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AN ECONOMETRIC ANALYSIS OF EMPLOYMENT
IN SERVICE SECTOR

The paper presents an attempt of describing the determination of the development of the service sector by the economic development exemplified by two countries - Poland and the Soviet Union.

The development of the service sector can be described by the analysis of structures and level (changes) of employment. The characteristic feature of the service sphere is that the quality and quantity of realized services are determined mainly by the input of labour. This concerns mainly the branches where the increase of labour consumption is connected with the increase of its quality. This group of services includes: health protection, culture and art, education and science (J. F o u r a s t i e (1963), V. R. F u c h s (1968)). The technical progress in these branches does not need to lead to the decrease of labour consumption. The increase of its quality for the higher level causes the increase of the labour consumption.

At the first stage of research conducted at the Vilnius University (V. K a r p u s h k i e n e, M. L u b e r a (1985)) the dependency between the level of employment of the i-th service branch (N_i) and the level of the net material product per capita (X/L) and alternatively the efficiency of labour in material sphere of production (X/NX) have been analysed. There has been assumed that the higher level of economic development the higher percentage of employees in services, total and in parti-

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cular branches. It is caused by the different character of tech-
nical progress in the material sphere of production and in   the
non-material aphere (J. F o u r a s t i e   (1963)). The   branch
structure of labour supply in services has been explained by the
wage structure, unfortunately non-satisfied. In almost   all   the
cases the non-significant estimates have been obtained. Therefore
there has been assumed that the demand for services and the rea-
lized labour norms had determined the ammount of employees in the
services in the long-term period. The net material product   and
its distribution (accumulation and investments) generates the in-
vestment possibilities in services. On the other hand the volume
of investments in service sector depends on the existing and the
expected demand for services and possibilities of its satisfaction
in the frame of the existing "production" capacities. The   inve-
stments enlarge the base of services (fixed assets) and with the
norms of labour determine the amount of labour places.

At the stage of research realized at the University of Łódź
the relation $(N_i L)$ of number of employees of the i-th service
branch (N_i) to the number of population of the country (L)   has
been analysed. This variable is regerded by the authors as   the
most synthetic indicator of service availability for population.
The demand services is determined, among others, by the number
and the population structure according to the age and sex.

The research covers the non-material production sector, total
(O) and the following branches:
   - municipal and housing economy (K),
   - health and social protection (Z),
   - science and technics   (W),
   - culture, art and education   (CE).
The values of variable $N_1 L$ for chosen years and its average
annual rate of increase in years 1963-1982 are included in Table
1. The data present the differences in the branch structure of
employment in Poland and the Soviet Union.

In Poland, for every 1000 persons, 80 were employed in ser-
vices in 1982, while in the Soviet Union 114. Respecti-
vely 55 and 68 in 1965. The more considerable differen-
ces are observed in particular branches especially in sci-

ence branch NWL and education, culture and art NCEL[1]. The increase
of employment in services was higher than the increase of popu-
lation in the years 1963-1982 in all branches. This is proved by
the increase of the all analysed indicators (except some years).
The growht rate is differentiated in particular branches.   The
similar rates can be observed in branches of municipal and hou-
sing economy, education, culture and art, while in the other
branches of services the growth rates were higher in Poland. That
has allowed to decrease the differences between countries in the
availability of services.

It has been assumed that the availability of services N_iL
has been determined by the level of the development of the coun-
try measured by the level of the net material product per capi-
ta[2].

The following form has been considered:

$$N_iL = f(X/L) \tag{1}$$

where:

X/L - net material product per capita, constant prices,
zlotys or roubles respectively,

N_iL - relation of employment in the i-th branch of services
to the number of population ($i = 0, K, Z, W, CE$[3]).

The function (1) has been estimated using the OLS method for
the linear and exponential form. The computations have been per-
formed by the program EST/2 on the RIAD type computer. The better
results have been obtained for the exponential form of the equa-
tion.

$$N_iL = \exp\left\{\alpha_o + \sum_k \beta_k U_k\right\} (X/L)^{\alpha_1} e^\varepsilon \tag{2}$$

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[1] These branches have been aggregated because of the clas-
sification differences in statistics of both countries.

[2] Alternatively the efficiency of labour in material produc-
tion sector was used, but the obtained results were less satis-
factory.

[3] See the earlier notation.

Relation of employment of the i-th sector of services to the number
of population and its average annual rate in Poland and USSR

No	Name of variable	Country	Number of employees in services for 1000 inhabitants					The average annual rate cf growth %
			1965	1970	1975	1980	1982	
1	NOL	USSR	0.0675	0.0856	0.0999	0.01112	0.1135	3.1
		Poland	0.0541	0.0653	0.0754	0.0797	0.0794	2.3
2	NKL	USSR	0.0104	0.0126	0.0150	0.0171	0.0172	3.2
		Poland	0.0087	0.0107	0.0131	0.0147	0.0147	3.4
3	NZL	USSR	0.0186	0.0210	0.0228	0.0235	0.0240	1.6
		Poland	0.0125	0.0143	0.0175	0.0197	0.0207	3.1
4	NWL	USSR	0.0114	0.0134	0.0150	0.0166	0.0166	2.4
		Poland	0.0016	0.0022	0.0044	0.0042	0.0032	6.3
5	NCEL	USSR	0.0304	0.0351	0.0380	0.0413	0.0420	2.0
		Poland	0.0171	0.0203	0.0228	0.0232	0.0248	2.1

S o u r c e: Author's calculations.

where:

α_0, α_1, β_k - structural parameters,

U_k - dummy variables,

ε - random terms,

$N_i L$, X/L - as above.

The obtained results of estimation are presented in Table 2. The parameter α_1 of function (2) can be interpreted as the elasticity of the variable $N_i L$ with respect to the net material product per capita. Then increase of the NMP per capita of 1% caused the increase of percentage population employed in services of 0.69% in the USSR and 0.44% in Poland.

Respectively the other indicators are following
- municipal and housing economy   0.66% and 0.61%
- education, culture and art   0.41% and 0.40%
- health protection   0.35% and 0.55%
- science   0.49% and 1.37%

The differences between the countries are caused mainly by the departure structure of employment in the analysed countrie and are connected with the differences in the demographic structure of the population.

As mentioned above, the dummy variables have been introduced into the equation(2), mainly U82, value 1 in 1982 and 0 in the other years. This variable is introduced in all equations for Poland (except the science branch) and in some for the USSR.

In equations for Poland the positive values of estimates - the deep decrease of the NMP in Poland has not caused (except the science branch) the sufficiently deep decrease of employment percentage in services[4]. The negative estimates have been obtained in the USSR - the increase of employment was lower than would be expected by the increase of the NMP.

In the beginning of the seventies the high increase of employment was observed in science sector in both countries, much hi-

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[4] It concerns the estimates for U81 as well.

The values of estimates of equation (2) for Poland and the USSR

No	Endoge- nous variable	Country	Elasticity coeffi- cients and values of t-statistics		Values of estimates of the dummy varia- bles				Coefficient of determina- tion	Durbin - - Watson statistics
			a_1	$t(a_1)$	value	year	value	year	R^2	DW
1	NOL	USSR	0.694	55.7					0.994	1.33
		Poland	0.442	10.9	0.095	U81	0.115	U82	0.894	0.63
2	NKL	USSR	0.660	66.9			-0.042	U82	0.997	1.35
		Poland	0.612	25.5	0.189	U81	0.211	U82	0.980	1.16
3	NZL	USSR	0.346	32.8			-2.34	U82	0.986	0.66
		Poland	0.551	25.7	0.194	U81	0.248	U82	0.979	1.14
4	NWL	USSR	0.492	48.3	0.042	U7274			0.993	1.42
		Poland	1.374	25.1	0.172	U7273			0.975	1.14
5	NCEL	USSR	0.414	42.4	-0.039	U63	-0.017	U82	0.994	1.15
		Poland	0.400	15.3	0.099	U81	0.160	U82	0.947	0.34

S o u r e :   Author's   calculations.

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gher than resulted by the NMP increase. The introduction of dum-
my variables of U7273 in equation for Poland and U7274 for the
equation of the USSR was due to that fact. The positive estima-
tes of parameters have been obtained in both cases.

The high value of R^2 and t-statistics have empirically vali-
dated the hypothesis about the connection of employment in ser-
vices and the NMP level. It seems necessary to enrich the analy-
sis about the introduction of the other factors, especially de-
mographic factors.

An attempt to explain the other economic categories in par-
ticular service branches, as investments, fixed assets, wages
seem to be interesting in the authors opinion. In would allow to
disaggregate the particular sectors of the national economy mo-
del for equations explaining the particular branches of services,
i.e. would allow to treat the services as one sector only and
often as residual one.

References

[1] F o u r a s t i e   J. (1963), Le grand espair du XX siecle,
    Editions Gollimard, Paris.

[2] F u c h s   V. R. (1968), The Service Economy, Columbia U-
    niversity Press, New York.

[3] L u b e r a   M. (1977), Zatrudnienie w sferze usług niema-
    terialnych w ekonometrycznym modelu gospodarki polskiej,
    "Gospodarka Planowa", No. 7-8.

[4] N i e w a d z i   C. (1975), Usługi w gospodarce narodowej,
    PWE, Warszawa.

[5] K a r p u s h k i e n e V., L u b e r a M. (1985), Spraw-
    nitielnyj analiz zaniatosti w nieproizwodstwiennoj sfierie
    SSSR i PNR, Vilnius, (in print).

[6] M i s i u n a s A.,   R a j a c k o s R. (1983), Analiz i
    prognoz nieproizwodstwiennogo potrieblenija, Vilnius.

[7] M i s h k i n i s A., D o b r o w o l s k a s D. (1984),
    Trud w sfierie obsłużywanija, Vilnius.

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ANALIZA EKONOMETRYCZNA ZATRUDNIENIA
W SEKTORZE USŁUG

Zmiana branżowej struktury zatrudnienia jest jedną z konse-
kwencji rozwoju gospodarczego. W tzw. okresie uprzemysłowienia
spada liczba zatrudnionych w rolnictwie i leśnictwie. Siła ro-
bocza z tego sektora (I) kierowana jest głównie do budownictwa
i przemysłu (sektor II). Na pewnym poziomie rozwoju gospodarcze-
go wzrost efektywności w działaniach gospodarczych przejawia się
w stopniowym spadku zapotrzebowania na siłę roboczą. To sprawia,
że możliwy jest rozwój sektora usług. Jakość i liczba usług o-
kreśla dobrobyt narodowy. Ten przejawia się w stopniowym wzro-
ście udziału zatrudnienia w usługach /III/. Określone zostały
zależności między zatrudnieniem w sektorze usług a dynamiką wzro-
stu gospodarczego. W tym celu zanalizowano m. in. elastyczność
zatrudnienia w stosunku do dochodu narodowegò oraz zależność
struktury zatrudnienia od struktury średnich płac, co w pewnym
sensie określa popyt na usługi.