Although these figures describe the situation in 1997 and 1998, they appear to be consistent with the analysis made by Standing and Zsoldos (2000 and 2001).

These authors propose a group of 6 indicators of surplus labour:

CU1 Possible reduction in employment to continue to produce the same output as previously, as a percentage of total employment. This indicator is not exhaustive for the sample, since each year only some of the institutions in the sample return their replies about their ability to produce at the same level with a lower volume of employment.

CU2 Workers on administrative leave without pay as a percentage of total employment.

CU3 Workers on administrative leave with part pay as a percentage of total employment. This indicator takes into account the number of workers on obligatory leave initiated by the administration with financial assistance over the total employment as of March the 1st of the current year of the survey.

CU4 Workers on administrative leave with pay as a percentage of total employment. This indicator takes into account the number of workers on obligatory leave initiated by the administration and partially paid (2/3 of the established tariff) as a percentage of total employment as of March the 1st of the current year of the survey.

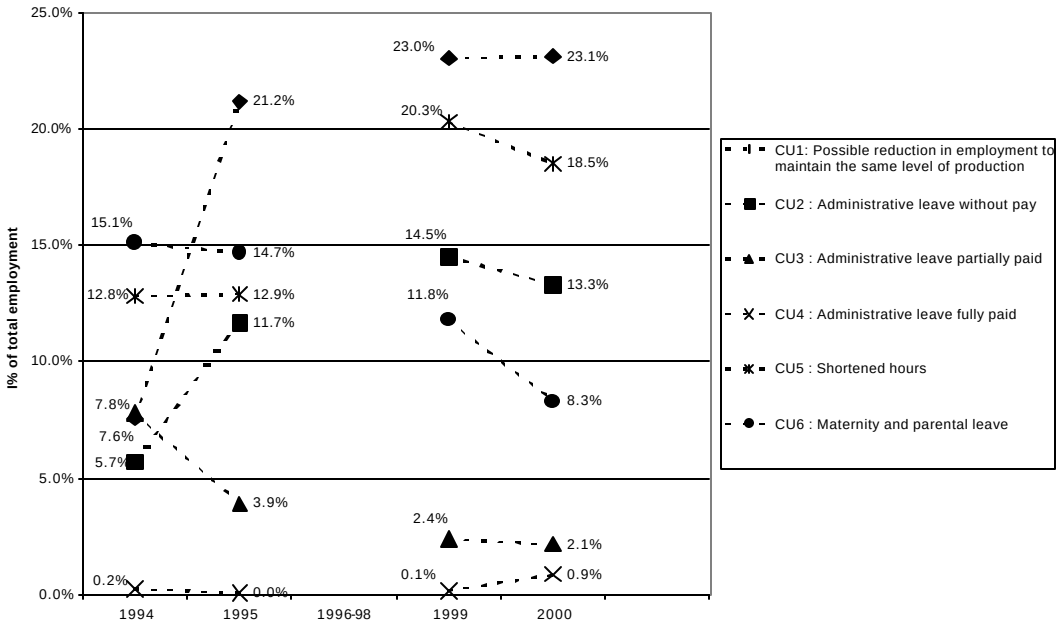
CU5 Part time workers (reduced hours or days per week) as a percentage of total employment. This indicator takes into account the number of persons working shorter hours on the initiative of the administration on both a daily and a weekly part-time basis as a percentage of total employment as of March the 1st of the current year of the survey.

CU6 Maternity and parental leave as a percentage of female employment.

Figure 2 gives the estimated values of these indicators in Ukrainian industry for the years between 1994 and 2000, according to the Ukrainian Labour Flexibility and Security (ULFS) surveys.

The figure shows a deterioration in the situation between 1994 and 2000, as the practice of administrative leave without pay has increased at the same time as part-paid posts have diminished, with a concomitant reduction in the worker's secure income.

Figure 2. Concealed unemployment indicators in Ukrainian manufacturing industry 1994-2000



Source: ULFS (Ukrainian Labour Flexibility and Security Survey) 1994, 1995, 1999 and 2000.
Note: The values calculated for the first indicator of labour surplus (possible reduction in the work force to maintain the same level of production) are obtained by averaging and uniform weighting. The other indicators are weighted by the size of the industry. The trends are shown in a dotted line because they refer to different enterprises.

The rate of maternity and parental leave has dropped dramatically, falling from 15.1 per cent to 8.3 per cent of the female work force, probably because these women fear losing their footing altogether in the labour market.

The proportion of labour surplus declared by industrial managers has risen nearly three fold in six years, from 7.6 per cent in 1994 to 23.1 per cent in 2000. What is striking, however, is that the first reason invoked by managers for not dismissing these workers is that their enterprises are unable to pay release benefits and the second is their concern for their own employees, who, if released, would have no social protection.

The Ukrainian data analysed here and in the following sections, were obtained through the ULFS surveys conducted annually since 1994 by the State Statistics Committee of Ukraine, in cooperation with the International Labour Organization (ILO) and the United Nations Development Programme (UNDP).

The survey is based on two questionnaires addressed to the management of Ukrainian industrial enterprises. The first questionnaire gathers quantitative statistical data on the enterprise. The second questionnaire, conducted as an oral interview, collects specific information from top management. The surveys from 1994 to 1999 used the same questionnaire. In 2000, the questionnaire was slightly revised.

The sampling design of the survey is carried out at regional level. The business registers of manufacturing enterprises in the different regions are used as the universe, and a sample selection obtained which ensures the representation of the regions. Each sample includes enterprises of various sizes (i.e. small, medium and large) and all property forms.

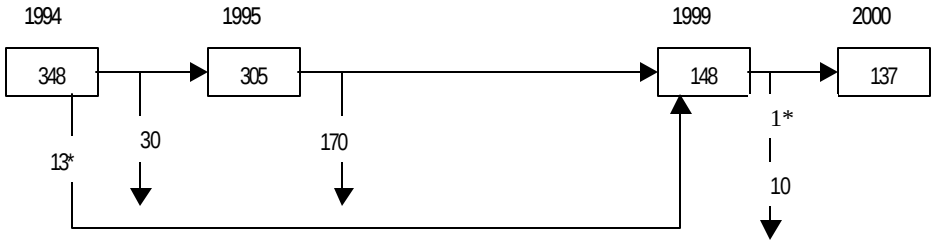
Since 1994, the sample size has progressively increased (from 60 enterprises in each of 6 regions in 1994 to 1,864 enterprises in 2000). From 1995 to 1999 the sample included 30 enterprises each of 26 regions. The objective was to roll over 50 per cent of the previous sample in successive years. It is important to note that the 2000 ULFS included all enterprises, which were interviewed in 1999.

4. A longitudinal analysis of data in Ukrainian industry

4.1 Construction of the cohort for 1994

A cohort is made up of statistical units identified by the fact that they have gone through the same initial event (in this case they have all taken part in the Ukrainian Labour Flexibility Survey of 1994). Through the succeeding surveys, information has been collected regularly and systematically over time. Two types of analysis in time can be distinguished: longitudinal analyses, which are based on the study of cohorts and operate at the level of statistical units; and cross-section approaches, where the statistical units are not necessarily the same from one time to another, but whose representative nature (of changes within the population of interest) makes it possible at an aggregate level to follow the evolution of certain characteristics. This paper applies a longitudinal analysis over time.

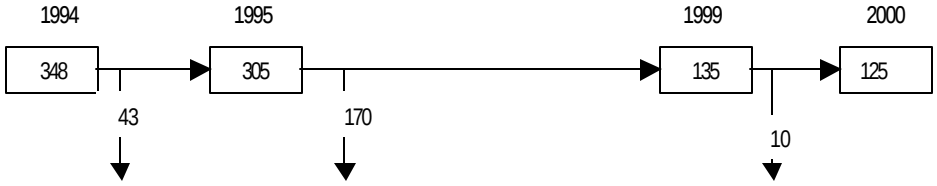
Figure 3. Enterprise survival flow chart 1994-2000



Note * - One enterprise was surveyed in 1994, surveyed again in 1999 and no longer appeared in the sample of 2000.

In our longitudinal analysis on the other hand, we are interested only in the enterprises surveyed in each of the 4 years. Of 348 enterprises surveyed in 1994, 125 are retained according to these criteria, as indicated in Figure 4.

Figure 4. Construction of the cohort

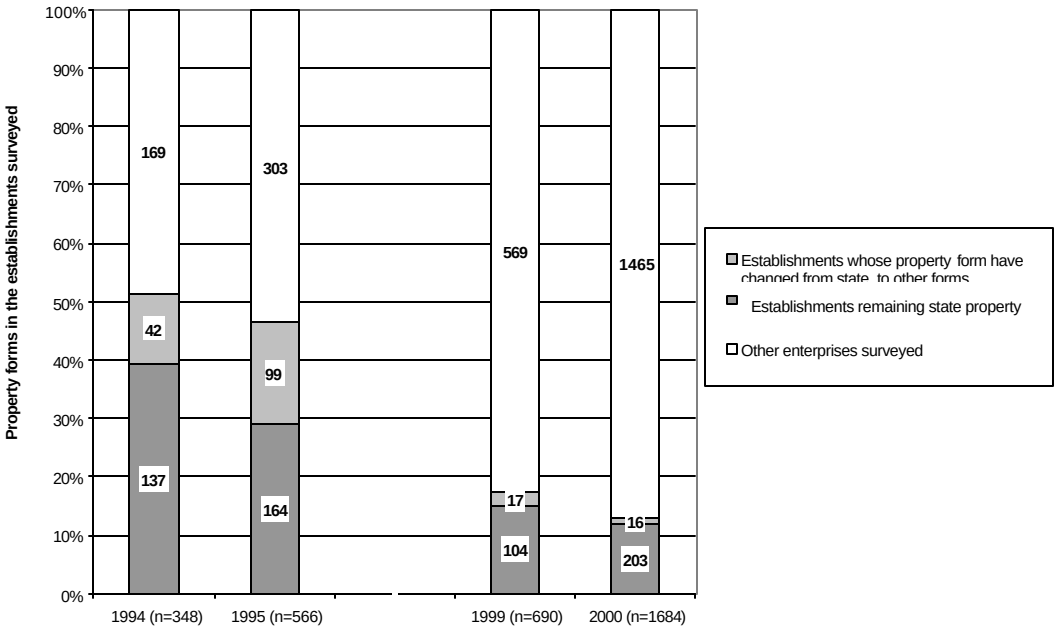


Appendix 1 shows the regional distribution and industrial sector of the 125 enterprises retained.

4.2 Type of ownership and concealed unemployment

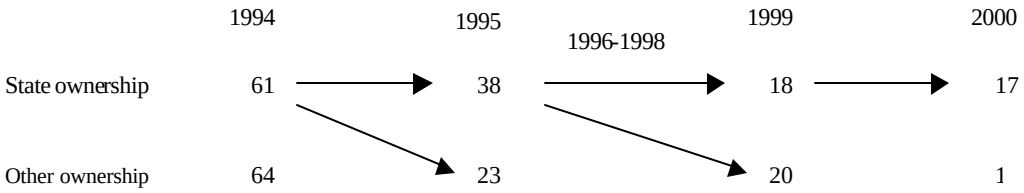
If we had to select one single element that characterizes the changes that have occurred in Ukrainian industry, at the enterprise level, it would be the process of privatisation. Figure 5 shows that in 1994 more than 50 per cent of the enterprises surveyed are or were in the year preceding the survey under state ownership. This proportion is less than 15 per cent in 2000.

Figure 5. Changes in property form in 1994,1995, 1999 and 2000



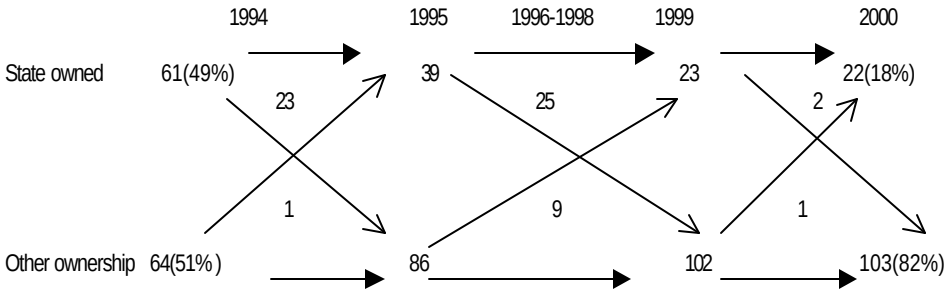
Among the 125 enterprises that constitute the cohort, the longitudinal approach indicates that the change from state ownership to a different type of ownership is even more marked. Figure 6 shows the extent of this phenomenon in the form of a flow chart.

Figure 6. Moves in property form: from state to other ownership, 1994-2000



In 1994, of the 61 enterprises belonging to the state, only 17 remain in 2000. As time progresses, the changeover to assets, other than public asset, slows down. But we also observe to a lesser extent changes in the type of ownership in the other direction, where enterprises pass into the hands of the state, although we suppose that this could only be in a transitory fashion. The reduction in the number of enterprises in the hands of the state took place mainly between 1994 and 1995. This progressive withdrawal of the state may be seen in Figure 7, which shows that of the 125 enterprises the state owned no more than 49 per cent in 1994, and this is down to 18 per cent in 2000.

Figure 7. Changes in property form between state and other ownership, 1994-2000



The extent of this phenomenon was also measured with reference to concealed employment. Figures 8 and 9 shows the total number of workers, and those on administrative leave, reduced hours or female maternity or parental leave, the most common forms of concealed unemployment in Ukraine.

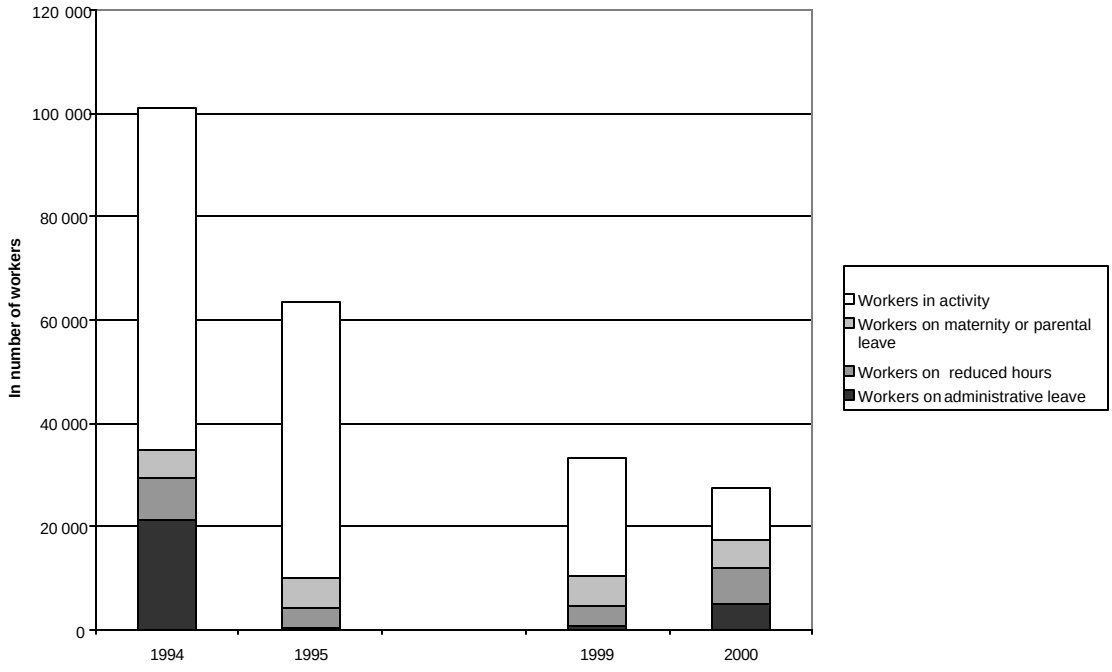
The two figures above show a surprising absence of a real trend in the changing composition of the concealed unemployment figures. They also show that as the workforce in state enterprises diminishes, it rises in the other enterprises. Nevertheless the trend is not the same in the two types of enterprises. The figures also show a net loss of employment.

In the state enterprises, we observe a relatively constant number of workers on reduced hours/pay and a sustained reduction in the number of workers on administrative leave. The recent situation is striking: in the enterprises where the state is still the owner, the number of surplus workers is higher than the number of workers in employment.

In enterprises where the ownership is elsewhere than in the hands of the state, the size of the workforce surplus is surprising. It would appear that these enterprises take on the surplus workforce without in the short term seizing the change of ownership as a chance to restructure.

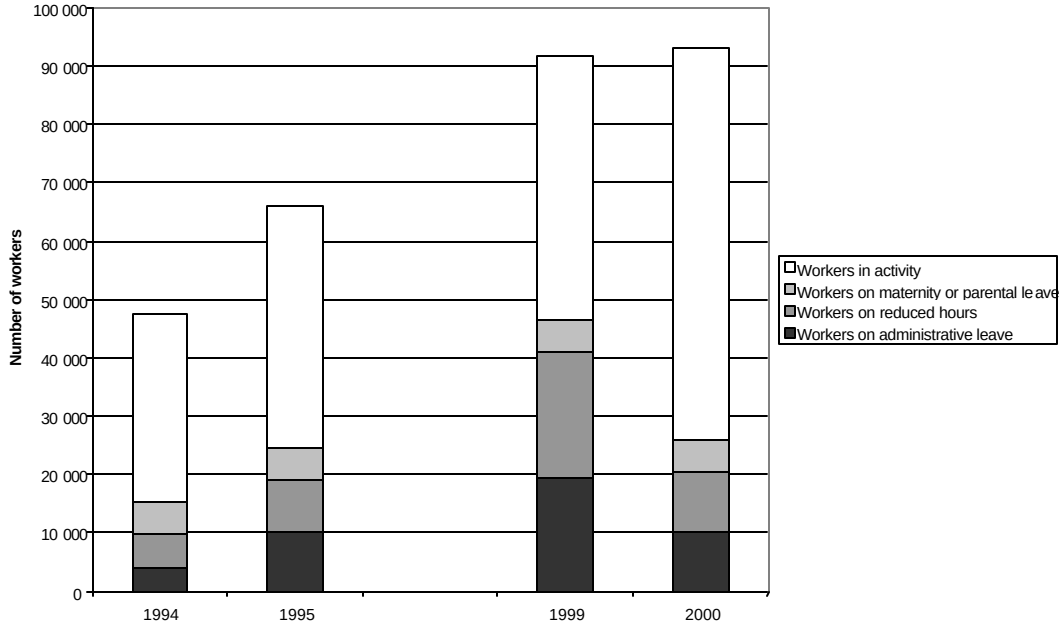
Thus, the surplus workforce seems to have remained proportionally important in spite of changes in the type of ownership. Moreover, the figures seem to show that concealed unemployment has actually been reinforced under these conditions.

Figure 8. Status in state owned enterprise (1994 cohort)



Source: ULFS 1994, 1995, 1999, 2000

Figure 9. Worker status in non-state owned enterprises (1994 cohort)



Source: ULFS 1994, 1995, 1999, 2000

Figures 10 and 11 show the usefulness of a longitudinal analysis. In effect, the 1994 cohort data show that the reduction of concealed unemployment did not take place the year following, but that it was pushed back in time. On the contrary, the state-controlled institutions actually increased the net number of workers who are on administrative leave without pay.

Figure 10. Profile of workers in the 23 state owned enterprises of the 1994 cohort which changed their property form in 1995

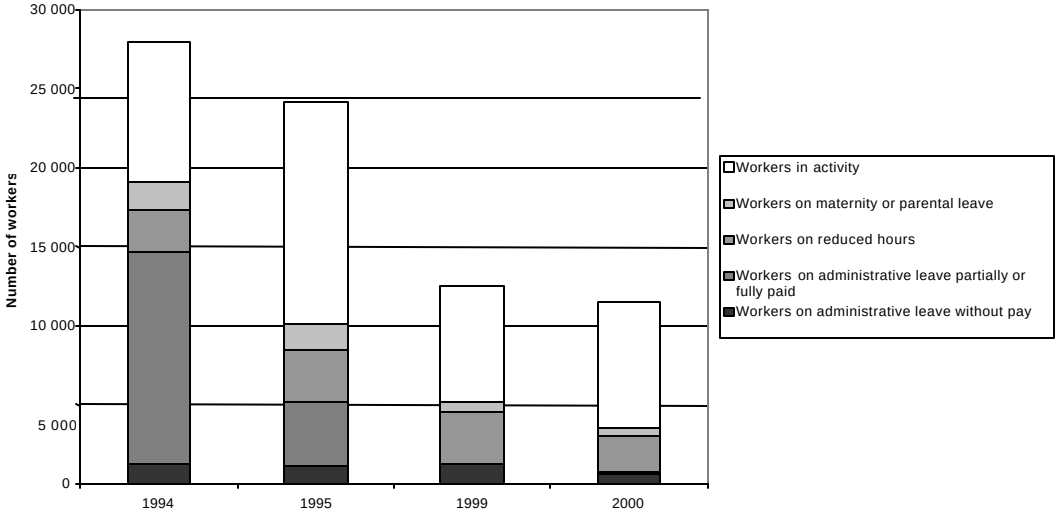
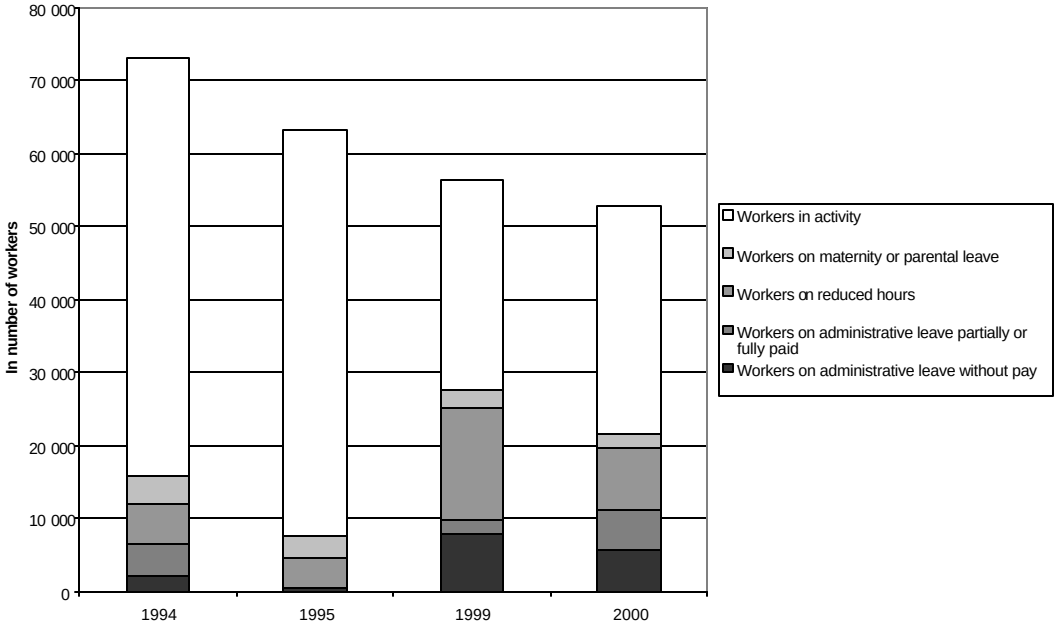


Figure 11. Profile of employment in the 38 state owned enterprises of the 1994 cohort which remained in state ownership in 1995

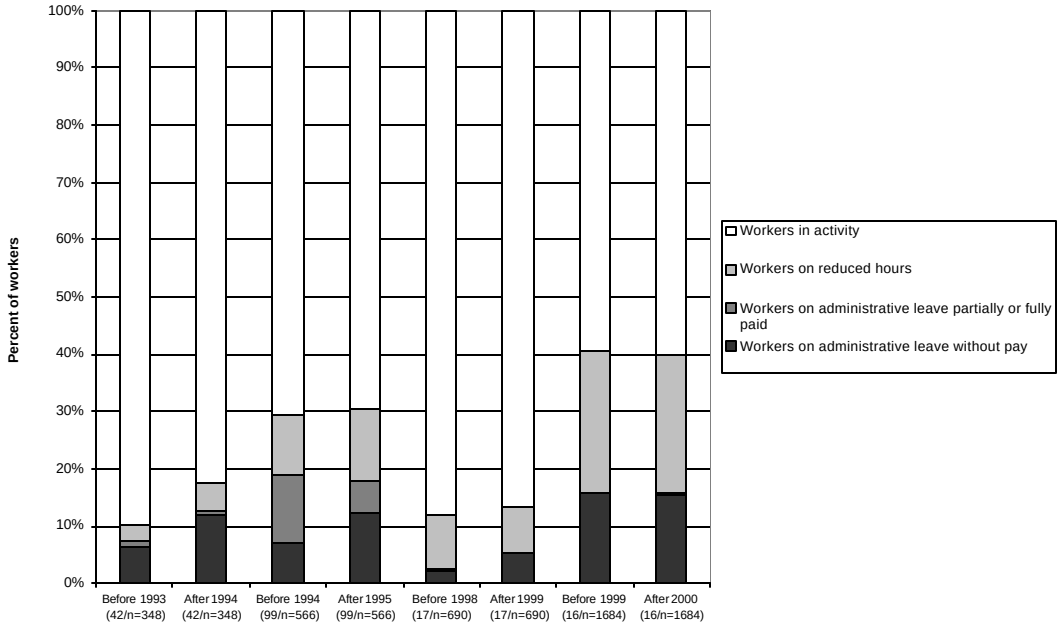


In comparison to the longitudinal analysis, Table 1 and Figure 12 is based on the samples of 1994, 1995, 1999 and 2000, in which all the enterprises are taken into account. It shows that in the enterprises that were state-owned and that changed to a different type of ownership the following year, the proportion of workers on administrative leave without pay increased. The proportion of the workers on reduced hours/pay has, however, remained the same.

Table 1. Employment in state enterprises whose property form changed the following year

Survey	Number of enterprises	Date	Workers on administrative leave without pay	Workers on administrative leave partially or fully paid	Workers on reduced hours	Workers in activity	TOTAL
ULFS94	42	Before (1993)	2 234	293	965	30 802	34 294
		After (1994)	3 708	212	1 501	25 754	31 175
ULFS95	99	Before (1994)	10 012	16 126	14 932	98207	139 277
		After (1995)	15 405	6 851	16 015	86 874	125 145
ULFS99	17	Before (1998)	248	38	1 161	10 795	12 242
		After (1999)	641	0	1 001	10 596	12 238
ULFS00	16	Before (1999)	1 460	27	2 310	5 541	9 338
		After (2000)	1 359	54	2 130	5 356	8 899

Figure 12. Profile of employment in state enterprises whose property form changed the following year



5. The nature of concealed unemployment in Ukrainian industry

This section describes the results of the survey on the flexibility of employment in Ukraine in 2000 (for a first exploratory analysis see Standing and Zsoldos, 2001), in a multidimensional and multi-factor presentation centred on the concept of concealed unemployment.

The first objective is to see whether there are patterns between enterprises with regard to concealed unemployment. A second objective, related to the first, is to propose a methodological tool to see whether there are any significant differences between regions and sectors as regards to concealed unemployment. It is important for political decision-makers to have instruments that identify the most affected regions and the most deprived industrial sectors. Apart from regional or sector differences, we need to look at concealed unemployment inequalities within certain regions and in specific sectors. The third objective of this section is to identify a group of basic indicators useful for the construction of a synthetic indicator of concealed unemployment for the enterprises. We propose here an alternative method to multiple regression analysis in the construction of aggregated indicators for metric variables when, as is the case here, the approach is clearly exploratory.

This analysis is based on the hypothesis that the sample of enterprises surveyed in the 2000 ULFS provides a proper representation of the regions and the sectors.

The group of initial variables in the statistical analysis of the data derives partly from the surplus labour indicators mentioned in the previous section, originally formulated by Standing and Zsoldos (2000). Other indicators have been added to characterize the context of employment in the enterprises, in particular indicators that underline the gender dimension as well as indicators of differences in the occupation profiles of the workers. Table 2 describes the indicators used. The formulas used for their construction are given in Appendix 2.

Given that our aim is above all exploratory, we first proceeded to a standard analysis of principal components (SAPC) with illustrative variables.

The principal components are obtained by combining linearly the initial indicators to build a set of new synthetic variables, two by two uncorrelated. The principle of this method is to describe the variance of the multidimensional space defined by the initial indicators. Thus, the positions of the indicators in the first principal component constitute the configuration that best represents the variance of the initial data. In this study, the percentage of variance represented by the first principal component is 12.8 per cent. The configuration represents the correlations observed on the data. The analysis of principal components consists in the interpretation of the configuration along the principal components. The configuration of the second principal component is the second best representation of the variance of the initial data (here 10.7 per cent).

In SAPC, the number of principal components to be interpreted is not fixed in advance and the criteria we use here is to explain a sufficient amount of variance. In this study we analysed the first six principal components, thus explaining 55.2 of the total variance.

There are several advantages of using this method. First, we have reduced the dimensionality. That is, we are synthesizing in 6 principal components 55.2 per cent of the variance expressed by 15 indicators (we have 21 indicators in total, but only 15 of them

contribute actively to the SPCA. The other 6 indicators are considered as illustrative.[2] Second, the principal components, by structuring the correlations, are putting the initial indicators in order. This order is based on the contribution each initial indicator gives to the variance of the first principal component.

Table 2. Basic indicators of concealed unemployment

	Description of indicator	Descriptive statistics
C1	Indicator for evaluating the surplus workforce by the management: evaluation of the percentage of possible reduction in employment while continuing to produce the same quantity (This indicator is not exhaustive for the sample, since each year only some of the institutions in the sample reply).	N Valid = 532 Min = .00 Max = 50.00 Mean= 22.5338 S.D. = 13.26752
C2	Indicator for the practice of administrative leave imposed by the enterprise *without pay*: ratio of the number of individuals this situation in March 2000 to the total work force on 1st January 2000	N Valid = 1615 Min = .00 Max = 1.00 Mean=.1542 S.D. = .25036
C3	Indicator of administrative leave imposed by the enterprise *with part pay*: ratio of the number of individuals in this situation in March 2000 to the total work force on 1sr January 2000.	N Valid = 1615 Min = .00 Max = 1.00 Mean= .0118 S.D. = .08052
C4	Indicator of administrative leave imposed by the enterprise *with full pay*: ratio of the number of individuals in this situation in March 2000 to the total workforce on 1st January 2000.	N Valid =1615 Min = .00 Max = .90 Mean= .0037 S.D. = .04281
C5	Indicator of female administrative leave imposed by the enterprise: relationship between the proportion of women *on administrative leave without pay* and the proportion of the female workforce.	N Valid = 733 Min = .00 Max = 4.86 Mean= 1.0829 S.D. = .57549
C5a	Indicator of female administrative leave imposed by the enterprise: relationship between the proportion of women *on administrative leave* and the proportion of the female workforce.	N Valid = 745 Min = .00 Max = 4.86 Mean= 1.0847 S.D. = .56090
C6	Indicator of the reduced schedule imposed by the enterprise (*fewer hours per week*): ratio of the number of individuals in this situation in March 2000 to the total workforce on 1st January 2000.	N Valid = 1615 Min = .00 Max = 1.00 Mean= .0528 S.D. = .16628

[2] In the same way as the indicators' principal coordinates are the correlations between the initial variables and the principal components, the illustrative variables' principal coordinates are calculated as the correlations between the illustrative variables and the principal components.

Table 2 (contd). Basic indicators of concealed unemployment

	Description of indicator	Descriptive statistics
C7	Indicator of the reduced schedule imposed by the enterprise (*fewer days per week*): ratio of the number of individuals in this situation in March 2000 to the total workforce on 1st January 2000.	N Valid = 1615 Min = .00 Max = 1.00 Mean= .1104 S.D. = .25349
C8	Indicator of care work (non-obligatory severance of women): women on maternity or parental leave on 1st January 2000 as a percentage of the total workforce on 1st January 2000.	N Valid = 1615 Min = .00 Max = 1.00 Mean= .0396 S.D. = .05993
C9	Indicator of income insecurity: ratio of the number of workers with pay outstanding between April 1999 and April 2000 to the total workforce on 1st January 2000.	N Valid =947 Min = .00 Max = 100.00 Mean= 91.6536 S.D. = 17.63772
C10	Indicator of degree of income insecurity: ratio of the number of workers with pay outstanding *for more than 3 months* between April 1999 and April 2000 to the total workforce on 1st January 2000.	N Valid = 780 Min = .00 Max = 100.00 Mean= 70.6256 S.D. = 36.23810
C11	Indicator of occupational inequality between sexes within the enterprise: Euclidian distance between the employment profiles (in administration, in the sales points and on the shop floor) of men and women in January 2000.	N Valid = 1585 Min = .00 Max = 2.60 Mean= .4789 S.D. = .37389
C12	Indicator of the change in volume of employment in the enterprise: ratio of the difference in volume of the work force between 1st January 1999 and 1st January 2000, to the volume of the work force on 1st January 2000.	N Valid = 1615 Min = -4.90 Max = 1.00 Mean= -.0568 S.D. = .33658
C13	Indicator of employment rotation within the enterprise: ratio of the movements (number of workers leaving and number of workers taken on) between October 1999 and March 2000, to the total work force on 1st January 2000.	N Valid = 1615 Min = .00 Max = 4.41 Mean= .2253 S.D. = .26956
C14	Indicator of numerical flexibility in the enterprise: Euclidian distance between the profile of workers dismissed by the enterprise as a result of reorganization, reduction in personnel or reconversion and the profile of workers who leave the enterprise for other reasons, according to the type of occupation (in administration, at a sales point or on the shop floor). This indicator also tracks employment insecurity in the context of restructuring from the point of view of the worker.	N Valid = 1533 Min = .00 Max = 8.91 Mean= .3622 S.D. = .90090
C15	Indicator of the contribution to functional flexibility within the industry of which the enterprise is a part: Euclidian distance between the profile of workers leaving the enterprise because they are transferred to a different enterprise and the profile of workers who leave the enterprise for other reasons, according to the type of occupation (in administration, at a sales point or on the shop floor).	N Valid = 1581 Min = .00 Max = 11.62 Mean= .2588 S.D. = .87676
C16	Indicator of numerical flexibility in the enterprise: percentage of workers who are dismissed because of reorganization of the enterprise as a proportion of all the departures registered between October 1999 and March 2000.	N Valid = 1561 Min = .00 Max = 1.00 Mean= .0638 S.D. = .14678

Table 2 (contd). Basic indicators of concealed unemployment

	Description of indicator	Descriptive statistics
C17	Indicator of female representation in the enterprise: percentage of women in the workforce of the enterprise on 1st March 2000.	N Valid = 1615 Min = .00 Max = 1.00 Mean= .4639 S.D. = .19853
C18	Indicator of numerical flexibility in the enterprise: percentage of workers transferred to other enterprises of the same group amongst the departures registered between October 1999 and March 2000.	N Valid = 1561 Min = .00 Max = 1.00 Mean= .0291 S.D. = .11280
C19	Indicator of the variation in the rate of capital utilization between 1999 and 2000: rate of variation between the rate of use in March 2000 and the rate in March 1999, in relation to the rate of use in March 2000. Estimate supplied by the representative of the enterprise. It would be more useful here to consider a longer period to evaluate the variation in this rate, for example by taking the variation between March 1998 and March 2000. Nevertheless, as we are dealing with guesstimates we prefer to take March1999 for reasons of reliability of the replies.	N Valid = 1486 Min = -21.00 Max = 1.00 Mean= -.2471 S.D. = 1.48422
C20	Size of the enterprise: by number of workers.	N Valid = 1615 Min = 2.00 Max = 24806.00 Mean= 664.4947 S.D. = 1601.93819

The principle is to build a multidimensional space based on the 21 concealed unemployment indicators described above. The analysis is said to be "standard" because we standardize the initial indicators (centred on their means and reduced by their standard deviations), as they were not on the same scales.

Unfortunately, the double status of the indicators precedes less from a conceptual choice than from a practical choice: the active indicators are those for which we can observe values in most of the enterprises in the sample. Conversely, the illustrative indicators are those for which we observe values in some enterprises only. As the indicators c1, c5, c5a, c9, c10 and c19 are not calculable, due to missing data, for over 20 per cent of the sample enterprises, we have considered them as illustrative variables in the analysis.

In a later step of consolidation of the results (a *posteriori* analysis of variance of the principal components), the principal components will be examined in the light of other explanatory variables. These are the size of the enterprise (factor S), the region (factor R) and the industrial sub sector (factor I) as described in Appendix 3.

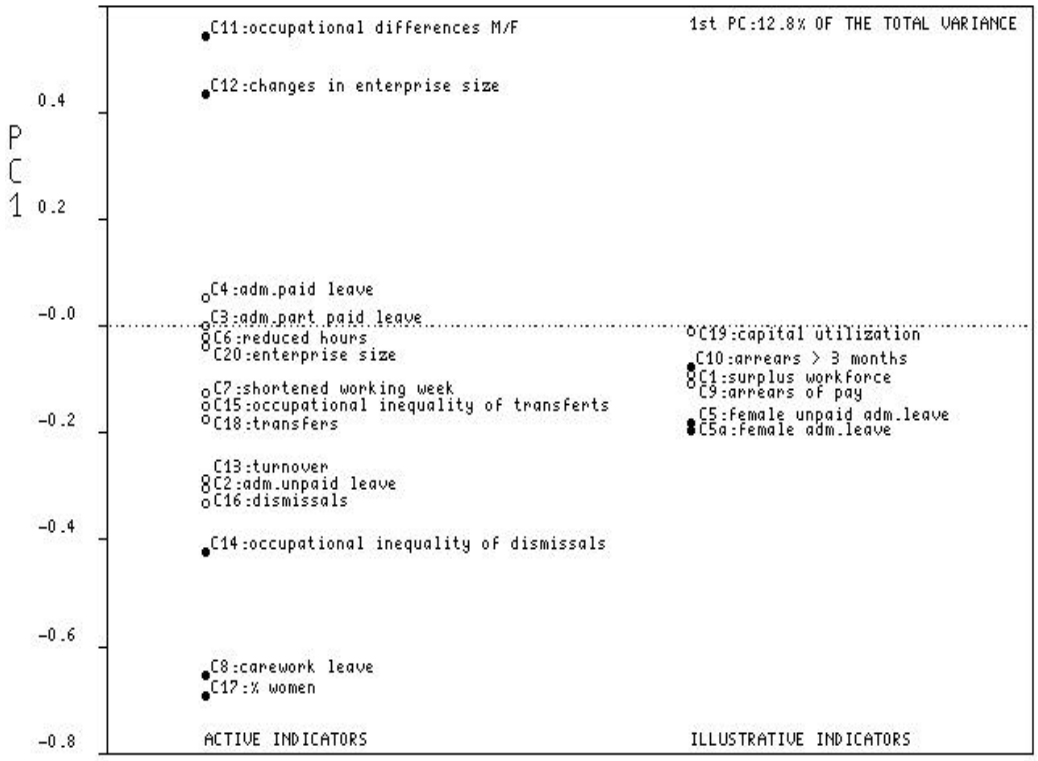
5.1. Analysis at the enterprise level (micro level)

The first 6 principal components explain 55.2 per cent of the total variance generated by the principal component analysis based on the 15 initial active indicators.

Keys to reading the figures:

In the figures presented in this section, the 15 active indicators participating to the principal component calculation are represented on the left. Black bullet points indicate that the contribution of this indicator is relatively high (more than the mean contribution). For those indicators not contributing to the axes formation (6 illustrative indicators), appearing on the right, the black bullet points indicate an acceptable quality of representation. All the 21 inital indicators are systematically reported on the figures on each of the 6 first principal components.

Figure 13. First principal component (PC1)



The first principal component (i.e. the one that concentrates the highest proportion of variance, at 12.8 per cent) underlines the gender dimension (Figure 13). This component indicates that the more the occupational profiles of men and women differ, the more important the volume of changes in employment. These two variables are opposed on this principal component to the indicator of female participation in the enterprise (indicator c17, percentage of women) as well as to the rate of women on maternal or parental leave (c8, care work leave indicator).

This last correlation, trivial as it may seem (the higher the proportion of women, the higher the maternity and parental leave), gives us valuable information when characterizing the enterprises belonging to the sectors presenting negative coordinates on the first component: those characterized by a young female labour force (of child-bearing age). These two indicators are positively correlated to the indicator of inequality of occupational dismissals (c14).

The illustrative variables show that this phenomenon is concomitant with wage arrears of over three months and with a high number of women on administrative leave (illustrative indicator c5a), frequently without pay (illustrative indicator c5).

It is the opposition between these two groups of indicators which is determinant for the whole set of enterprises retained in this analysis and which is, at this level, the most determinant of all the bivariated correlations observed between the 21 indicators, as shown by the correlations in Appendix 3.

To summarize: this first component appears as a gender phenomenon showing the cumulative character of insecurity factors for women workers (income and employment insecurity) linked to external numerical flexibility (we can only see here the reduction

aspect of the flexibility), even though the occupational profiles of men and women do not present important differences.

Figure 14. Second principal component (PC2) [3]

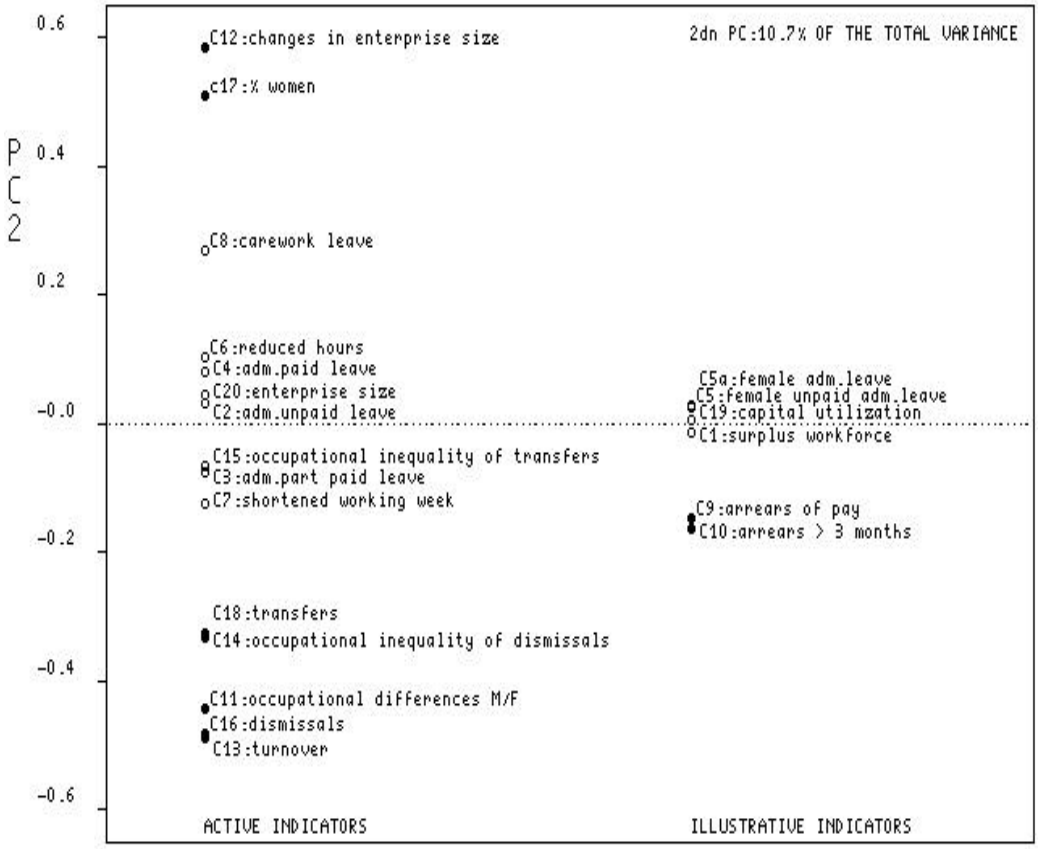


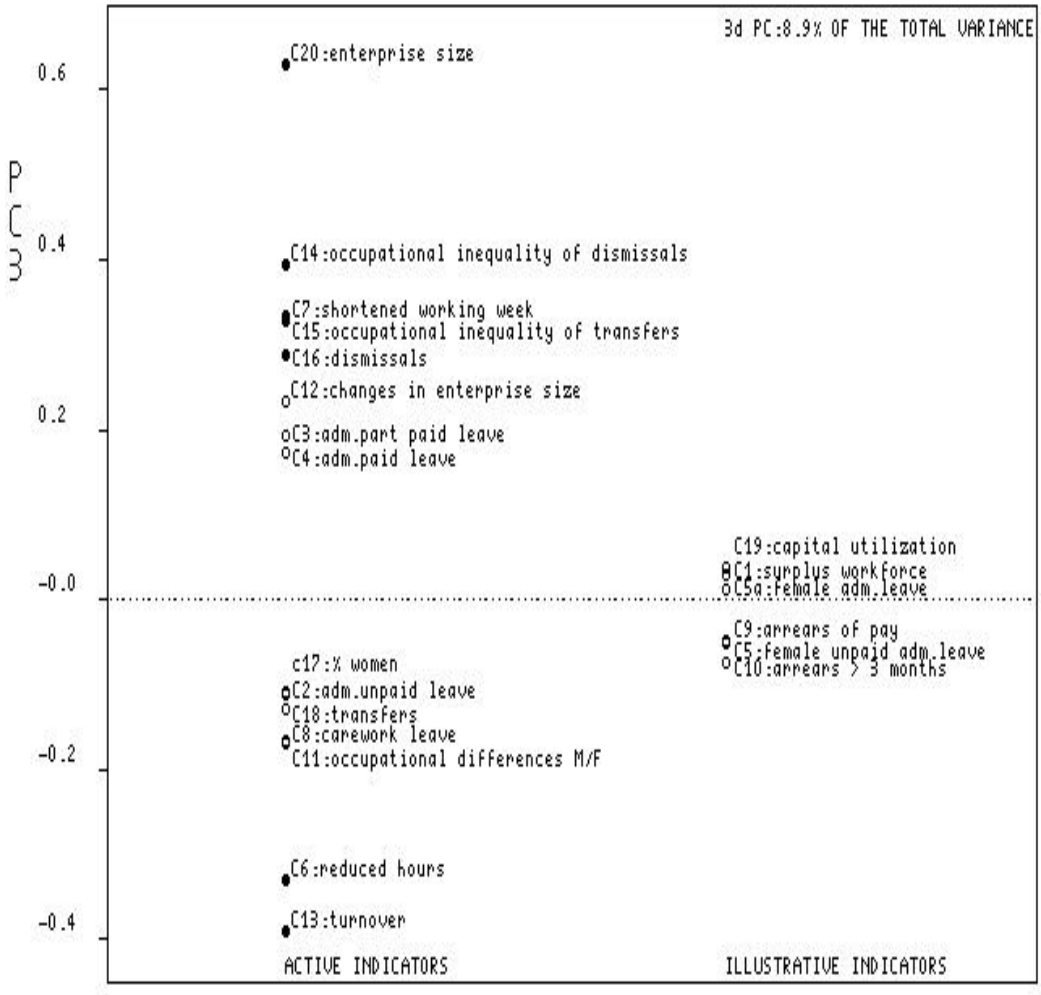
Figure 14 indicates that the greater the occupational differences between men and women workers (c11), greater the turnover of personnel (c13). In the same vein, the levels of occupational inequality of dismissals are high. This goes also with a volume of workers transferred (c18) relatively important (compared to the other causes of outflows between October 1999 and March 2000). This picture is composed in an income insecurity context for the workers who stayed in the enterprise indicated specifically by wage arrears (c9), frequently of over 3 months (c10).

The second group of indicators shows a positive correlation between changes in the size of enterprises and changes in the rate of women employed (c17). This principal component indicates also that the turnover is negatively correlated with the changes in enterprise size (c12), within the context of numerical flexibility experienced by the enterprises.

[3] The interpretation of this second principal component is in addition to the one made on the first component. In effect, all the principal components are orthogonal, that is uncorrelated two by two and consequently their meanings are distinct and complementary.

Thus, the second component reveals the labour force outflows from enterprises, once the gender dimension "controlled", as other dimension of external numerical flexibility (distinct from the first and less important one) lived within the industrial enterprises.

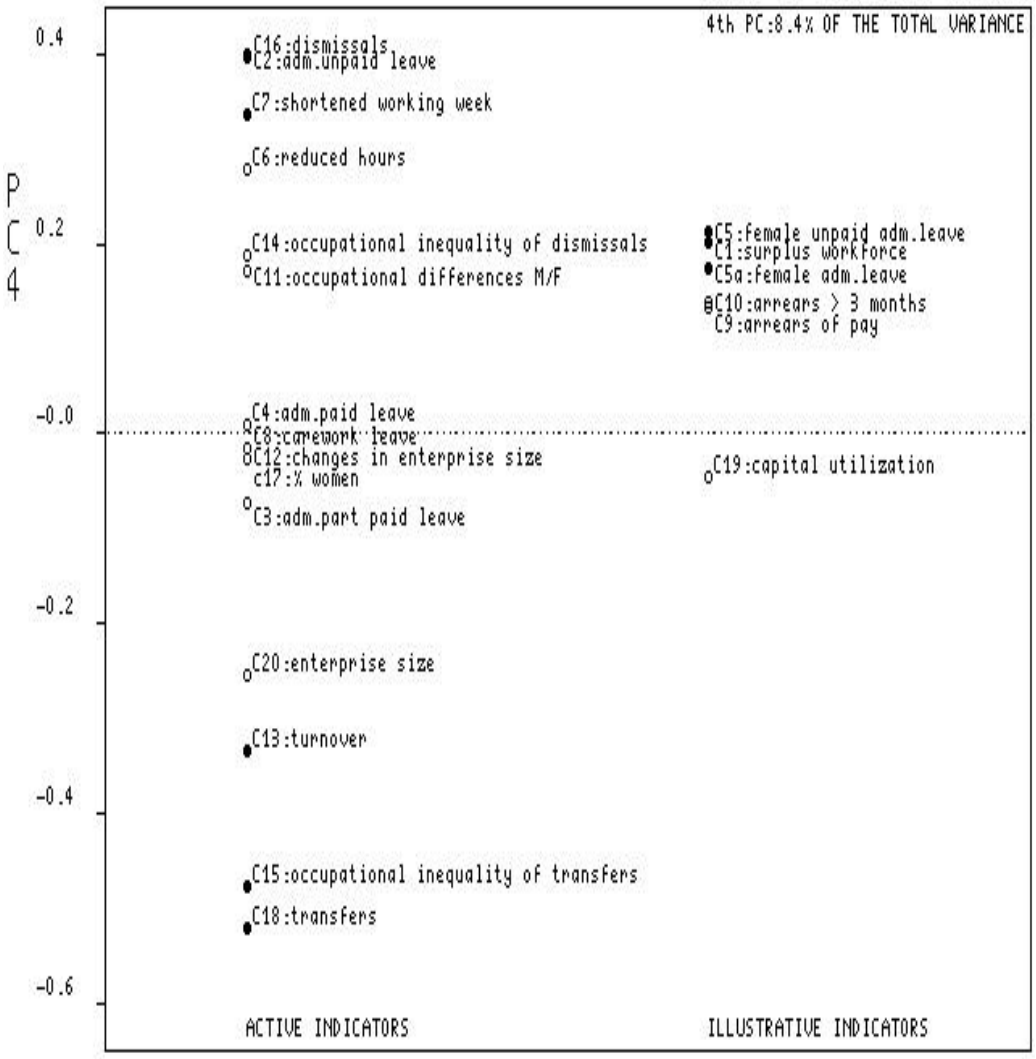
Figure 15. Third principal component (PC3)



The third principal component shows the labour force outflows from enterprises as indicators of numerical flexibility according to the size of the enterprise (c20): in smaller enterprises, numerical flexibility takes the form of reduced hours (c6). These enterprises present high levels of turnover (c13).

Conversely, numerical flexibility in larger enterprises takes the form of labour force outflows, with shortened working week (c7) and high levels of dismissal (c16) (external numerical flexibility). It appears that these outflows operate unequally between occupational categories in larger enterprises. In these enterprises, personnel transfers to other enterprises within the same enterprise group (functional flexibility), operate very unequally between occupational groups.

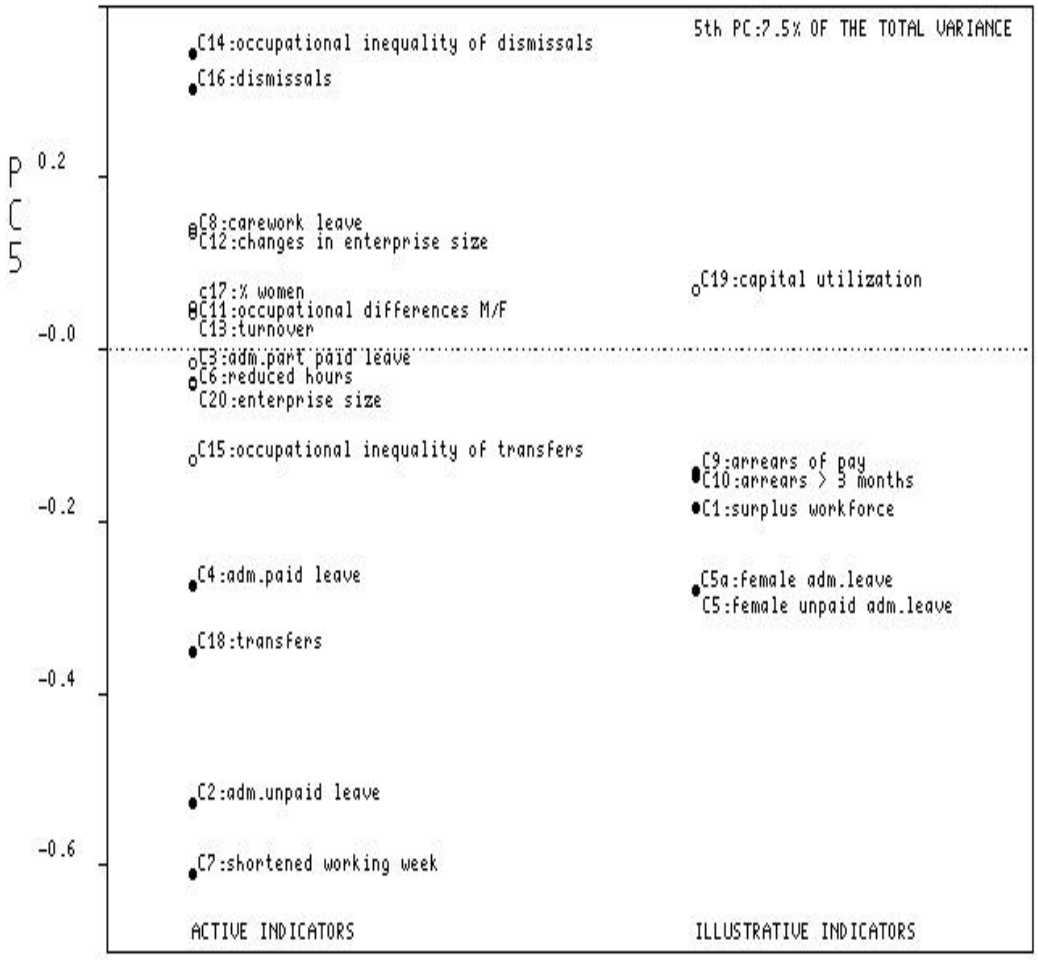
Figure 16. Fourth principal component (PC4)



The fourth principal component distinguishes between numerical flexibility and functional flexibility (Figure 16). On the one hand, administrative leave without pay used on a large scale (c2) is one of the more common forms taken by numerical flexibility. This is accompanied by shortened working weeks (c7) for the other workers maintained in their employment. In general, in these enterprises administrative leave without pay is proportionally more important for women (illustrative indicator c5a). This situation coincides and is consistent with the managers' evaluation of labour surplus (evidenced through indicator c1: they declare that the same level of production can be maintained with a greater labour force reduction than in other types of enterprises).

On the other hand, when transfers are relatively important (c18), it appears to operate unequally between occupational categories (c15). This component seems then to indicate that the numerical flexibility, compared to functional flexibility, affects men more, in proportionately than women (indicated by the illustrative indicators c5 and c5a).

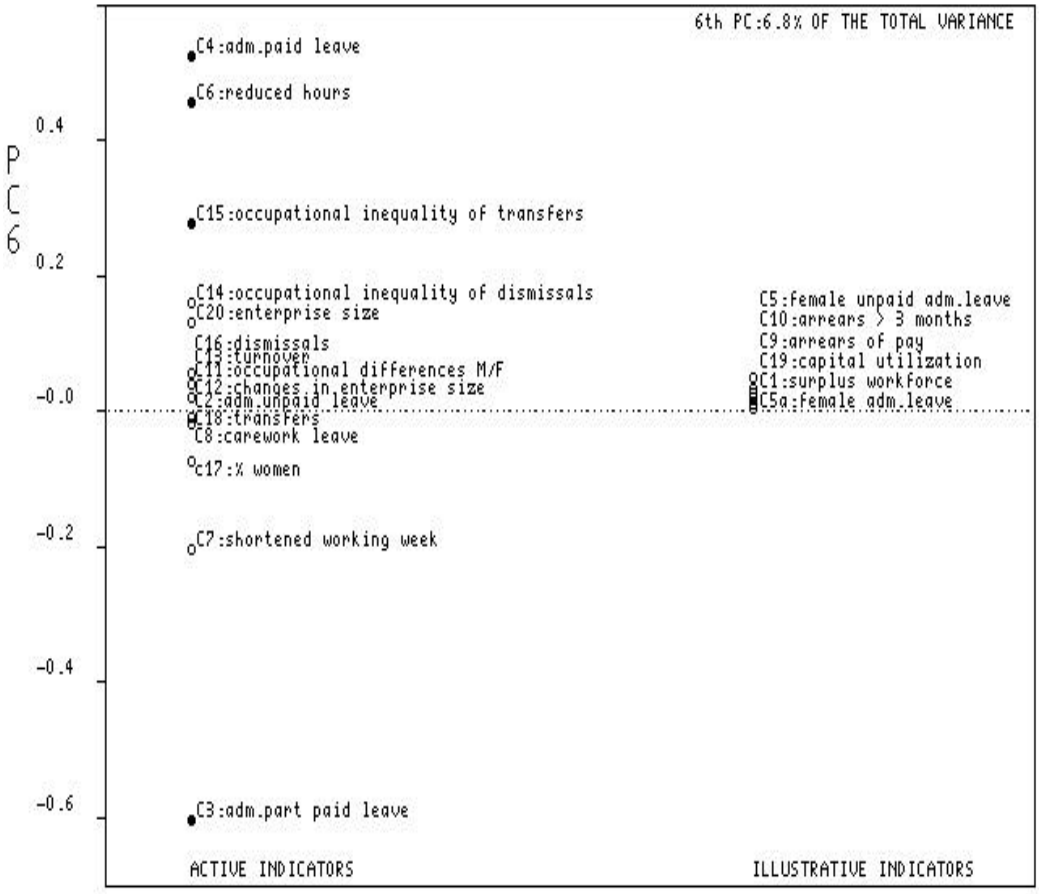
Figure 17. Fifth principal component (PC5)



The fifth principal component (Figure 17) represents the different aspects of concealed unemployment (principally centred on administrative leave without pay, indicator c2) in opposition to open unemployment, whose main indicator here is the relative volume of dismissals (c16). This principal component turns out to be a "good candidate" to be considered for the construction of a synthetic indicator of concealed unemployment at the enterprise (micro) level.

The configuration of the initial indicators given by the fifth principal component gives interesting results. First, it defines the organisation of correlations among the initial indicators on concealed unemployment: for example, on this principal component, the levels of administrative unpaid leave (c2), are correlated at the enterprise level with a shortened working week imposed by the enterprise (c7). Although the correlation between c2 and c7 is low (0.153, low but nevertheless significant at a 0.01 two-tailed level), the proximity of the corresponding points in the figure at the negative pole takes account of all the other correlations. Thus, taking the the enterprises of the fifth principal component we are defining a metric (literally a multiple) distance between the enterprises, which is based on concealed unemployment indicators. With "negative" coordinates we have those enterprises that cumulate high levels of concealed unemployment. Conversely, enterprises with positive coordinates are those that present the relatively lowest values of concealed unemployment indicators. In this sense we can consider the fifth principal component as an aggregated concealed unemployment indicator.

Figure 18. Sixth principal component (PC6)



The sixth component (Figure 18) opposes the administrative partially paid leave (c3) to other numerical flexibility measures taken by the enterprises, such as administrative paid leave (C4) and reduced hours (c6), concomitant with high levels of occupational inequality of transfers (c15).

5.2 Analysis at the regional and industrial subsector levels (meso level)

The exploratory analysis in the previous section is based on the one hand on the identification of those active indicators which most contribute to the principal component; and on the other, on the illustrative indicators correctly represented on these components. It is thus possible to give a sense to the principal components, providing the means to draw a map of the 1,615 enterprises analyzed.

This section investigates *a posteriori* the sense of the principal components at an aggregated level in terms of the regions (factor R), the industrial subsectors (factor I) and the employment size of the enterprises (factor S) as factors explaining the variability. In addition, changes in the property form were examined but their contribution to the

variability expressed by the components and to total variance appears not to be important for 1999-2000.[4]

Table 3 summarizes the double decomposition of the variance both by the principal components and by the three factors R, I and S and their combinations. The Eigen Value associated with a principal component is in fact the absolute contribution (as opposed to the relative contribution) to the total variance, equal to 15. The table takes combinations of the three factors as variability sources. For example, the intersection of row "R and I and S" and column PC1, shows the value 1.03027 which corresponds to the global contribution of the mean points of "R and I and S" to the variance given by the first principal component. One example of the mean point of the set "R and I and S" is the category "enterprises between 500 and 999 workers in the food industrial sector located in the region of Odessa". The absolute contribution to the variance from "R and S and I" to the 1st principal component is a variance *between* classes. The corresponding absolute variance *within* the classes can be obtained by calculating the difference between the Eigen Value and the variance between classes, that is 1.92457 - 1.03027 = 0.8943.

Table 3. Absolute contribution to the variance of the first 6 principal components

Variation source	PC1	PC2	PC3	PC4	PC5	PC6
Eigen values	1.92457	1.60393	1.33715	1.25839	1.12390	1.02577
R and I and S	1.03027	0.86816	0.71388	0.68475	0.58477	0.49947
R and I	0.47591	0.41324	0.31707	0.32296	0.24592	0.18361
R and S	0.20501	0.13251	0.16479	0.12358	0.10541	0.10660
I and S	0.10979	0.09458	0.10141	0.05889	0.05820	0.05767
R	0.05066	0.03545	0.04634	0.03741	0.02536	0.01572
I	0.02625	0.01287	0.02516	0.00503	0.01265	0.00690
S	0.00655	0.00173	0.00981	0.00341	0.00522	0.00480

Note: The expression "R and I and S" designates the set of categories obtained by crossing (incompletely) the 3 factors.

Table 4 details the relative contributions to the variance of each principal component. It should be recalled that the contribution of the first 6 principal components to the total variance is 55.2 per cent.

These indicators, based on a more aggregated level than the micro (enterprise) level, show that, in respect to concealed unemployment, *socio-economic security at an aggregate level is not a linear function of the inferior (less aggregated) levels*.

One of the questions initially formulated when taking the regions all together was whether there exist global regional differences of concealed unemployment. The answer is negative, because the contribution of factor R (the regions) never exceeds 50 per cent over the first 6 principal components, indicating that the variance within the regions as a whole is higher than the differences between the regions.

[4] Variability or variance, refers to the variance of the enterprises. In effect, to each enterprise corresponds a profile constituted by 15 values (one for each of the 15 active indicators used in the analysis). It also refers, in virtue to the duality principle, of the sum of the variance of these same 15 indicators. Hence the variance of each indicator equals one and the total variance is equal to 15.

Table 4. Relative contributions to the variance of the first 6 principal components

Variation source	PC1	PC2	PC3	PC4	PC5	PC6
Eigen values, as % of the variance	12.8	10.7	8.9	8.4	7.5	6.8
R and I and S	53.5	54.1	53.4	54.4	52.0	48.7
R and I	46.2	47.6	44.4	47.2	42.1	36.8
R and S	43.1	32.1	52.0	38.3	42.9	58.1
I and S	53.6	71.4	61.5	47.7	55.2	54.1
R	46.1	37.5	45.7	63.5	43.6	27.3
I	51.8	36.3	54.3	13.4	49.9	43.9
S	25.0	13.4	39.0	67.7	41.3	69.6

Note: The expression "R and S and I" refers to the set of categories obtained by crossing (incompletely) the 3 factors.

The combination of the industrial sector and size of enterprise appears to be a reasonable aggregation level for the first, second, third and fifth principal components. Three conclusions can be drawn from these tables.

First, the principal component that best differentiates the industrial sectors is the third, with a relative contribution to the variance of 54.3 per cent, (i.e. PC3, that is precisely the one which distinguishes "the patterns of outflows from the enterprise as a function of the enterprise size").

Second, it was previously mentioned that the fifth principal component constitute an aggregated indicator of concealed unemployment. We also mentioned that this principal component not only gave a configuration of the initial indicators, but also expressed a metric to evaluate the similarity between enterprises and between groups of enterprises, based on the initial concealed unemployment indicators. That is, table 4 shows which factor contributes to the variance taken into account by the principal components (the factors retained are the regions, the employment size, the industrial sector, and the different combinations of these three factors). For example for the fifth principal component, the factor which most contributes to the variance reported by the principal component is the enterprise grouped both by employment size and main industrial sector of activity. This means that in terms of concealed unemployment indicators, the differences measured between enterprises grouped by employment size and main industrial sector of activity (the variance between groups of this factor represent 55.2 per cent of the variance of the fifth principal component) is greater than when comparing the differences based on concealed unemployment indicators for enterprises grouped only by main industrial sector of activity (then the variance between groups of this factor represent 49.9 per cent of the variance of the fifth principal component). We also can see that differences between regions of enterprises based on concealed unemployment are lower than differences within regions (inter-variance for the factor R is 43.6 per cent on the fifth principal component).

Third, Table 4 shows that the variation source that most contributes to the fifth principal component is "I and S" (55.2 per cent of the variance of this principal component). Appendix 2 (section 2.7) reproduces the coordinates for the industrial sectors by enterprise size. These coordinates are obtained by averaging the coordinates of the enterprises within the corresponding groups. For example the coordinates of "small enterprises (1 to 49 workers) in Flour grinding and cereals" equals the mean of the enterprises' coordinates of both size and sector. Without taking into account enterprise size, "Flour grinding and cereals" is the sector presenting the highest of value indicator c2 (unpaid administrative leave) and the fourth highest value indicator c7 (shortened working week). Its value for indicator c4 (administrative paid leave) is zero (see table 5). Globally this sector has a negative coordinate on the fifth principal component (see appendix 2,

section 2.5), showing a depressed situation in respect to concealed unemployment of the enterprises of this sector. Within this sector, small enterprises (1 to 49 workers) and large enterprises (500 and more workers) avoid concealed unemployment, but dismiss their workers. Those dismissals operate unequally, depending on the occupation of their workers.

Table 5. Mean values of indicator c2 (administrative unpaid leave), c4 (administrative paid leave) and c7 (shortened working week), by industrial sector.

P1 Industrial sector	C2	C4	C7
Electroenergetics	1.2	0.0	1.8
Fuel industry	5.3	0.0	2.8
Ferrous industry	4.3	0.0	2.4
Mechanical engineering and metal working	17.7	0.4	21.7
Non-ferrous metallurgy	10.1	0.9	13.3
Chemical and petrochemical industry	15.8	1.8	16.6
Wood and paper products	15.7	1.2	5.3
Building materials	21.9	0.4	12.0
Glass and china-faience	12.0	0.0	10.9
Light industry	25.9	0.0	7.2
Food processing	14.3	0.2	6.6
Microbiology	0.0	0.0	0.0
Flour-grinding, cereals	23.2	0.0	12.3
Medicine	0.0	0.0	6.2
Printing	4.0	0.2	10.5
Other	4.3	0.0	6.6
Total	15.4	0.4	11.0

Note: the indicators are expressed as percentage of total employment. Source: ULFS 2000.

6. Conclusion

The longitudinal study realized on the basis of the cohort data of 1994 tends to show that the change from pure state ownership to another form of ownership has important effects on labour force composition and particularly on concealed unemployment; and that concealed unemployment has generally been reduced in the enterprises.

The analysis shows how the three dimensions of socio-economic security described in section 2 are combined in concealed unemployment. We show how subjective and objective indicators at a meso level can be related to specific time scales: at the enterprise level, while the perception of the subjective effects of concealed unemployment can be observed in the short or medium term, the objective effects of concealed unemployment need to be examined over a longer period of time.

The results of the Standardized Principal Component Analysis puts concealed unemployment in a context of flexibility and of two socio-economic security domains: employment and income security, identifying different patterns in Ukrainian industry.

The analysis stresses some important mechanisms behind concealed unemployment in Ukrainian industry.

First, it shows that there is a cumulative pattern of socio-economic insecurity for women. The survey evidenced high levels of occupational inequality of dismissals in enterprises where women were proportionally more numerous, contributing to a loss of employment security. In those enterprises, there was no evidence of occupational difference between men and women, nor of different employment size. However, women workers in these enterprises are in proportion more frequently on administrative leave, mostly without pay.

This shows that women are more affected by this form of numerical flexibility than men, who tend to be more affected by some forms of functional flexibility measures, such as transfers.

The survey also shows that it is precisely in the enterprises where female employment rates are higher that there are more wage arrears over three months. Most of the difference is related to the industrial sector and the size of enterprises.

Another important mechanism behind concealed unemployment, which is not extensively reported here, but however indicated by the survey, is that concealed unemployment measures, such as administrative leave (paid, partially paid or unpaid), shortened working regimes (week or days) are extensively employed by the enterprises as strategies to avoid downsizing.

Also, when managers are questioned on the main reason for not releasing workers, only 29.5 per cent give an explicit answer (this rate is consistent with estimated levels of concealed unemployment, obtained through the analysis of the ULFS 2000). 6.2 per cent recognize that the enterprise would not be able to pay release benefits. Five per cent formulate the need to keep qualified labour and 3.9 per cent say that the enterprise is about to increase production. Surprisingly, one of their reasons for not releasing workers is that there is no social protection for released workers (5.8 per cent), showing that these managers have a certain level of social concern.

Methodologically, the analysis *a posteriori* of the variance and its decomposition stresses the non-linearity between micro and meso structural levels. The value of an indicator in an aggregated category (region, enterprise size, sector), cannot be obtained simply as the sum (or even the - weighted - average) of its values attributed to its units, but contains also a part imputable to other sources of variation.

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Appendix 1

Appendix 1.1 Distribution of the 1994 cohort by region

Region	Number of enterprises	Percent	Cumulative percent
Donetsk	22	17.6	17.6
Kiev	19	15.2	32.8
Kiev City	23	18.4	51.2
Kharkov	15	12.0	63.2
Lvov	23	18.4	81.6
Nikolaevsk	23	18.4	100.0
Total	125	100.0	

Appendix 1.2 Distribution of the 1994 cohort by industrial sector

Industrial sector in 1994*	Number of enterprises	Percent	Cumulative percent
Electroenergetics	1	0.8	0.8
Fuel industry	6	4.8	5.6
Ferrous industry	3	2.4	8.0
Mechanical engineering and metal working	40	32.0	40.0
Chemical and petrochemical industry	4	3.2	43.2
Wood and paper products	5	4.0	47.2
Building materials	10	8.0	55.2
Glass and china-faience	1	0.8	56.0
Light industry	13	10.4	66.4
Food processing	26	20.8	87.2
Flour-grinding, cereals	1	0.8	88.0
Medicine	3	2.4	90.4
Printing	9	7.2	97.6
Other	3	2.4	100.0
Total	125	100.0	

Note *: Some of the enterprises have changed their main activity; therefore they belong to a different industrial sector in 2000 from that in 1994.

Appendix 2. Construction of indicators of concealed unemployment

2.1 Coverage

The ULFS 2000 is based on a sample of 1,684 enterprises. Two enterprises had the same identification number but as their data were not the same, they were treated as two different units. The sample size in this analysis is therefore n=1,685.

Within the 1,684 enterprises, a certain number of tests were performed on the consistency of the variables used. The table indicates the tests and the corresponding discarded number of enterprises.

Tests performed	Number of enterprises discarded
IF (p67 > p59) THEN test1 = 1	7
IF (p71 > p59) THEN test2 = 1	1
IF (p75 > p59) THEN test3 = 1	0
IF (p79 > p59) THEN test4 = 1	7
IF (p80 > p59) THEN test5 = 1	0
IF (p83 > p59) THEN test6 = 1	3
IF (p87 > p59) THEN test7 = 1	6
IF ((p83+p87) > p59) THEN test8 = 1	60
Total	67
If some enterprises satisfy simultaneously several tests: IF ((test1=1) OR (test2=1) OR (test3=1) OR (test4=1) OR (test5=1) OR (test6=1) OR (test7=1) OR (test8=1)) THEN keep = 0.	

2.2 Factors or explanatory variables

Industrial sector P1	Frequency	Percent	Cumulative percent
Electroenergetics	54	3.3	3.3
Fuel	51	3.2	6.5
Ferrous	50	3.1	9.6
Mechanical engineering and metal working	370	22.9	32.5
Non ferrous metallurgy	23	1.4	33.9
Chemical and petrochemical	77	4.8	38.7
Wood and paper products	106	6.6	45.3
Building materials	126	7.8	53.1
Glass and china-faience	31	1.9	55.0
Light industry	164	10.0	65.1
Food processing	398	24.0	89.8
Microbiology	1	0.1	89.8
Flour-grinding, cereals	54	3.3	93.2
Medicine	20	1.2	94.4
Printing	67	4.1	98.6
Others	23	1.4	100.0
Total	1 615	100.0	

	Region P2	Frequency	Percent	Cumulative percent
Valid	Donetsk	43	4.5	4.5
	Lviv	64	4.0	8.5
	Nikolayiv	66	4.1	12.6
	Kyiv city	75	4.6	17.2
	Kyiv	59	3.7	20.9
	Kharkiv	79	4.9	25.8
	Dnipropetrovsk	53	3.3	29.0
	Zaporizhzhya	57	3.5	32.6
	Odesa	63	3.9	36.5
	Poltava	55	3.4	39.9
	Chernivtzy	57	3.5	43.3
	Chernigiy	61	3.8	47.2
	Crimea	67	4.1	51.3
	Vinnitsa	62	3.8	55.2
	Volyn	57	3.5	58.7
	Zhytomir	62	3.8	62.5
	Zakarpatye	60	3.7	66.3
	Ivano-Frankivsk	60	3.7	70.0
	Kirovograd	64	4.0	73.9
	Lugansk	75	4.6	78.6
	Rivne	59	3.7	82.2
	Sumy	54	3.3	85.6
	Ternopil	59	3.7	89.2
	Kherson	59	3.7	92.9
	Khmelnitsk	56	3.5	96.3
	Cherkasy	59	3.7	100.0
	Total	1 615	100.0	

Size (number of workers) of enterprise P59C	Frequency	Percent	Cumulative percent
1-49	148	9.2	9.2
50-99	229	14.0	23.0
100-249	456	28.0	51.0
250-499	303	18.0	70.0
500-999	231	14.0	84.0
1000	248	15.0	100.0
Total	1 615	100.0	

2.3 Bivariate correlations matrix

	C1	C2	C3	C4	C5	C5A	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20
C1	1																				
	532																				
C2	.212**	1																			
	532	**1 615**																			
C3	-.031	-.043	1																		
	532	1 615	**1 615**																		
C4	.029	-.017	-.012	1																	
	532	1 615	1 615	**1 615**																	
C5	-.072	-.101**	-.061	.002	1																
	310	733	733	733	733																
C5A	-.058	-.078*	-.065	.003	.976**	1															
	317	745	745	745	690	745															
C6	.068	.085**	-.023	.026	-.020	-.038	1														
	532	1615	1615	1615	733	745	**1 615**														
C7	.098*	.153**	.038	.049	-.047	-.056	-.060	1													
	532	1 615	1 615	1 615	733	745	1 615	**1 615**													
C8	.061	.101**	-.007	-.021	-.022	.002	.032	-.032	1												
	532	1 615	1 615	1 615	733	745	1 615	1 615	**1 615**												
C9	-.072	.001	-.019	-.008	-.148*	-.139*	-.006	.013	-.055	1											
	380	947	947	947	536	533	947	947	947	947											
C10	-.006	.044	-.038	-.040	-.050	-.044	.050	.035	-.118**	.429**	1										
	318	780	780	780	464	457	780	780	780	780	780										
C11	.107*	-.087**	.000	-.026	-.079*	-.075*	.039	-.019	-.193**	.070*	.080*	1									
	527	1 585	1 585	1 585	729	741	1 585	1 585	1 585	927	764	1 585									
C12	-.118**	-.110**	-.031	.037	.011	.004	-.027	-.094**	-.138**	.025	-.061	-.049	1								
	532	1 615	1 615	1 615	733	745	1 615	1 615	1 615	947	780	1 585	**1 615**								
C13	.063	-.011	-.015	-.029	-.022	-.038	-.023	-.079**	.062*	-.008	.042	.045	-.333**	1							
	532	1 615	1 615	1 615	733	745	1 615	1 615	1 615	947	780	1 585	1 615	**1 615**							
C14	-.065	.049	.014	-.022	-.068	-.070	-.029	.054	.130**	.053	-.006	-.072*	-.144**	.085*	1						
	503	1 533	1 533	1 533	682	692	1 533	1 533	1 533	890	733	1 508	1 533	1 533	**1 533**						
C15	-.108*	-.024	.006	.008	.032	.039	-.040	.028	.043	-.011	-.059	-.064*	.002	.053	.091**	1					
	521	1 581	1 581	1 581	714	725	1 581	1 581	1 581	923	760	1 552	1 581	1 581	1 513	**1 581**					
C16	.005	.028	.016	-.016	-.053	-.048	-.025	.088	.029	.010	.006	.010	-.261**	.051*	.436**	-.026	1				
	523	1 561	1 561	1 561	722	735	1 561	1 561	1 561	925	761	1 540	1 561	1 561	1 479	1 527	**1 561**				
C17	.011	.118**	-.015	-.016	-.059	-.055	.047	.012	.479**	-.051	-.089*	-.488*	-.018	.020	.070**	.016	-.013	1			
	532	1 615	1 615	1 615	733	745	1 615	1 615	1 615	947	780	1 585	1 615	1 615	1 533	1 581	1 561	**1 615**			
C18	-.009	.010	.018	-.011	-.024	-.031	-.046	.007	.002	-.038	-.076	-.035	-.186**	.183**	.015	.149**	-.031	-.023	1		
	523	1 561	1 561	1 561	722	735	1 561	1 561	1 561	925	761	1 540	1 561	1 561	1 479	1 527	1 561	1 561	**1 561**		
C19	-.018	-.110**	.000	.005	.016	.027	-.005	-.031	.017	-.003	.042	-.009	.014	-.020	.026	.035	.022	.026	-.003	1	
	493	1 486	1 486	1 486	653	666	1 486	1 486	1 486	844	689	1 464	1 486	1 486	1 417	1 457	1 438	1 486	1 438	**1 486**	
C20	-.93*	-.41	.051*	.049*	-.027	.023	-.067**	.034	-.020	-.035	-.047	.052*	.040	-.087**	.030	.018	.071**	-.041	.071*	.032	1
	532	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	1 615	**1 615**

** Correlation at a 0.01 level (2-tailed). * Correlation at a 0.05 level (2-tailed) both reported in grey. The number of cases involved is indicated under each correlation. The frequencies in bold indicate the variables which are taken as active in the analysis, because all of them cover the 1,615 enterprise retained.

2.4 Indicator's principal components

The indicators, which are fundamental to the interpretation of the principal components (that is those most contributing to the variance of a principal component), figure in grey in the above table. Dark grey is used for indicators which have a positive coordinate on the principal component, light grey for those with negative coordinates.

ACTIVE Indicators	PC1	COR	CTR	PC2	COR	CTR	PC3	COR	CTR	PC4	COR	CTR	PC5	COR	CTR	PC6	COR	CTR
C2	-303	92	48	33	1	1	-111	12	9	397	158	126	-528	279	248	22	0	0
C3	-1	0	0	-77	6	4	192	37	28	-74	5	4	-17	0	0	-602	363	354
C4	51	3	1	79	6	4	173	30	22	9	0	0	-274	75	67	524	275	268
C6	-20	0	0	102	10	7	-331	110	82	279	78	62	-38	1	1	457	209	204
C7	-124	15	8	-125	16	10	330	109	81	337	113	90	-609	371	330	-202	41	40
C8	-653	427	222	269	72	45	-167	28	21	-15	0	0	141	20	18	-17	0	0
C11	542	293	152	-441	195	121	-169	29	21	172	30	24	42	2	2	56	3	3
C12	435	189	98	585	343	214	232	54	40	-27	1	1	136	18	16	41	2	2
C13	-288	83	43	-490	240	150	-391	153	114	-336	113	90	42	2	2	56	3	3
C14	-424	179	93	-331	110	68	394	155	116	187	35	28	345	119	106	160	26	25
C15	-149	22	12	-67	5	3	334	111	83	-477	227	181	-129	17	15	278	77	76
C16	-331	109	57	-481	231	144	289	84	63	398	159	126	303	92	82	57	3	3
C17	-693	480	249	510	260	162	-109	12	9	-27	1	1	51	3	2	-73	5	5
C18	-173	30	16	-328	107	67	-130	17	13	-523	273	217	-352	124	110	-9	0	0
C20	-38	1	1	44	2	1	630	397	297	-255	65	52	-40	2	1	132	18	17
			1 000			1 000			1 000			1000			1 000			1 000

ILLUSTRATIVE Indicators	PC1	COR	CTR	PC2	COR	CTR	PC3	COR	CTR	PC4	COR	CTR	PC5	COR	CTR	PC6	COR	CTR
C1	-91	8	0	-13	0	0	30	1	0	-185	34	0	11	0	0	-56	3	0
C5	-182	33	0	27	1	0	-50	3	0	-281	79	0	51	3	0	125	16	0
C5A	-195	38	0	25	1	0	12	0	0	-279	78	0	3	0	0	-37	1	0
C9	-107	11	0	-148	22	0	-49	2	0	-142	20	0	27	1	0	26	1	0
C10	-76	6	0	-164	27	0	-74	6	0	-149	22	0	33	1	0	16	0	0
C19	-11	0	0	6	0	0	38	1	0	69	5	0	21	0	0	-19	0	0
			0			0			0			0			0			0

2.5 Principal coordinates of industrial subsectors

Industrial Sector	Frequency	PC1	PC2	PC3	PC4	PC5	PC6
Microbiology	1	-0.3037	-1.0265	0.4703	0.3591	1.3389	0.0900
Food processing	398	-0.0655	-0.0555	0.0120	0.0477	0.0831	-0.0141
Medicine	20	-0.3864	-0.1023	0.5393	-0.1887	0.0733	-0.0085
Fuel industry	51	0.2114	-0.0316	0.1504	0.1347	0.0666	0.1123
Mechanical engineering and metal working	370	0.0682	0.0192	0.0195	-0.0448	0.0661	-0.0010
Building materials	126	-0.0254	-0.0567	-0.0907	-0.0164	0.0589	-0.0881
Electroenergetics	54	0.0225	0.2085	0.0043	-0.0108	-0.0136	-0.0063
Light industry	164	0.1340	-0.0241	-0.0277	-0.0142	-0.0393	-0.0516
Chemical and petrochemical industry	77	0.1055	0.2467	-0.2002	-0.1095	-0.0570	0.0797
Ferrous industry	50	0.2664	0.2119	0.2015	0.1462	-0.0736	0.3205
Printing	67	-0.1650	-0.1143	-0.0607	0.0342	-0.1270	-0.0554
Other	23	-0.5825	-0.2135	0.6506	0.0574	-0.1399	-0.1769
Flour-grinding, cereals	54	-0.1694	-0.1333	-0.4765	-0.1158	-0.1548	-0.1072
Wood and paper products	106	0.1492	0.1777	-0.0824	0.0863	-0.1626	0.0769
Non-ferrous metallurgy	23	-0.5854	-0.2862	0.3669	-0.0361	-0.2151	0.2203
Glass and china-faience	31	-0.3906	-0.0828	0.1712	-0.1748	-0.4410	-0.0505

2.6 Principal coordinates of regions

Regions	Frequency	PC1	PC2	PC3	PC4	PC5	PC6
Donetsk	73	0.187	-0.156	0.219	-0.077	-0.122	-0.140
Lviv	64	-0.091	-0.117	0.355	-0.209	0.219	-0.019
Nikolayiv	66	0.196	-0.247	0.203	-0.026	0.044	-0.132
Kyiv city	75	0.042	0.034	0.181	-0.415	0.143	0.016
Kyiv	59	-0.264	0.125	-0.153	0.150	0.130	-0.157
Kharkiv	79	-0.074	0.014	0.474	-0.213	-0.188	0.006
Dnipropetrovsk	53	0.498	0.023	-0.138	0.188	0.190	0.319
Zaporizhzhya	57	-0.174	0.019	0.050	0.046	-0.228	0.027
Odesa	63	0.180	0.090	-0.088	-0.036	-0.034	0.062
Poltava	55	-0.141	0.108	-0.153	-0.068	-0.039	-0.046
Chernivtzy	57	0.158	0.164	-0.167	0.003	0.165	0.101
Chernigiy	61	0.264	-0.127	0.134	0.075	-0.238	0.099
Crimea	67	-0.074	0.296	-0.159	-0.155	0.322	0.167
Vinnitsa	62	-0.551	0.061	-0.277	0.107	-0.087	0.095
Volyn	57	-0.099	0.027	0.043	0.328	-0.143	-0.022
Zhytomir	62	0.223	-0.160	0.236	-0.301	-0.161	0.040
Zakarpatye	60	-0.363	0.039	0.106	0.360	-0.102	0.188
Ivano-Frankivsk	60	0.140	0.087	0.029	-0.105	-0.009	0.114
Kirovograd	64	0.101	0.222	0.001	0.166	0.148	-0.104
Lugansk	75	0.009	-0.043	-0.345	0.282	-0.043	0.106
Rivne	59	0.026	0.178	-0.074	0.196	0.025	-0.105
Sumy	54	-0.323	-0.047	0.067	-0.214	0.239	0.050
Ternopil	59	-0.299	-0.090	-0.133	-0.002	0.188	-0.203
Kherson	59	0.255	0.136	-0.016	-0.032	-0.207	-0.192
Khmelnitsk	56	0.075	0.112	-0.237	-0.037	-0.142	-0.129
Cherkasy	59	0.064	-0.713	-0.390	0.158	-0.038	-0.130

2.7 Principal coordinates of enterprises by size

Industrial Sub- Sector	Frequency	Enterprise size	PC1	PC2	PC3	PC4	PC5	PC6
Electroenergetics	54	1 to 49	0.030	-0.938	1.099	0.170	-0.915	-0.283
		50 to 99	-0.377	-0.166	0.509	0.791	0.007	-0.092
		100 to 249	1.561	-0.999	-0.287	0.068	0.358	0.000
		250 to 499	-0.452	0.635	-0.211	-0.564	0.236	0.170
		500to 999	-0.256	0.619	-0.151	-0.060	-0.229	-0.371
		1000 and +	0.150	0.262	0.117	0.141	-0.181	0.081
Fuel industry	51	2 to 49	0.644	0.147	-0.654	-0.417	0.415	0.173
		51 to 99	-0.092	1.365	-0.223	-0.256	0.497	-0.343
		101 to 249	-0.158	0.004	0.634	-0.607	0.714	-1.077
		251 to 499	-0.136	-0.283	-0.002	0.530	-0.162	-0.157
		500 to 999	0.252	0.391	-0.401	0.644	-0.112	0.138
		1001 and +	0.261	-0.186	0.321	0.094	0.022	0.289
Ferrous industry	50	1 to 49	-0.884	1.311	-1.511	0.276	0.313	0.940
		50 to 99	-0.070	0.644	0.370	0.321	-0.437	-0.464
		100 to 249	0.359	0.053	0.432	0.126	0.312	-0.188
		250 to 499	0.548	-0.584	0.195	0.403	0.617	0.135
		500 to 999	0.467	0.369	0.300	0.339	-0.749	1.630
		1000 and +	0.279	0.205	0.145	0.058	-0.249	0.460
Mechanical engineering and metal working	370	1 to 49	0.148	-0.046	-0.077	0.024	0.178	-0.012
		50 to 99	0.120	0.255	0.330	-0.112	0.050	0.048
		100 to 249	0.112	0.061	0.036	-0.014	0.052	-0.073
		250 to 499	0.046	-0.141	-0.304	-0.036	0.083	-0.005
		500 to 999	0.016	0.110	0.224	-0.185	-0.200	0.134
		1000 and +	0.012	-0.081	-0.031	0.024	0.242	-0.022
Non-ferrous metallurgy	23	1 to 49	0.234	-1.012	-0.862	-2.451	-1.553	-0.258
		50 to 99	-0.132	-0.348	-0.135	1.148	-0.430	0.293
		100 to 249	-0.863	-1.237	0.138	-0.379	-0.077	-0.001
		250 to 499	0.236	0.027	0.992	0.418	-1.435	0.210
		500 to 999	-0.393	0.599	-0.354	-0.464	0.213	-0.295
		1000 and +	-1.251	-0.036	0.873	-0.030	0.483	0.643
Chemical and petrochemical industry	77	1 to 49	0.043	0.665	-0.001	-0.603	0.125	-0.187
		50 to 99	0.400	0.135	-0.249	-0.261	-0.083	0.566
		100 to 249	-0.179	0.154	-0.383	-0.030	-0.228	-0.073
		250 to 499	-0.314	0.503	-0.152	0.186	0.238	0.268
		500 to 999	0.360	-0.317	-0.093	-0.103	-0.636	0.058
		1000 and +	0.347	0.308	-0.126	0.049	0.154	-0.019
Wood and paper products	106	1 to 49	-0.019	0.034	0.134	0.544	0.001	0.005
		50 to 99	0.351	0.172	-0.081	0.284	-0.099	-0.078
		100 to 249	-0.015	0.283	-0.142	0.026	-0.212	-0.033
		250 to 499	0.069	0.147	-0.320	0.044	-0.232	0.159
		500 to 999	0.408	-0.029	0.221	-0.001	-0.196	0.396
		1000 and +	0.225	0.565	-0.036	-0.628	-0.038	0.118
Building materials	126	1 to 49	-0.135	-0.455	-0.068	0.498	0.580	-0.054
		50 to 99	-0.047	0.005	-0.382	-0.074	0.148	-0.011
		100 to 249	-0.050	-0.036	-0.030	-0.032	0.058	-0.201
		250 to 499	0.016	-0.302	-0.474	0.064	0.287	0.180
		500 to 999	0.198	0.060	0.503	-0.463	-0.618	-0.102
		1000 and +	-0.057	0.312	0.348	0.103	-0.266	-0.143
Glass and china-faience	31	1 to 49	-2.133	0.733	-1.654	0.827	0.289	0.870
		50 to 99	0.962	0.525	0.400	-0.674	0.113	-0.010
		100 to 249	-2.515	1.614	-1.526	1.086	-0.741	0.239
		250 to 499	-0.132	-1.606	0.052	-0.218	-0.030	0.194
		500 to 999	-0.615	-0.390	-0.235	-0.650	-1.120	-0.202
		1000 and +	-0.308	0.413	0.999	0.079	-0.379	-0.242
Light industry	164	1 to 49	0.521	-0.102	0.270	-0.015	-0.166	-0.214

Industrial Sub- Sector	Frequency	Enterprise size	PC1	PC2	PC3	PC4	PC5	PC6
		50 to 99	-0.444	-0.573	-0.182	-0.145	0.562	0.064
		100 to 249	-0.053	-0.019	0.115	0.252	0.020	-0.127
		250 to 499	0.329	0.136	-0.105	0.049	-0.177	0.122
		500 to 999	0.006	0.035	0.066	-0.106	-0.025	-0.205
		1000 and +	0.376	-0.013	-0.272	-0.220	-0.197	0.003
Food processing	398	1 to 49	0.006	-0.237	-0.129	-0.074	0.144	-0.061
		50 to 99	0.404	-0.094	-0.193	0.162	0.164	-0.004
		100 to 249	-0.309	-0.209	0.102	0.088	0.062	-0.062
		250 to 499	0.011	0.178	-0.024	0.012	0.023	-0.006
		500 to 999	-0.239	-0.016	0.244	-0.162	0.053	-0.027
		1000 and +	-0.217	0.195	-0.105	0.442	0.222	0.411
Microbiology	1	250 to 499	-0.304	-1.026	0.470	0.359	1.339	0.090
Flour-grinding, cereals	54	1 to 49	0.279	-0.162	-0.402	0.230	0.197	-0.022
		50 to 99	-0.253	-0.815	-0.781	-0.472	-0.302	-0.117
		100 to 249	-1.013	0.696	-0.455	0.374	-0.099	-0.080
		250 to 499	-0.041	-0.085	-0.251	-0.554	-0.541	-0.187
		500 to 999	1.031	0.069	-0.115	-0.102	0.179	-0.209
Medicine	20	1 to 49	-1.482	0.410	-0.494	-0.057	0.335	0.023
		50 to 99	-0.971	-1.524	2.262	-1.456	1.040	1.603
		100 to 249	0.022	0.278	0.722	-0.340	-0.218	0.033
		250 to 499	-0.018	-0.345	0.545	0.326	0.264	-0.511
		500 to 999	-0.969	-0.105	-0.416	0.115	-0.286	-0.377
Printing	67	1 to 49	0.029	-0.235	-0.017	0.171	-0.235	-0.057
		50 to 99	-0.454	0.418	0.250	0.187	0.137	-0.291
		100 to 249	-0.308	-0.307	-0.498	0.232	-0.157	-0.200
		250 to 499	-0.368	0.049	0.086	-0.813	-0.052	0.217
		500 to 999	1.722	-1.252	-0.873	-0.446	0.439	0.021
		1000 and +	0.444	-0.298	1.944	-0.756	-1.124	2.751
Other	23	1 to 49	-0.860	1.648	-0.376	-0.235	0.014	-0.252
		50 to 99	-1.931	-1.015	1.565	1.049	-0.761	-0.009
		100 to 249	-0.440	-0.016	0.068	-0.220	-0.102	0.074
		250 to 499	0.157	-0.471	0.631	0.258	1.325	0.216
		500 to 999	-0.308	-0.251	1.009	0.128	-0.135	0.645
		1000 and +	-0.634	-1.510	2.388	0.447	-0.462	-2.387