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## **CONSEQUENCES OF PARAMETERS CHANGE IN THE DEMAND FUNCTION IN PERIOD OF ECONOMY TRANSFORMATION IN POLAND**

### **Abstract**

The parameters of the demand function have been changing significantly during economy transformation in Poland. Political elections and economical education of the citizens are playing a very important role in this kind of analyses. Some negative consequences of the transformation on the population are observed and one of them is a change of its health-condition. Especially, a strong effect on the public health service can be seen. In a long term a cost of the public service will increase strongly and that sector could hinder the socio-economic development and growth. At this stage of economy transformation in Poland, the most effective development of every public sector should use the European Union experiences.

**Key words:** demand function, economy transformation, macroeconomics, socio-economic policy.

**JEL classifications:** E21.

### **Introduction**

The influence of political decisions on the economic growth, especially during elections (Wrede, 2002), of centralized versus decentralized decision-making in a country government setting (central and local) (Karahan et al., 2002), or political manipulation of public firms (White, 2002), etc. is well known. Additionally, the economic education (from basic to higher level) plays a very important role, especially during economy transformation in Eastern European countries (Adnett et al., 2002; Petrakis and Stamatakis, 2002). Particularly complicated problems are encountered in transformation of Polish economy. Unfortunately, the uncertainties associated with economic agent actions by acquiring information are greater in Poland than in other European Union (EU) states (Giannikos and Ozenbas, 2002). In modern times additional new aspects are playing an important role in the economic growth (Saviotti, 2001) and special difficulties arise during the transformation of economy. Other very important consequences of the changed demand for goods/services can be noticed in health of population and in the growing economical and social cost of the transformation process. The effect of population aging on future health care cost is an important concern of public policy in many countries (Denton et al., 2002). The German welfare state has encountered a great

financial problem after unification (Pfaller, 1998).

The aim of this work is analysing the effect of changing parameters in demand function during the economy transformation in Poland. Some negative effects on the quantity and quality of goods/services will be discussed. Especially, the negative influences on health of the population and the increasing cost of health care services (drugs/doctors) are stressed. These factors could have a short-term and long-term negative influence on the socio-economic development and growth in Poland. This kind of analysis can lead to better understanding of economic growth of this European region.

### The demand function

The demand function  $Q(U,p)$  presents the dependence of the number of goods gained in a unit of time  $Q$ , as a function of available means  $U$  and prices  $p$  (Czernavskii et al., 2002). The means  $U$  are assigned for acquirement of goods, and either they are taken as customer's savings, or, as customer's income ( $y$ ) per time unit in the case of lack of savings. In the latter case, the demand function depends on income and price  $p$ . The function  $Q(U,p)$  does not change on proportional basis along with a change of prices  $p$ , means  $U$  or incomes ( $y$ ) (Ivanov et al., 1994). It depends on only one parameter – the buying force  $r$ , where  $r=U/p$ . The demand function could be defined for three different categories:  $Q_1(r)$  – goods and services belonging to the primary commodities, i.e. the 1<sup>st</sup>-order goods (foods, cloths, dwelling, energy and transport),  $Q_2(r)$  – goods of the 2<sup>nd</sup>-order (most of the products of every-day use) and  $Q_3(r)$  – goods of the 3<sup>rd</sup>-order (high-quality, luxury goods and services). The borderlines between various categories could differ from country to country.

The demand function for primary commodities  $Q_1(r)$  could be presented in analytical form by the following formula (Czernavskii et al., 2002):

$$Q_1(r) = Q_{1,0} \left[ \frac{r}{r + r_{1,0}} + \varepsilon_1 r \right] \quad (1)$$

where  $Q_{1,0}$  is such a value of the demand function, above which, it grows only slowly. This growth is connected with changes in assortment, prestige, etc., what could be categorized as a human factor. The parameter  $\varepsilon_1$  is reflecting the existence of the same type of goods, but differing in terms of quality and price. This parameter is small and for small  $r$  has a negligible effect on  $Q_1$ .

The demand function for goods of the second category could be written as:

$$Q_2(r) = \Theta(r - r_{\min}) \left[ Q_{2,0} \frac{r - r_{\min}}{(r - r_{\min}) + r_{2,0}} + \varepsilon_2 (r - r_{\min}) \right] \quad (2)$$

where:

$$\Theta(x) = \begin{cases} 0 & \text{for } x \leq 0 \\ 1 & \text{for } x > 0 \end{cases}$$

The demand function  $Q_2$  has a threshold character: for small means or for high prices ( $r < r_{\min}$ ) the demand for such goods vanishes. This function is also practically not saturated and this property plays an important role in economy dynamics (Saviotti, 2001). For larger values of  $r$  the demand for goods and services of 2<sup>nd</sup>-order category is transforming continu-

ously to come to the 3<sup>rd</sup>-order category.

It is important to analyze the increase of function  $Q_2(r)$  coming close to the value  $r=r_{\min}$ , because this parameter gives information of  $Q_2$  sensitivity to changing prices or resources. Elasticity of demand for buying force  $E_r$  is an important figure and in our case it is defined as:

$$E_r = \frac{r}{Q} \frac{dQ}{dr} = \frac{d(\ln Q)}{d(\ln r)} \quad (3)$$

For  $r=2r_{\min}$  we obtain:

$$E_r (r \approx 2r_{\min}) \cong \frac{2r_{2,0}}{r_{\min} + r_{2,0}} \quad (4)$$

Thus elasticity of demand for price  $E_p$  is the following:

$$E_p = \frac{p'}{Q} \frac{dQ}{dp'} = -E_r \quad (5)$$

where  $p'=p/U=1/r$  is an apparent price, and

$$Q_2 = Q_{2,0}(1 - r_{\min} p') \quad (6)$$

The above relation could be used only for a limited range of  $p$  values, because it does not describe the saturation effects. The parameters of the  $Q_2(r)$  function are showing different sides of the so-called “human factor”, e.g. influence of custom, fashion, political life, corruption level, education, etc. Parameter  $r_{\min}$  is carrying information about the point, which separates the use of goods/services of 1<sup>st</sup>-order and the 2<sup>nd</sup>-order category. The parameter  $r_{2,0}$  could be mainly characterized by behaviour of the middle class (they have enough income). In Poland this group of people is forming very slowly and the demand structure for this category of population is not established yet. The parameter  $Q_{2,0}$  describes the living standard of people in this country. The economy level in Poland is essentially different from that in the developed EU countries. The factor  $\varepsilon_2$  describes increasing demand for the elite goods with increasing means. The demand function and its parameters could be determined by three methods: analysis of statistical data, expert’s evaluation and interviews.

### Analysis of a few aspects of the demand function

Using formula (1) we have tried to fit the demand function by changing the parameters  $r_{1,0}$  and  $\varepsilon_1$ . Fig. 1 present  $Q(r)$  1<sup>st</sup>-order goods/services variation with the change of  $\varepsilon_1$  and  $r_{1,0}$  parameters. As it could be seen, an effective way of reaching the second order goods/services is to change the parameter  $\varepsilon_1$ , which reflects the existence of goods of the same type, but differing in quality (e.g. lower quality but cheaper). Fig. 2 presents variation of the demand function of 1<sup>st</sup> and 2<sup>nd</sup> order goods/services with the change of  $r_{\min}$ . This parameter reflects very well the transition point to 2<sup>nd</sup> order goods/services and strongly depends on  $\varepsilon_1$  and  $r_{1,0}$  parameters. In this work we are not concerned with the higher order transition of  $Q$  (elite goods/services), because in Poland the population using these goods is probably less than 1%

of the total population. Below we present some relevant statistical data and make an attempt to determine certain consequences arising from the structure of the demand function.

Table 1 presents the activity structure of the population in Poland during the transformation period (from 1990 to 2004 year). The total population  $P$  was fairly stable during this time ( $\Delta P/\Delta T = -0,5(1) \cdot 10^3$  [population per year], where  $T$  is time). This process of population stabilization has a negative aspect, as it causes an increase of the rate of the retired persons and pensioners in comparison to the population of the young and working people group. One of the components that could change significantly, is the life expectancy ( $T_{av}$ ) for males in Poland (increased to 69 years in 2001 from 64 years in 1990, while in EU the average is about 75 years). The statistical data show that the death rate during of transformation period for this part of the population has an increasing tendency. The active part of population is growing ( $\Delta A_p/\Delta T = 190(1) \cdot 10^3$  [population per year]), but unfortunately, there is a strong decrease of the economically active population ( $\Delta E_a/\Delta T = -91(1) \cdot 10^3$  [population per year],  $\Delta E_i/\Delta T = 201(1) \cdot 10^3$  [population per year]), an increase of retirees/pensioners ( $\Delta R_p/\Delta T = 141(1) \cdot 10^3$  [population per year]) and students ( $\Delta S/\Delta T = 101(1) \cdot 10^3$  [students per year]). The activity rate in this decade has changed ( $\Delta A_r = -9.4\%$  [population per 15 years]); the employment rate ( $\Delta E_r = -16.8\%$  [per 15 years]) and net reproduction has decreased by about ( $\Delta N_e/N_{e1990} \cdot 100\% = -39(1)\%$  ( $\Delta N_e = N_{e2004} - N_{e1990}$ ) (Table 1). In 2004, the ratio of the employed to the total population was 36%, while in 1990 it was 45%. As it is seen from the above numbers, the social and economic cost of the transformation process in Poland is very high.

The German welfare state has increased dramatically its cost after unification (Pfaller, 1998). When the two German states were united in 1990, East Germans immediately obtained the right to participate in the various systems of the Federal Republic's welfare state. In consequence, the expenditure of these systems increased dramatically, while their revenues from the "New States" turned down, e.g. West-East transfers reached a figure of about 11 billion US dollars in the public pension scheme for employees and workers, and about 22 billion US dollars in the unemployment insurance, where it accounted for almost half of total expenditure. Unfortunately, the Polish people have not possessed such kind of resources. The role of EU is very important in the transformation processes in Poland. Additionally, the effects of aging on the future health care costs are an important public policy concerns in many countries (Denton, 2002).

Now, we will estimate the increasing social costs of not productive groups of Polish population. The following value-cost has increased from the growing inactive groups of population:

$$\Delta V = \Delta E_i \cdot C_{av} = \sum_i^n \Delta Q_i C_i \quad (7)$$

where  $\Delta V$  is the increased value of cost by a changed structure of the population,  $C_{av}$  is the average cost ( $C_{av} = (\sum_i^n \Delta Q_i C_i) / \Delta E_i$ ),  $C_i$  the montly cost of inactive groups.

It was supposed that  $C_i = 200$  Euro (scholarship, accommodation, health service, teaching cost), while in the European Union these numbers are 4-5 times greater. Using the data from Table 1 the obtained value is about  $\Delta V = 7.2$  billion Euros per year and it is only increasing from the structural changing of three groups of population in a decade of transformed economy in Poland. This is only the lower limit on that sum, because the real values of  $C_i$  parameters are certainly greater. By adopting the EU standards, this cost would increase. This very simple estimation is showing us the real problems in the demand structure of Poland. For example the EU support Poland financially with about 30 billion per seven years (about 4.3 billion per year).

Table 2 presents the structure of the full-time paid employees and their average sala-

ries (gross weight). Moreover, the demand structure of the Polish society is presented in Table 2. From Table 2 it is seen that the Polish society could be dominated by the goods/services of the 1<sup>st</sup> order and only small groups could use the second order goods/services. Individual consumption expenditure (current prices) per month was about 237 Euros in 2000, while in EU it was few times higher. In 2000, a household spent 90.2% (a household consisting of 3 persons and with income of about 80 Euro per person) of gross nominal disposable income for individual consumption expenditure (Table 3). The prices in supermarkets in Poland are comparable with many EU countries. In Poland about 100000 families (it is about 1% of population) has accumulated about \$215 billion and this group could use the elite goods/services.

Economy transformation in Poland could be analyzed in terms of the critical phenomena model used in many fields of science for these phenomena, in which some important parameters could change drastically, for example, the parameters  $\varepsilon_1$  or  $r_{1,0}$  in the demand function (1) (Figure 1). In this work we are not interested in e.g. production, investments. Now, we want to stress the importance of a few selected factors during transformation of Polish economy with the changing parameters of the demand function (1), such as:

- the structure of consumption, especially of the first order goods,
- the aspect of population health during the transformation,
- the level of economy education in the population,
- the scale of poverty,
- administration quality.

The above factors seem to have an important influence on the socio-economic development and growth. The quality of the goods/services could be lowered by, e.g. food produced with additional chemical compounds (preservatives), import of cheaper goods, and so on. Use of lower quality goods/services could change eating tradition and influence strongly health of population (by an increase of the medicine/physician cost), increase the number of deaths, decrease the local production etc. Another very important parameter is the level of bureaucracy and administration quality, which could have an adverse influence on the economic growth. Especially perilously could this reflect on the welfare state system and a significant part of the population may decrease their life expectancy. In a short and long time span this interaction is negative and if it reaches the so called “critical mass”, the economy growth could come to the low level.

As it is seen from Fig. 1a, the politicians could influence on the demand function very easily. Fig. 1a presents the influence on the  $Q(r)$  of the 1<sup>st</sup>-order goods on the  $\varepsilon_1$  parameter, e.g. the effect of cheaper, lower quality products. In this way it could stabilize  $Q_{1,0}$  on the same level with the decreased values of  $r$  and the 2<sup>nd</sup> goods/services could be reached with smaller value of  $r_{\min}$  (Fig. 2). In the long run, this phenomenon has an adverse effect, because it hinders the economic growth. Politicians could easily hide the problem, if the economic education of the population is lower than in the developed countries (Petraakis and Stamatakis, 2002). This information is very important for investment decisions (Giannikos and Ozenbas, 2002). It is clear that the full analysis would be more complicated, because it must be done for various production sectors.

Some positive aspects are observed in education sector in that the number of students has increased over 4 times (Table 1). Generally, the primary and secondary education in Poland is on a very high level in comparison with the EU countries. Proper education is crucial for assimilation and usage of high-technologies, e.g. nanotechnology. These technologies could help us better understand the living biological systems and in the near future could offer a cheaper technology in the health sector.

The real cost of  $i$ -household could be calculated by using the well now relation:

$$I_i^C = (\sum_j^m Q_{ji}(t) p_{ji}(t)) / (\sum_j^m Q_{ji}(t) p_{ji}(t-z)) \quad (8)$$

where  $I_i^C$  is the real cost for the existence of  $i$ -household,  $Q_{ji}(t)$  is quantity of goods/services of  $i$ -household in period  $t=T$ ,  $p_{ji}(t)$  is the prices goods/services in time  $T$ ,  $p_{ji}(t-z)$  is the prices goods/services in the base period,  $m$  is the quantity of goods/services. Using another quality of the goods/services, the political class could influence the elasticity of demand for buying force  $E_r$  (3) or elasticity of demand for price  $E_p$  (5). Here, it must be stressed that one must be careful, because the economic education in population during the transforming period is not sufficient enough to understand a lot of negative consequences in: health, education, security etc.

The relation (8) allows for a lot of elasticity. For example, in the energy sector the price of energy was increasing every year of about 10%, while the income was increasing only very slowly. From Fig. 1a, it could be seen that the politicians could do something with the existence minimum  $(r_{1,0})$ , for example with warmer winters in the recent years the  $Q_{1,0}$  could be smaller, because of decreasing consumption of energy by the population (in 1963/64 the average temperature was  $-27^{\circ}\text{C}$ , but during winter months of 2001/2 the temperature was about  $0^{\circ}\text{C}$  in Poland). As mentioned, the buying force in EU is greater than in Poland. The price of some goods in Polish supermarkets may be a little smaller than for the same goods in EU countries. Many food products have longer expiry times by using chemical components (e.g. preservatives). The price of many goods could be lowered by use of cheaper base components. The Polish agriculture uses a lot of area and the food products used to be more natural. The supermarket-phenomena have changed drastically the way of eating in Polish population. The majority of them must survive on the level of energy minimum  $K=4A+9G+4C$  ( $A$ -albumen per gram,  $G$ -grease per gram and  $C$ -carbonate per gram). For health condition it is very important to have a proper ratio of various kinds of food. Unbalanced diet could have short and long time health implications, while for economy the costs could be huge. Here, we have one of the important critical parameter especially during economy transformation.

Unfortunately, it is easy to make political revolution, but the humans could not be changed drastically so easily. The drastically transforming economy has created a lot of problems and some of them, from the human point of view, are:

- how many people in a short-time and in the long-time would change health condition due to the negative aspects of the transformation,
- how many people would have health problems and what will be the economic cost in the short-time and long-time period.

From Table 4 it is seen that the death rate in population increased from illnesses connected with the economy transformation. It means that during a decade of Polish economy transformation the additional more than 100 000 people have had problems with health condition, and in the coming years that number could reach over a million. This is the second factor that influences the life expectancy ( $T_{av}$ ) in Poland (70 years for males and 78 years for females), which is more than 5 years shorter than in the EU countries (Sweden 78 years (males), 82 years (females) and in Greece 75 years (male), 81 years (females)). The differences between male and female life expectancy is in Poland 8 years, while only about 4 years in EU. On the other hand, the life expectancy in Poland during the transformation has essentially increased (of about 3 years for males and 2.5 for females). One of the causes of increasing  $T_{av}$  is the population aging phenomena and better medicine services (e.g. new generation of apparatus and medicine) in hospitals. The difference of life expectancy between Poland and EU is considerable and the main cause is a different buying force between these two populations. The quality of such goods/services as food, health services etc. is statistically lower in Poland. Unfortunately, in recent years a scale of poverty in Poland has an increasing tendency (Table 5).

Now, it is difficult even to estimate economic cost of the above mentioned problems, but the cost must be very high. The two above described phenomena, change of  $\varepsilon_1$  and the

scale of poverty (parameter  $r_{1,0}$ ) are dominating in explaining the differences of life expectancy between Poland and EU. The lowest life expectancy in the world is in Sierra-Leone (36 years for males and 39 years for females). These data is comparable with those of medieval period in Europe. During that time in Europe the slave economy dominated and  $r_{1,0}$  parameter was almost zero. One of the important problems faced by the world is a need for cheaper technologies. Of course, here we have ignored many others parameters connected with e.g. undemocratic regimes, illnesses or wars.

From Fig.1a and 1b it could be seen that  $Q_{1,0}$  might be changed by varying two parameters:  $r_{1,0}$  and  $\varepsilon_1$ . In other words it could be influenced by the level of goods and services. For example, before transformation in Poland, almost every citizen could eat good quality meat products and the food was more ecological. Now, for some of them the problem is even to buy much lower quality products. A lot of other goods/services have lower quality than in the EU countries. Decreasing  $r_{\min}$  would cause more people to go for the consumption  $Q_2$ . But this has health consequence for the population and in the long run it will influence the parameter  $T_{\text{av}}$ . Of course, it would increase the cost of medicine services and it would influence the economy growth drastically. If there were enough statistical data, a deeper physical sense of the parameter  $r_{1,0}$ , as the critical parameter for the population of the country, might be given. State budget (Table 6) and consolidated expenditure of the general government sector (Table 7) show very negative trends for the education and health sectors, which are relevant for the problem discussed above. The poverty rate in Poland was the highest among the the Vyshehrad Group countries (Table 8).

Fig.2 presents dependence of  $Q_2(r)$  on change of parameter  $r_{\min}$ . For smaller values of  $r_{\min}$ , the differences are essentially greater. The  $r_{\min}$  during the transformation of economy in Poland could decrease with an increase of  $\varepsilon_1$ , or a decrease of  $Q_{2,0}$ . In Poland, a very intense buying of the second order goods and services in an increasing number of supermarkets is observed. The buying possibilities for the most of the population are near  $r_{\min}$ , and the quality level of goods and services is worse than in the EU countries.

The investigation of the effect of human capital on growth in three groups of countries that exhibit significantly different levels of development has shown the link between growth and education (Petraakis and Stamatakis, 2002). The developing countries invest over \$100 billion per year in education and other human capital investments, such as health (Alderman et al., 1996). A significant part of the population in Poland has a high-level education and knowledge of high quality. Thus, joining of EU will be profitable for both sides. During Poland's transformation a lot of EU firms have took advantage of not proper economic laws and have made very good profits. It has helped solve problems of unemployment in some EU countries.

Some of the important indicators influencing governance quality are (Kaufmann at al., 2001): democratic control, political stability, state effectiveness, quality of regulations, rule of law.

The above indicators are very important elements, which have influence on the problems discussed above. The Polish parliament, including senate and government, has made great efforts in these directions. Unfortunately, in the new democratic countries two negative phenomena are observed: making use of the "gaps" in economic law system, and the administration quality. These phenomena could considerably increase the cost of economic transformation in Poland. They influence directly and indirectly the nature of the demand functions. These basic indicators are very important in determination of the demand policy on goods/services of the first order. In developed countries the dominating parameter is  $\varepsilon_1$  and in the developing countries the essential role is played by the parameter  $r_{1,0}$  (1).

## Conclusions

We have tried to present some effects on Polish society and the health of population, resulting from the changing nature of the demand function during the economy transformation. The discussed indicators are very important for the control of character of consumption by Polish population. The observed radical change of goods/services from traditional ones has had a influence on the health of population. Thus, the cost involved could increase to such an extent as to decrease the socio-economic development and growth. The main direction of socio-economic policy must go now towards the efforts of taking advantage of the EU joining, because the EU has a great experience gained over the last twenty years.

## Tables

Table 1. Economic activity of the population aged 15 and more

Specification	1990 ( $\cdot 10^3$ )	1995 ( $\cdot 10^3$ )	2000 ( $\cdot 10^3$ )	2002 ( $\cdot 10^3$ )	2004 ( $\cdot 10^3$ )
Total population (P)	38 183	38 609	38 644	38 230	38 175
Active population (Ap)	28 269	29 106	30 671	31 109	31 123
Economically active persons (Ea)	18 396	17 004	17 300	17 097	17 025
Employed persons (E)	17 270	14 771	14 540	13 722	13 795
Unemployed persons (Ue)	1 126	2 233	2 760	3 375	3 230
Registered unemployment rate (Ru)	6.5%	14.9%	15.1%	19.7%	19%
Economically inactive persons (Ei)	10 999	12 102	13 371	14 012	14 007
Retired persons and Pensioners (RP)	7 104	9 002	9 465	9 279	9 213
Students (S)	404	795	1 585	1 801	1 926
Activity rate (Ar)	65.1%	58.4%	56.4%	55%	54.7%
Employment rate (Er)	61.1%	50.7%	47.4%	44.1%	44.3%
Total fertility rate (Tfr)	2.039	1.611	1.367	1.249	1.227
Net reproduction Rate (Ne)	0.967	0.765	0.640	0.599	0.590

Source: Polish Central Statistical Office.

Table 2. Full-time paid employees and average gross wages and salaries by performed occupational groups

Specification	Total (%)		Average salaries (Euro)	
	2001	2004	2001	2004
Total	100	100	554	523
Legislators, senior officials and managers	5.1	6.3	1225	1210
Professionals	18.5	19.6	717	702
Technicians and associate professionals	15.9	16.2	562	517
Clerks	11.6	9.4	497	446
Service workers and shop and market sales workers	7.5	8.1	369	301



Skilled agricultural and fishery workers	0.4	0.3	362	357
Craft and related trades workers	19.1	17.8	474	407
Plant and machine operators and assembles	12.3	13.1	496	442
Elementary occupations	9.6	9.2	328	299

Source: Polish Central Statistical Office.

Table 3. Individual consumption expenditure of households sector

Specification	1995 (%)	2000 (%)	2002 (%)	2004 (%)
Total	100	100	100	100
Food and non-alcoholic beverages	29.2	21.6	29.5	28.1
Alcoholic beverages, tobacco products	8.9	7.2	3.0	2.7
Clothing and footwear	5.9	4.7	5.2	4.9
Housing, water, electricity, gas and other fuels	19.6	23.9	19.9	20.3
Furnishing, household equipment and routine maintenance of the house	4.8	4.7	5.0	4.9
Health	3.3	4.3	4.5	5.0
Transport	11.1	13.3	8.5	9.1
Communication	0.8	1.4	4.5	4.7
Recreation and culture	6.5	6.6	6.4	6.8
Education	1.0	1.4	1.6	1.5
Restaurants and hotels	3.3	3.2	1.6	1.8
Miscellaneous goods and services	5.6	7.7	5.0	5.0

Source: Polish Central Statistical Office.

Table 4. Deaths from some diseases per 100 thousand of population

Specification	1996	2000	2003
Ischaemic heart disease	100.8	145.3	135.3
Cerebrovascular disease	78.2	108.3	105.8
Neoplasms	206.8	225.5	237.3
Diseases of the respiratory system	37.0	47.9	45.4
Diseases of the digestive system	32.4	38.3	39.1
Endocrine, nutritional and metabolic diseases	14.2	14.9	15.0
Diseases of the genitourinary system	10.1	10.8	10.6
Diseases of the nervous system and sense organs	8.1	9.4	10.3
Suicide	14.1	15.3	15.3

Source: Polish Central Statistical Office.

Table 5. The scale of poverty in Poland, 1993-2004

Poverty line	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Relative (50% of average monthly expenditure of households)	12	13.5	12.8	14	15.3	15.8	16.5	17.1	17	18.4	20.4	20.3
„Official”	n/d	n/d	n/d	n/d	13.3	12.1	14.4	13.6	15	18.5	18.1	19.2
Subsistence level	n/d	6.4	n/d	4.3	5.4	5.6	6.9	8.1	9.5	11.1	10.9	11.8
Subjective (Leidenian) <sup>a</sup>	40.0	33	30.8	33.5	30.8	30.8	34.8	34.4	32.4	30.4	28.0	27.3

n/d – no data

<sup>a</sup> Data relate to the IV quarter, percentage of households.

Source: Estimates on the basis of research into family household budgets. Polish Central Statistical Office.

Table 6. State budget expenditure by selected divisions

Item	State budget expenditure							
	In percent					In % of GDP		
	1991	1995	2000	2002	2004	2000	2002	2004
Science	2.6	1.6	1.9	1.5	1.5	0.4	0.3	0.3
National defence	7.5	5.8	6.6	5.1	5.6	1.5	1.2	1.2
Education	11.6	11.3	1.3	1.1	0.7	0.3	0.3	0.1
Higher education	2.7	2.4	3.5	3.7	4.5	0.8	0.9	1.0
Health care	16.1	14.4	2.8	2.0	1.9	0.6	0.5	0.4
Social welfare <sup>a</sup>	5.5	9.3	7.9	8.5	8.4	1.7	2.0	1.8

<sup>a</sup> Also named as social assistance and other tasks in sphere of social policy.

Source: Polish Ministry of Finance.

Table 7. Consolidated expenditure of the general government sector by function

Item	1995	1999	2000	2001
Total	100	100	100	100
General public services	5.5	5.5	5.8	5.5
National defence	3.9	3.4	3.2	2.8
Public order and safety	3.8	4.3	4.2	4.1
Education	11.5	13.1	13.7	13.8
Health care	10.1	9.8	9.9	9.5
Social security and welfare	46.1	44.3	43.4	44.4
Dwelling and community economy	8.5	7.1	6.9	5.7
Recreation, cultural and religious	1.7	1.9	1.8	1.9
Fuel and energy	0.8	0.5	0.5	0.5

Agriculture, forestry, fishing and hunting	2.2	1.9	1.7	
Mining and mineral resources (other than fuels), manufacturing and construction	0.5	0.6	0.6	0.4
Transport and telecommunication	2.6	3.1	3.2	4.9
Other economic affairs and services	0.6	0.5	0.6	0.5
Expenditures not classified	10.0	7.1	7.4	7.5

Source: Polish Central Statistical Office.

Table 8. Poverty rate in some Eastern European countries

Country	Relative poverty*	Absolute poverty**
Czech Republic	1.3	0.8
Slovakia	1.7	8.6
Poland	12.0 (1994), 15.8 (1998)	18.4
Hungary	9.9	15.4
Bulgaria	15.0	18.2

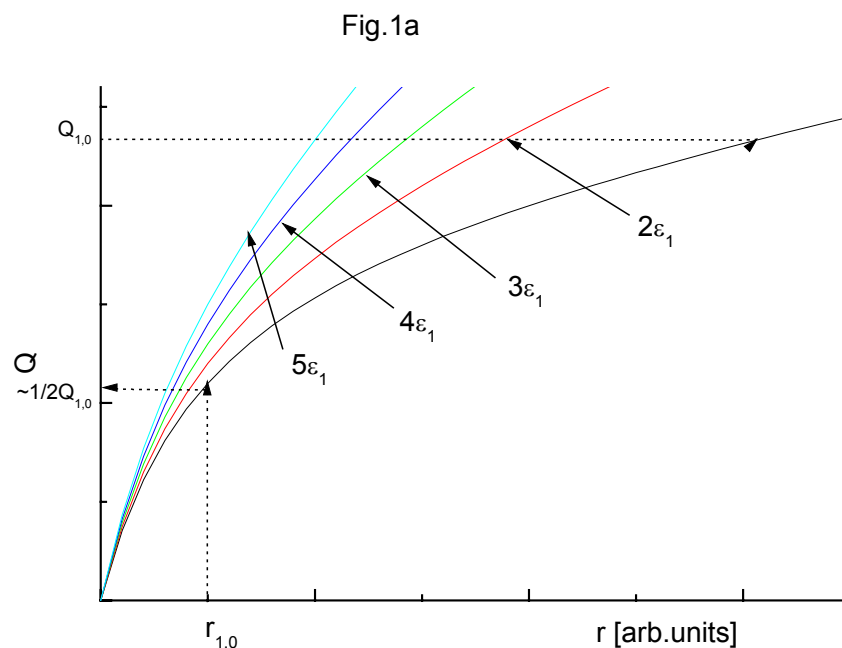
\* Supposed line of poverty – 50% expenditure of households, calculated per unit of consumption due to equivalent scale OECD, in period from 1993 to 1996.

\*\* The line of poverty used by the World Bank, 4.30 dollars per day and per person, in period 1997-99.

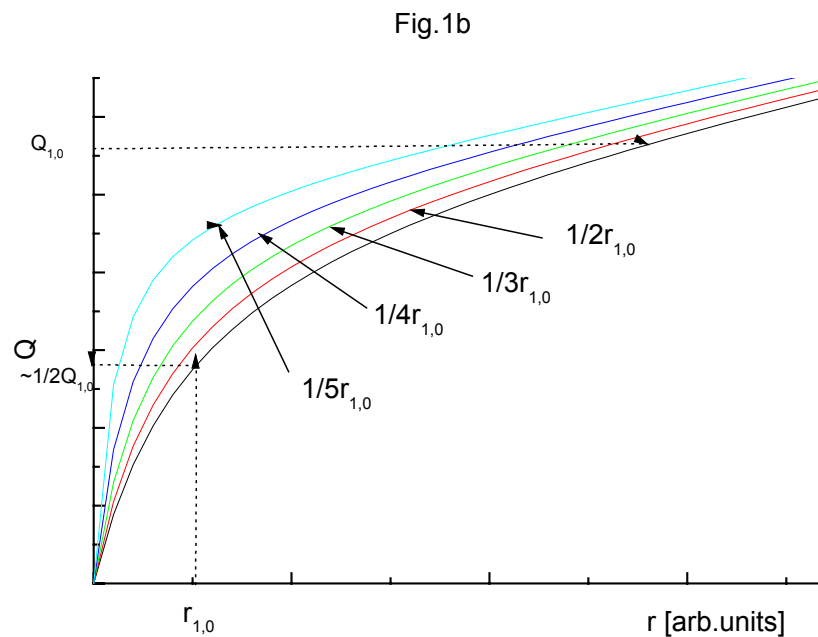
Source: World Bank.

## Figures

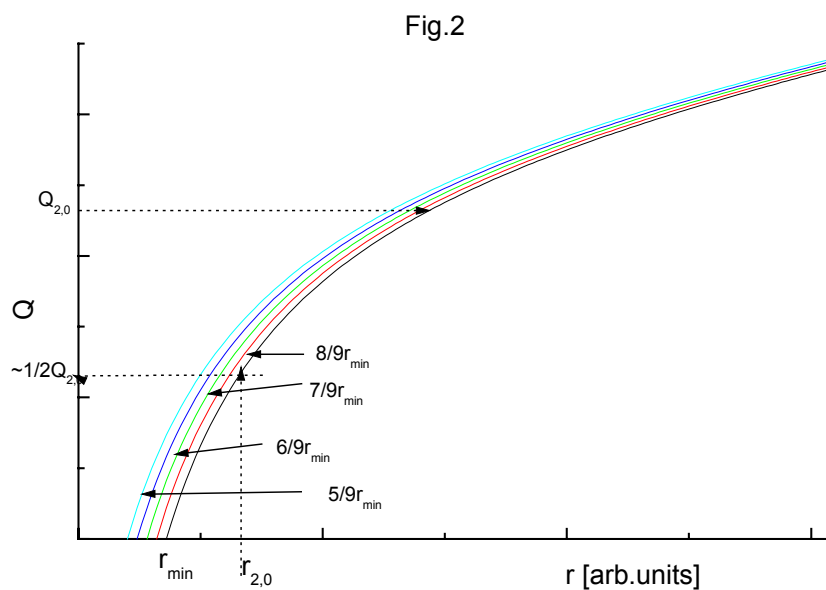
Figure 1a. Influence of parameter  $\varepsilon_1$  on the demand function of  $Q_1(r)$



Source: own compilation.

Figure 1b. Influence of parameter  $r_{1,0}$  on the demand function of  $Q_1(r)$ 

Source: own compilation.

Figure 2. Influence of parameter  $r_{\min}$  on the demand function of  $Q_2(r)$ 

Source: own compilation.

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