WELFARE EFFECT OF THE MINIMUM WAGE LAW IMPLEMENTATION IN UKRAINE.

by

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Abstract

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This paper investigates the influence of the minimum wage on social welfare in Ukraine. For this purpose, quarterly time series data with a sample size of 29 was used. Atkinson index was employed as a proxy for social welfare. A range of Atkinson indexes for different degrees of inequality aversion in society was constructed. Empirical study, which is based on the latest data (1995-2002), confirms the expectations about the positive effect of the minimum wage on social welfare, i.e. it decreases income inequality. Moreover, the contribution of the minimum wage to social welfare increases with increasing degrees of aversion to inequality in society.

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GLOSSARY

Atkinson Index. The measure of inequality invariant to proportional shifts in income.

Dalton's Measure. The measure of inequality defined as the ratio of the actual level of social welfare to that which would be achieved if income were equally distributed.

Equally Distributed Equivalent Level of Income. The level of income per head which if equally distributed would give the same level of social welfare as the present distribution.

Gini Coefficient. The measure of inequality defined as the ratio of the area between the Lorenz curve and the line of equality (45-degree line) to the total area under the line of equality.

Inequality. The distribution of a valued attribute across different sections of society, when these different sections possess different amounts of this attribute.

Kaitz index The measure of effectiveness of the minimum wage defined as a fraction of average earnings (often weighted to allow for the fact that not all workers are covered by minimum wage law).

Lorenz Curve. The graphical representation of cumulative income distribution in society.

Wealth. All goods and resources having value for an economic agent (yield economic utility in terms of exchange or use).

Welfare. The state of being happy, healthy, and prosperous.

Utility. The level of satisfaction that a person gets from consuming a good or undertaking an activity.

Welfare Ratio. A concept that measures welfare as a multiple of poverty line.

Chapter 1

INTRODUCTION

The achievement of economic equity is an explicit policy objective in many countries. Measuring the impact of government policies on the income distribution is important not only because the intention of some policies is deliberately to alter it, but also because these policies do have an impact on the distribution of social wealth and social welfare regardless of the original intent. One such policy is *the minimum wage*. Despite the fact that the minimum wage has been the subject of several studies since the 1970s, still there are no agreements on several basic questions, for example, whether family, individual, or household is the appropriate unit of analysis to measure social welfare. In addition, there is no agreement on the question of how resources are shared within these units. These controversies go far to explain why researchers have not come to an agreement on the influence of the minimum wage laws.

The redistributive effect of the minimum wage law depends on the labour market and the redistributive system, in which it operates. At best, it will shift the distribution of earning in favour of low-paid workers. At worst, it will reduce the share of earning that goes to low-paid workers by displacing part of them from employment. Neither outcome is certain.

Most recent research in this area in the US, France and England has offered empirical evidence to the effect that the minimum wage program lowers social welfare. This unintended consequence is explained by three important facts about income structure of households.

First, low-wage workers are frequently members of high-income households – for instance, students working during their studies; so part of increased wage accrues to the upper part of the income distribution given the family or the household.

Second, low-income households receive a relatively small part of their income from low-wage work. Therefore, an even large increase in income of low-wage workers does not cause large increase in the income of low-income households.

The last, unwanted effect of a minimum wage is its unintended unemployment effect, when it disrupts the low-wage labour market, lowering the welfare of the same class of workers it intends to help. Most of these studies have focused on the developed countries. Effect of minimum wage on social welfare in developing countries has received much less attention. Still less attention has been paid to the issue in the post-Soviet countries. Results can differ from the ones for developed countries because of the differences in the economies.

Here we would like to draw attention to several unique features of the Ukrainian economy that differentiates it from the developed countries. First, Ukraine has a different labour market structure. Nearly half of the low-wage workers in the US work in fast food restaurants and gas stations. Mostly, they are young people under 22 years. In Ukraine, mostly workers of the public sector (cleaners, technical workers, and specialists of the lowest third category) have the lowest income. Second, wage arrears, which decrease social wealth, still exist in Ukraine. In the 2nd quarter of 2002, the average delay of payment

was about 3.2 months and the sum of all means of wage arrears amounted to 2.4 billion hryvnas.

The question of the influence of minimum wage on social welfare has acquired added significance in the light of the recent enactment of a new bill on the minimum wage. The 2003 fiscal budget has yet to be amended to reflect a minimum wage increase approved by parliament after the budget adoption. So far, the Ukrainian legislature has failed to reach a consensus on the sources needed to finance the increase in the minimum wage. Thus, the primary risk of nonpayment of wages and growth of the wage arrears has increased.

Thus, the present paper addresses an issue that has significant policy implications in addition to being an important academic issue in labour economics. The purpose of this paper is to investigate how and to what extent social welfare is affected by the minimum wage law. The findings from the research should help us to evaluate the efficiency and efficacy of the minimum wage increasing being considered by Verchovna Rada.

The paper is organized as follows. Part I considers the theories of social welfare measurement and the consequences of the minimal wage. The first part of Chapter 2 briefly discusses relevant papers dedicated to measures of social welfare. The second part presents the recent points of view on the influence of the minimal wage on the labour market and welfare of the population. Chapter 3 introduces the theoretical issues relevant to these studies. Next three chapters focus on the case of Ukraine. Chapter 4 discusses the methodology of empirical research and provides a short description of data used to measure the social welfare. Chapter 5 presents the empirical results

obtained and offers an analytical discussion of the results. Chapter 6 discusses the results and suggests areas for further research.

Chapter 2

LITERATURE REVIEW

Measurement of Social Welfare

Although more than fifty years have elapsed since the Fair Labour Standards Act was passed in the U.S., the law's impact is still the subject for an argument. There are many economics papers devoted to the study of relationship between the minimum wage, and, poverty/income inequality. Many people are concerned that conservative policies of governments in many developed countries have led to an increase in poverty. The statistics of last decades provide some ground for this view. Thus, between 1980 and 1990, the share of income accruing to the poorest quintile of the family income distribution fell from 5.2 percent to 4.6 percent in the United States (U. S. Department of Commerce, 1991). However, some researchers doubt whether such data accurately reflect the changes in the level of social welfare. Indeed, a different choice of poverty measure could lead to a different conclusion about what has happened. Therefore, the method employed in the measurement of poverty can be the subject of criticism.

The choice of the measure of poverty as a measure of welfare has been the subject for many papers and varieties of measures have been proposed in the literature. Therefore, first, the researcher studying the consequences of the minimum wage should find a proper measure of social welfare that would allow for a comparison of agents' welfare. Second, he or she should present arguments for or against the minimum wage, based on that measure.

The choice of a measure of social welfare depends on how a researcher treats transfers between individuals. Dalton (1920) argued that a transfer of income from a richer person to a poorer person leads to a preferred distribution of income. He proposed the principle of transfer that any ranking of distributions should satisfy. In his view, only strictly concave measures can be used since they are sensitive to the transfers between people on the same side of the mean.[1]

Sen (1976) distinguished the two main problems that economists encounter in their research about social welfare. First, there is the question of identifying the poor among a population. Second, there is the problem of constructing a proper index of poverty. A common index used in official statistics is the "head-count ratio". It is calculated as the ratio of the poor to the total population. Sen severely criticized this. He pointed out that a pure transfer of income from the poorest poor to those who are better off would either keep it unchanged or make it go down. In addition, the head-count ratio does not take into account the extent of shortfall of income from the poverty line.[2] Another common measure of poverty is the so-called "poverty gap" which is the aggregated shortfall of income of all poor taken together, from the poverty line. This index, like the head-count ratio, has its own drawback, as it is

[1] The Dalton principle is meant to apply to all regressive transfers. As an example of a measure that is insensitive to such transfers consider the 'mean absolute deviation' :

$M = (1/\mu n) \Sigma \left| n_j y_j - \mu \right|$

where the notation $\left| . \right|$ stands for absolute value and μ is the mean income. Taking two income levels, y_i and y_j above the mean, with y_j being higher than y_i. Now making a transfer from the y_j to y_i may not change M as long as both remain above the mean after the transfer.

[2] Given a poverty line of $1000, a person with one dollar below the poverty line is treated as equal to a person with a person $999 below the poverty line.

completely insensitive to the number of people who are poor. Sen proposed a new poverty measure, based on several axioms that a good index of poverty should fulfil. The most important axioms are (Sen, 1976, p. 219):

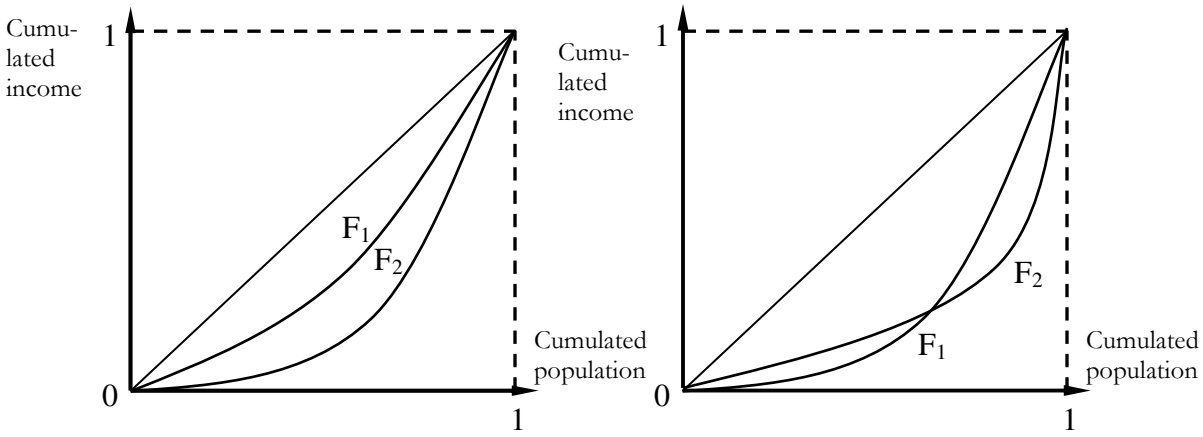
Monotonicity Axiom: Everything else held constant, a reduction in income of a person below the poverty line increase the poverty measure.

Transfer Axiom: Everything else held constant, a pure transfer of income from a person below the poverty line to anyone who is richer increase the poverty measure.

He concluded that the Gini coefficient is a proper index for measuring income inequality. The author proposed his own index for poverty measure that is similar to the Gini index. Sen replaced the number of poor by the total number of people and the poverty level by the mean income of the community in the formula for Gini index calculation.

The Gini coefficient is a well-known measure of inequality. It measures aggregate inequality and varies from 0 (perfect equality) to 1 (perfect inequality). Gini coefficient is closely related to the Lorenz curve, which presents the cumulative income distribution in society (Stiglitz, 2000). Governments usually intervene into the market in order to improve the distribution of income. Thus, usually, the objective of any tax system is equity and efficiency of income distribution. The measurement accuracy of the effectiveness of such interventions is crucial. However, the Gini coefficient does not account for regressive and progressive transfers that, for example, may occur as a result of government intervention. In those cases, the Gini coefficient may remain the same before and after implementing governmental

program whereas the Lorenz curves may cross reflecting the distributional changes as shown in Figure 2.1 b). In such cases, we must weigh the cost of the regressive transfer(s) against the benefit of the progressive one(s). Such tradeoffs are almost impossible to quantify in a universally acceptable way.



a) Progressive taxation, b) Regressive taxation.

FIGURE 2.1. LORENZ CURVES.
It plots the cumulative share of income against the cumulative population share. The diagonal represents perfect income equality. The further away it is from the diagonal, the more unequal the society.

Another approach to measuring social welfare was proposed by Atkinson (1970). In his work, Atkinson discussed various measures of income inequality. Atkinson criticized the Gini coefficient because of its non-invariance to the linear transformations. *The Gini index gives the right results only in case when the mean of population income is the same in both distributions under investigation. However, this measure gives an ambiguous result if the mean of income distribution is not preserved.* If, for example, the distribution of income in one country is simply a scaled-up version of that in another country, the Gini index reports different degrees of inequality.

Thus, Atkinson introduced his own index for measuring social welfare, independent of the mean level of incomes, which allows measuring inequality independently of the mean level of income. Also his index implicated constant (relative) inequality-aversion for the concavity of social welfare function.

Several other economists developed the Atkinson idea about decomposition of measurement of social welfare. Foster *et al.* (1984) suggested a class of measures based on the poverty gap. He proposed to divide the population in subgroups of households with ordered income vectors and population sizes. Poverty is analyzed by each subgroup. When income in a given subgroup changes (the income of the rest remaining fixed), total poverty moves in the same direction. Thus, "decomposition allows a quantitative, as well as qualitative, assessment of the effect of changes in subgroup poverty on total poverty" (Foster *et al.,* 1984, p.764). The validity of such approach was exemplified by the measurement of poverty in the capital of Kenya. The data from the Nairobi Household Survey (1970) were used. Conclusions, however, were not different from those that were obtained by others researchers based on other indexes of poverty.

Some economists claim that only poverty is a real problem, not income inequality (Feldstein (1998). The Pareto principle will not be violated if someone rich is made better off without making anyone else worse off. The poor and the rich have different preferences and needs. The prices of non-luxury items do not change because of increased quantity of money in the possession of the rich. Thus, a person at the bottom of the income ladder will not suffer if welfare of someone well off increases.

That poverty and not income inequality is the real problem is illustrated by the the recent increase in the income of the rich in the U.S. First, high wage individuals have increased their working time. It is well known that some investment bankers, professors, and other highly paid professionals are now working up to 70 hours per week. Second, entrepreneurial activity has increased during the last ten years. This is a source for the rise in the number of high-income individuals too. Third, much of the widening gulf between the poor and the rich is accounted for by increase in the relative return to higher education. Fourth, as Feldstein (1998) explains, "unequal distribution of income contributes to general economic growth and therefore the standard of living of the poor by increasing the national saving rate."

While Feldstein makes a valid point about income inequality being potentially a positive factor in reducing poverty, the relative weight of poverty and inequality in social welfare index remains a subject of controversy. The sceptics assert that poverty and inequality are confounded. Atkinson (1987) summarizes all approaches to measuring social welfare over the last 25-30 years and distinguishes among four different views on this question in modern economics. The first view is that of the economists who are concerned only with inequality and give no weight to poverty. The Gini index (times the mean) can be used for measuring social welfare considering this approach. The second view is the Lexicographic approach. The idea behind it is that "liberty cannot be enjoyed unless people reach some necessary level of welfare" (Atkinson, 1987). Thus, first, a country should maximize social welfare based on any poverty measure, for instance, head-count ratio, and then based on an inequality index. Advocates of the third view are concerned only about poverty. They measure only the worsening of social welfare associated with the

fact that the income of a certain part of population is below the poverty line. The last view focuses upon finding a trade-off between poverty and inequality. Under this approach, one of the possible measures of social welfare can be obtained after subtraction the cost of inequality measured by the Gini coefficient (times the mean) and the cost of poverty measured by the Sen Index from mean income.

Summarizing, many different indexes for the measurement of social welfare, some very simple, other very comprehensive, have been proposed. Choosing one of these measures depends on the goal of research and on available information. It is common in recent papers to choose a range of coefficients for social welfare in order to be able to draw some general inferences.

Social Welfare and the Minimum Wage

The simplest model to explain the consequences of the minimum wage is the supply-and-demand model. It will be described more precisely in the next chapter. Today roughly 80 percent of low-wage worker are covered by the minimum wage law in the United States. To analyse the effect of minimum wage laws, a two-sector economy is considered. One sector is covered by the minimum wage. Workers displaced by an increase in minimum wage try to find jobs in the uncovered sector. Thus, equilibrium wage in this sector falls, because, the supply curve shifts outward. In response to this decrease in wage, some workers may decide not to work because wage in uncovered sector is less than their reservation wage. The total change in employment depends on the elasticity of labour supply and demand, the workers, reservation wage, and the size of the covered sector.

A further extension to this model introduces queuing for covered-sector jobs. In this model a worker, who does not work in the covered sector and wants to maximize his or her income, has two strategies. He or she can work in the uncovered sector and look for the job in the covered one. Alternatively, he can decide not to work while looking for work in the covered sector. It is shown that "the measured unemployment rate is an increasing function of the minimum wage and an increasing function of the proportion of employment in the covered sector" (Brown, 1982, p. 492). There are several actions that can reduce the disemployment effect of the minimum wage, such as, increasing the efficiency of manager and worker effort, and movement of the workers from the covered to uncovered sector. However, the social cost of each of these actions is not zero. Therefore, even if the minimum wage will not have any unemployment effect, the social welfare costs of it are not zero. Although the conclusion from the theory is straightforward, empirical research within this theoretical framework does not give conclusive answers about the impact of the minimum wage law. The most studied population group in empirical literature is teenagers (Meyer, 1983; Currie, 1992; Card, 1992, 1994; Neumark *et al.*, 1999b). The time series studies by Currie (1992) show that a 10 percent growth in minimum wage prompts a decrease in teenage employment by 1 to 3 percent. The result obtained by Neumark et al. (1999b) is the same. He finds that with every 20 percent increase in the minimum wage employment of American teenagers and young adult falls by about 2 to 4 percent. In addition, wage hike has negligible effect on income of the unskilled workers. The data also shows that the increase in income of employed workers after the implementation of the minimum wage law is considerably lower than 20 percent. Neumark et al. (1999b) points out that in the real world the majority

of youth are earning well above the minimum, and so, most youths will see little or no pay increase after a minimum wage increase.

However, there is evidence of a positive influence of the minimum wage too. Card (1992) studies the effect of wage growth in California. In January 1988, the State Assembly's Labour and Employment Commission voted to raise the minimum wage from $ 3.35 to $ 4.25 (near 26 percent). The author studies the effect of wage growth on groups of workers (constructed based on age, ethnicity, and industry). He concludes that although an increase in the minimum wage rises the earning of low–wage workers, empirical data does not show a reduction in employment even in the retail trade industry. The result for teenagers was even more unexpected. Data showed a simultaneous growth of hourly earning by 10 percent and of the employment–population ratio by 4 percent.

A similar result is obtained by other studies. Card and Krueger (1994) find that the minimum wage hike from $ 4.25 to $ 5.05 in New Jersey in 1991 is followed by increase in fast-food employment. This research has several important advantages. Firstly, the minimum wage increases only in New Jersey and neighbour Pennsylvania is used as control group for making precise inferences. Secondly, the wage level is enlarged during recession in U.S. economy. So, a positive employment effect could not be explained by economic growth. In addition, the authors point out that during the 80s federal minimum wage legislation covered the vast majority of workers and, since the federal law was adjusted infrequently, the number of independent observations was small. The valuable opportunity to research the impact of minimum wage appeared when some state authorities legislated the minimum wage above the

federal level in response to a declining economy. This fact explains, according to the authors, differences in conclusion with most preceding studies.

Such inferences have not gone uncharged. Card and Krueger's paper is criticized by several scholars. The consistency of perfect competition model with heterogeneous workers is discussed in Neumark's (1995) paper. The author points that the minimum wage growth increases the probability that teenagers leave school to join worker force or work more. The probability that these teenagers will be unemployed increases too. Thus, a binding minimum wage can decrease employment as well as increase it among teenagers. Empirical evidence based on data taken from the CPS for the period 1979-1992 supports this view.

Deere (1995) obtains different results. Based on monthly data for 8 years he partitions population in groups based on age, race, education, and marital status and finds that the group with the highest percentage of low-wage workers is also the group with the greatest decrease in employment. However, the result is different for groups formed on gender basis and distinguishing between low- and high-wage states. Employment of women is found to be not affected relative to male employment. Moreover, a proportionally equal number of employees are found to have lost job in low- and high-wage states. Thus, the minimum wage is not everything that affects the employment and other things must be taken into consideration for an accurate estimation of the employment effect of minimum wage.

The effect of the minimum wage on adult employment is a subject of yet another controversy in the literature. For instance, Brown (1998) finds that negative employment effects are consistent features of the studies of low-wage

manufacturing and agriculture, but that findings are mixed for other industries. The author explains this thus: "while some adults are undoubtedly displaced by the minimum wage, others can be employed because the minimum wage protects them from teenage competition."

The redistributive effect of the minimum wage is examined not only on real data, but also in a simulation exercise, for instance, by Johnson *et al.* (1983). They research the effect of minimum wage by simulating the redistribution of family income under restrictive assumptions about employment effects. They note that, even if an absence of a disemployment effect from the minimum wage hike is assumed, it has at best a very small desirable impact on income distribution.

The effect of minimum wage law depends on the labor market and the redistributive system, in which it operates. At best, it will shift the distribution of earning in favor of low-paid workers. At worst, it will reduce the share of earnings that go to low-paid workers by making some of them unemployed. Using Current Population Survey (CPS) data, Neumark *et al.* (1997) investigate the impact of minimum wage on groups of workers with different income. They find that over one-to-two year period, minimum wage increases both the probability that poor families escape poverty and that previously non-poor families become poor. They also point out that unintended unemployment effect causes a substantial reduction in the income of a subgroup of families that are initially non-poor. On the other hand, the data show that the minimum wage boosts the incomes of poor families that remained below the poverty line. Thus, "increasing the minimum wage generates a tradeoff between growth of the income of poor families and a decline for low-income

families" (Neumark, 1997, p. 31). In addition, the earnings of the workers in poor families increase, but the number of workers per family declines.

Neumark's findings are contradicted by Macpherson (2000) who finds a negative effect of minimum wage. The author obtain empirical evidence that growth of the level of the minimum wage from $5.15 to $8.81 required by a living wage ordinance passed by Miami–Dade Country in 1999 cause a loss of jobs for 131,207 to 222,354 workers. This is shown to have caused an annual loss of income to the affected workers from $1.7 to $2.9 billion. Another weakness of the minimum wage, in Macpherson's viewpoint, is that much of the wage increase goes to the low-wage workers in higher-income families rather than to those most in need. He points out that the positive effect of the minimum wage law is overestimated by authors who focus only on income effect on low-paid workers rather than on the effect on the entire income distribution.

Golan et al. (2001) research the effect of the minimum wage and other government policies. They use several traditional welfare measures (the coefficient of variation of the income distribution, the relative mean deviation of income, the standard deviation of logarithms of income, the Gini Index) parallel with the Atkinson index as a proxy for social welfare. It allows them to compare the results and the accuracy of all these coefficients. They draw two main conclusions. First, it is practical to study the welfare effects of government programs because almost all the estimated results are qualitatively identical across common welfare measures. Second, "the minimum wage, unemployment insurance, and food stamps – unlike other government programs — increase inequality according to all common welfare measures. A 10 percent increase in the minimum wage (about 50 c) increases the welfare

loss from inequality by between $2 and $54 billion depending on the welfare index used" (Golan, 2001, p. 28).

The same inference is made by Freeman *et al.* (1996). The authors find that low-income households receive relatively small part of their income from low-wage work. So, even large increase in income of low-wage workers does not cause a large increase in the income of low-income households. In authors' viewpoint, a minimum wage can increase income only in the short-run. But at the same time this increases the risk of job loss.

In his analysis of direct effect of minimum wage hike on employment and cross–country analysis, John (1999) uses the data extracted from the Labour Force Survey for the years 1990 to 1998 for France and CPS data for the years 1981 to 1991 for the United States. He finds that growth in the American minimum wage is associated with small or even no employment effects, whereas in France it has very strong negative employment effects.

All of the above studies involve developed countries. The impact of the minimum wage in transition and developing countries is not well studied. There is no generally accepted view on this issue. As in the case of developed countries, there is no agreement on magnitude and sign of the employment elasticity. Advocates of the minimum wage hold that it redistributes resources efficiently and can increase productivity, reduce poverty, and foster growth. Opponents state that the result of government intervention in the labour market will be a misallocation of the labour force and a waste of resources, a decrease in productivity and a reduced growth rate.

Rama (1998) studies the effects of doubling real minimum wage in Indonesia and finds that it leads to a 10 percent increase in average wages, a 2 percent decrease in employment, and a 5 percent decrease in investment. The disemployment effect is found to be considerable in small firms but employment is actually found to increase in large firms.

The result for Mexico and Columbia differ slightly form the ones presented above. In Mexico in 1980s, the minimum wage fell roughly by 45 percent and was about 13 percent of average unskilled manufacturing wage in 1990. In Colombia minimum wage has increased at nearly the same rate and reached 53 percent of average unskilled wage during the same period. Several papers dedicated to the minimum wage in developing countries come to the same conclusion. Bell (1995) investigates how the minimum wage affects the demand for skilled and unskilled workers during that period. The conclusion is that minimum wage has no effect on wages and employment in Mexico. The explanation is that a small minimum wage (as a percentage to the average) in not the effective wage for most workers. In Columbia minimum wage has a much stronger effect on income distribution. The author finds that "given reasonable assumption about the distribution of minimum wage labour across the firms, a disemployment impact of minimum wage on low paid unskilled workers is in the range of 2 to 12 percent."

As noted earlier, transition economies may have some unique features that may result in differential impact of minimum wage laws in these countries. On average, transition economies have contracted during the last decade. Poverty and income inequality in them have risen. Unemployment and falling participation in the labour force are obvious sources of increased differences in workers' income. Statistical data show that in many transition countries, and

especially in those where income inequality has risen the most, the importance of formal earnings (wages paid to workers) has declined sharply (UNICEF, 2001). This causes serious problems. People refuse to work for very low salary and there are vacant positions in public sector of the Ukrainian economy. This suggests that, *in case of transition countries, the minimum wage may not have disemployment effect*. Increase in the minimum wage is likely to be reflected in the increment of social welfare.

Chapter 3

THEORY.

Social welfare function.

Despite the fact that the genesis of the social welfare function can be traced as far back as to Pareto, or even Smith, and that the literatures on this theme is both large and complex, there are several unresolved issues. One of them has to do with the way to sum and weight individual's utilities in society. Followers of the different economic schools incorporate different information and assumptions into their analysis. A mathematical formulation that has the ability to incorporate different assumptions on parameters is the constant elasticity function given by:

$$W = \frac{\sum_{i=1}^{n} a_i (U_i)^{1-e}}{1-e} \qquad (3.1)$$

where W is social welfare, a is parameter, U is utility, and $1/e$ is constant elasticity of substitution of a social indifference curve. The parameter e is interpreted as *the degree of risk aversion.*

There are three main approaches to maximization of the social welfare function in modern economics.

Utilitarian social welfare function (if e =0 and a_i =1) maximizes the sum of utilities of the individuals.

A special kind of the previous function is *the Generalised Utilitarian* social welfare function (if e=0 and $a_i \neq 1$), which maximizes the weighted sum of utilities of individuals. Utilitarian or so-called Benthamite social welfare function is associated with the idea of the greatest happiness for the greatest number of people, or, in other words, maximum of the total utility. In the two-person-economy case, the line SW " in Fig. 2 represents the Benthamite utilitarian function.

Nash social welfare function (if $e \rightarrow 1$ and $a_i = 1$) maximizes the product of utilities of individuals.

Rawlsian social welfare function (if $e \rightarrow \infty$ and $a_i = 1$) maximizes the utility of the least well off individual and hence is the minimum function of economic agents' utilities $W = \min (u_1, u_2, \ldots, u_n)$. The Atkinson Utility function corresponds to this case.

John Rawl described the idea of such measurement of the social welfare. He argues that the only position from which a theory of justice as fairness can be developed is the position behind the so-called 'veil of ignorance'. This means that in order to be able to make a fair judgement, a person should to be ignorant of his own position and role in society; of his personal interest; of knowledge about human society, except the most general facts. Cullis (1997) describes the rules derived by Rawl, obeying which such judgement can be made:

1. All individual have the right to the most extensive basic liberty compatible with a similar liberty for the other.

2. Deviations from social and economics equality are justified provided they do not conflict with rule 1 and provided that the position of the least well off person is improved.

The Atkinson inequality index, corresponds to the above rules of justifying inequality. Atkinson assumes that the social welfare depends on the sum of individual's utility and that individual utility of income is given the isoelastic form:

$$U(Y_i) = \frac{(Y_i)^{1-e}}{1-e} \quad where \ \ e \neq 1 \tag{3.2}$$

Then the social welfare can be presented by:

$$SW(U_1, U_2, \ldots, U_n) = \sum_{i=1}^{n} U(Y_i) = \sum_{i=1}^{n} \frac{(Y_i)^{1-e}}{1-e} \tag{3.3}$$

Atkinson introduces the concept of equally distributed equivalent level of income, Y^e. It is the level of income per head which if equally distributed would give the same level of social welfare as the present distribution.

$$Y^{e} = \left[\frac{1}{n} \sum_{i=1}^{n} Y_i^{1-e} \right]^{\frac{1}{1-e}} \tag{3.4}$$

Finally the Atkinson index is

$$AI = 1 - \left[\frac{1}{n} \sum_{i=1}^{n} \left(\frac{Y_i}{\overline{Y}} \right)^{1-e} \right]^{\frac{1}{1-e}} \tag{3.5}$$

Distributional attitudes to inequality are contained in the parameter ***e*** (whose inverse is the elasticity of substitution of the social welfare (SW) curve). In Figure 3.1, the simplest two-person economy case is illustrated. Suppose that

economy has initial endowment of money X. Then money will be distributed between two people A and B. The income of the person A and B is shown on the Y-axis and X-axis correspondingly. Therefore, at point E the income of the person A is Y_{A1} and the income of person B is $Y_{B1} = X - Y_{A1}$.

When e = 0, the society is indifferent to unequal distribution of income. The social indifference curve SW" is a straight line with a 45° angle to the X- and Y-axes. e→ ∞ corresponds to the extreme case when society concerns only in the income of the poorest part (the Rawlsian case). The society indifference curve SW'_0 corresponds to this case.

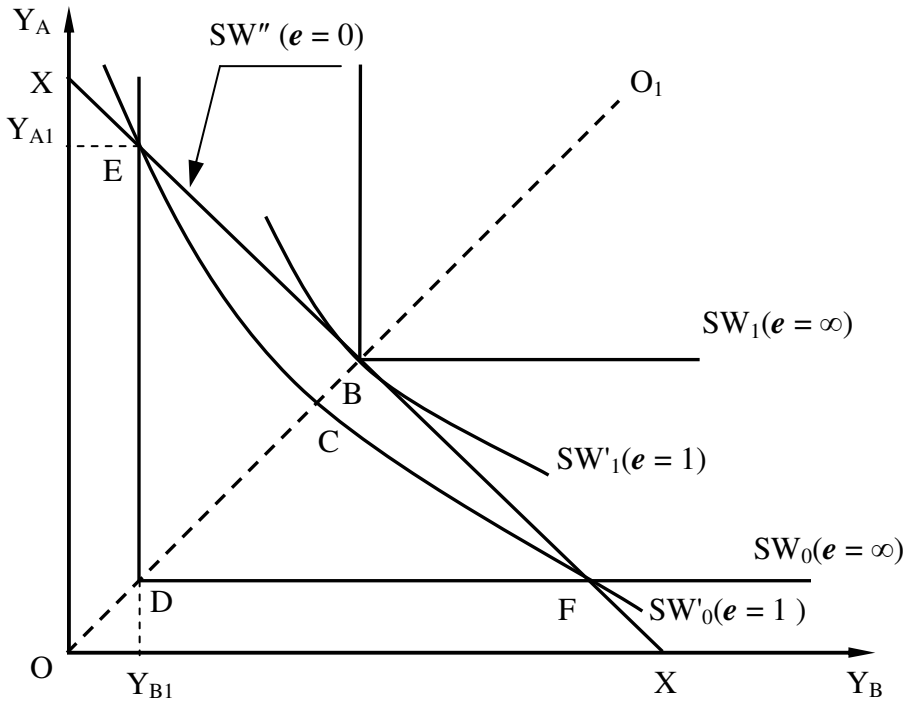


FIGURE 3.1. A DIFFERENT APPROACH TO EQUALITY MEASURE.

For any initial income distribution, say at point E, the line XX (line 45° to the X and Y-axis) shows all income allocations attainable from point E. The 45° ray OO_1 from the origin represents equal (average) income for both persons. With an e value of unity, point E is on SW'_0. The higher curve SW'_1 can be attained by equal income distribution at B from E. The distance BC represents the difference (gain) in social welfare. Given the definition above, point C is the equally distributed equivalent of point E, Y^e. Therefore, interval CB represents social losses from equalizing the distribution of income. Correspondingly, for the Rawlsian case the loss is the interval DB. So, Atkinson index can be interpreted graphically. It is

$$AI = 1 - \frac{CB}{OB} \qquad (3.6)$$

It runs from 0 to 1, which corresponds to the completely equal income and complete inequality cases correspondingly. For instance, AI equals to 0.3 means that the same level of social welfare can be attained if only seventy percent of total current income will be equally distributed.

$$Y^e = \overline{Y}(1 - AI) \qquad (3.7)$$

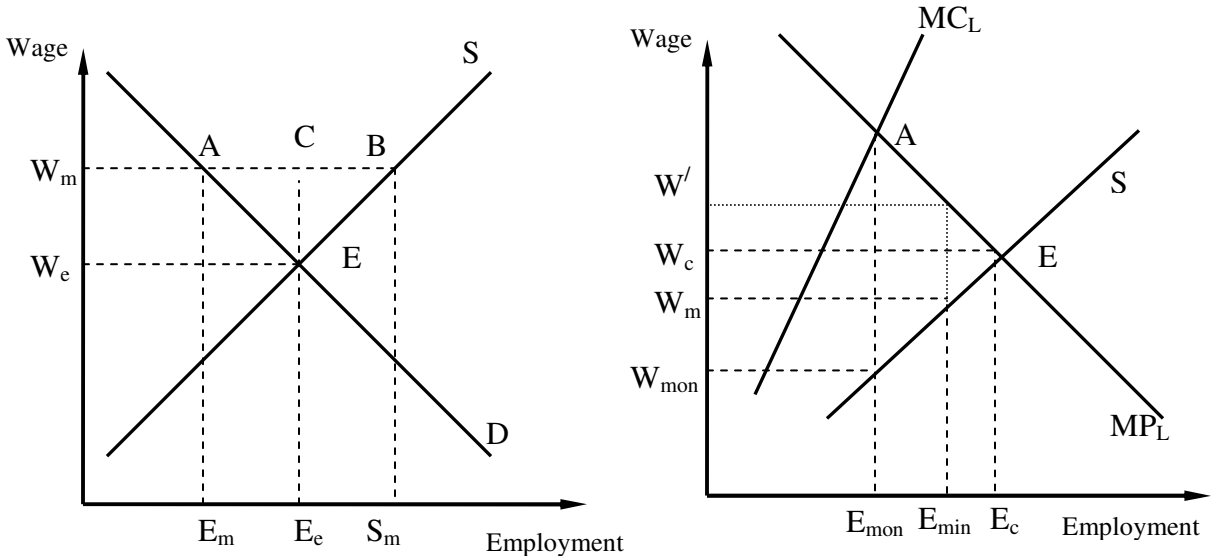
The significant effect of this index is that it reduces all arguments about the appropriate shape of the social welfare function to the question of the value of the inequality aversion $\boldsymbol{e}$. This inequality aversion cannot be estimated directly in survey. The impossibility of precise estimation of inequality aversion is the greatest weakness of Atkinson index.

Minimum wage impact.

The simplest model within which the consequences of the minimum wage can be explained is the simple competitive labour market model. If the minimum wage $\mathbf{W_m}$ is higher than the equilibrium wage $\mathbf{W_e}$ in the market then supply of labour exceeds demand and employment will decrease, from $\mathbf{E_e}$ to $\mathbf{E_m}$ in Figure 3.2 a). The proportional reduction in employment equals the proportional wage increase times the elasticity of demand. However, the difference between supply and demand at the new minimum wage (segment AB in Figure 3.2 a) does not correspond to the standard measure of unemployment, which does not include persons who can work but are not actively searching for it. Thus, *the gap between demand and supply is greater than what the official statistics report*. The weakness of this model is that it cannot explain simultaneous increases in wage and employment found, for example, by Card (1992), and Card and Kruegger (1994). Their findings can be explained by a monopsony model.

In this model, an employer of workers has market power and act as monopsonistic purchaser of labour. The binding minimum wage from interval between original monopsony $\mathbf{W_m}$ and perfect competition age $\mathbf{W_c}$ makes an employer price-taker and, as result, employment increases as illustrated in Figure 3.2 b).

The question of the existence of monopsony is controversial among economists. Opponents of monopsony, for instance Staiger (1999), argue that situations where the employer is a single purchaser of labour in the market and hence has a monopsonistic power are extremely rare. Proponents maintain that features of monopsony exist in any situation where firms have some discretion



a) Competitive market. b) Monopsony.

FIGURE 3.2. CONSEQUENCES OF MINIMUM THE WAGE FOR EMPLOYMENT. Figure 3.2 (a) shows the effect of minimum wage on the labour market equilibrium wage rate and employment in the perfectly competitive market. Figure 3.2 (b) presents the monopsony case. Wm represents the minimum wage. In case of perfect competition, the employment level goes down from Ee to Em while in case of monopsony, it increases from Emon to Emin.

over the payment of wages. Taking this into consideration, they state that perfect competition is more likely to be the extreme case. It is really difficult to imagine that an employer finds that all his or he workers leave immediately after having their salaries reduced even by one dollar.

Impact of the economics growth on income inequality.

In assessing the effect of the minimum wage as the government policy for reducing poverty and income inequality, we must take into account the effect that economic growth has on them. There is deep dissention among scholars about this issue. Based on empirical results some economists claim that the income share of the poorest of society rises proportionately with average income. So, economic growth generally does benefit the poor as much as everyone else. However, some researchers argue that economic growth tends to increase income and asset inequality, and that these higher levels of inequality ensure that economic growth benefits the rich rather than the poor. The relationship is more complex than presented in these statements.

It was the Nobel laureate Simon Kuznets who pioneered serious empirical investigation of the relationship between growth and inequality. Kuznets finds evidence for the so-called inverted U-shaped hypothesis: in the early stages of economic development, income distribution tends to worsen and does not improve until countries reach middle-income status. The implications of this hypothesis are obvious: if, in the early stages, economic growth leads to more inequality, then poverty might take many years to decline.

Early evidence shows that developing countries do on average tend to have a higher level of inequality than the developed countries. More detailed investigation over time for a single country runs into data problems, and, therefore, majority of studies rely on analysis of inequality over a cross section of countries. The evidence is mixed.[3] Taiwan and China real per capita income increased fivefold between 1964 and 1990, yet the Gini coefficient barely moved, declining from 0.322 to 0.301. In the same time in Brazil economic

[3] See chapter seven of Debraj Ray for an excellent review of the relevant literature.

growth had positive influence on inequality (inequality lowered), while in Mexico the situation was just the opposite – inequality increased during period of increasing real GDP per capita. Thus, despite the most recent idea that economic growth does not have much of an impact on inequality, because income distributions, in average, do not change much over time, the real effect highly depends on the country's particularities. When country fixed effects are allowed for, the Kuznets hypothesis fails to hold up.

What about the post-Soviet transition countries? Given the short period of time since the collapse of the former Soviet Union, there have been few studies on income inequality. Early evidence shows that in all this countries income inequality has increased during the last decade. This can be explained by neoclassical growth theory. If the economy is growing toward the steady state and preferences are such that marginal utility from consumption is finite at some non-negative consumption level then the average agent's propensity to save is positively related to his wealth. Therefore, the higher is income of the economic agent during current period the more is his or her saving and thus income in the next period. In other words, distribution of current period wealth Lorenz-dominates next period's distribution of wealth. This suggests that economies undergoing economic development are likely to see a deterioration in their distribution of wealth.

As regards Ukraine, there are some evidences to suggest that economics growth is positively associated with income inequality in Ukraine. Derzcomstat reports that the share of population that has enough wealth to save money still is very low (near 32 percent) despite the recent growth of bank deposits. The most part of the population income increased due to economics growth is consumed immediately. From other hand, the gap between the minimum and

average wage decreases in Ukraine during recent year. Now the average salary in medical and educational industries is only 30 hryvnas more than the minimum wage. Thus, the wealth of the poorer part of population rises more quickly than mean income and we suggest that increment of the Ukrainian GDP will affect the social welfare positively.

C h a p t e r 4

METHODOLOGY OF EMPIRICAL RESEARCH.

Description of methodology.

The goal of this research is to test whether minimum wage is playing an important role in determining the social welfare of the Ukrainian population. So, the level of the minimum wage is the key explanatory variable in the model. Other main factors that need to be controlled to assess the independent effect of minimum wage on social welfare are: wage arrears, unemployment level, the rate of GDP growth, and inflation. The unemployment variable is included in the model in order to distinguish the negative effect of the minimum wage on employment. Increasing unemployment lowers the value of social welfare. Wage arrears have the same effect as unemployment: a person cannot benefit because of the delay in obtaining the earned money. Although the amount of non-paid wages diminished sufficiently since the second quarter of 1999 year, when it reached its maximum point, it is still considerable and undoubtedly influences the wealth of the population. The influence of GDP growth on the society's welfare is ambiguous as discussed in the previous chapter. . High level of inflation undoubtedly lowers the social welfare, while its low level may not have significant effect or may even have a positive effect.

A two-step analysis is used for estimating the influence of the minimum wage on social welfare. The values of proxies for the social welfare function are calculated during the first step. We use the Atkinson index as the proxy. It is calculated using the following formula:

$$AI = 1 - (Y^e / \overline{Y}) = \begin{cases} 1 - \left[\frac{1}{n} \sum_{i=1}^{n} \left(Y_i - \overline{Y} \right)^{1-e} \right]^{\frac{1}{1-e}}, when\ e \neq 1; \\ 1 - \frac{\prod_{i=1}^{n} Y_i^{\frac{1}{n}}}{\overline{Y}}, when\ e = 1. \end{cases} \quad (4.1)$$

where Y_i reflects income of every decile of the population, $\overline{Y}$ is the empirical mean of income, and $\boldsymbol{e}$ is a measure of the degree of inequality aversion in society

This inequality aversion cannot be estimated directly for the society and depends on the approach to the measurement of social welfare. By changing its value, we can obtain different formulations of the social welfare function.. Thus, the closer is $\boldsymbol{e}$ to zero the closer is the estimated function to the Utilitarian; and the closer is $\boldsymbol{e}$ to infinity– the closer is our estimated function to the Rawlsian social welfare function.

Atkinson (1970) proposed a range from 0.5 to 2.5 for $\boldsymbol{e}$. In the present work, seven Atkinsons' indices are calculated. Five of them for values of $\boldsymbol{e}$ from 0.5 to 2.5 with range 0.5, additional two (for $\boldsymbol{e}$ equals to 0.01 and 10) are calculated for extreme cases of welfare measurement concepts. Implementing this procedure allows for testing the effect of the minimum wage and other variables on population welfare under different approaches to its estimation.

All proxies for social welfare function are calculated based on data for the deciles distribution of households' aggregate expenditure taken from Derzcomstat publications. So, the first step yields seven proxies for the social welfare function for every time point.

In the second step, influence of the minimum wage controlling for other key social welfare determinants is estimated through regression analysis. Based on

the theoretical part of this paper and Golan (2001) research, we highlight four determinant of the social welfare: the minimum wage, the GDP per capita, the unemployment rate, and the wage arrears. So, the model is following:

$$W_t = \beta_0 + \beta_1 MinWage_t + \beta_2 GDP\ per\ capita_t + \beta_3 Unemployment\ rate_t + \\ + \beta_4 Wage\ Arrears_t + error\ term$$

where t is index for time period, W_t is a proxy for social welfare; all other variables are self-explanatory..

We run regressions to test whether the coefficient of minimum wage is positive and significant. We run seven regressions with different dependent variables (proxies for the social welfare function for various values of the degree of inequality aversion, $\boldsymbol{e}$) on the same independent variables. Based on the results, it is possible to make an inference about the primary issue of this thesis. In addition, it is possible to draw conclusions about the significance of each of the independent variables on the social welfare measured under different approaches comparing coefficient obtained for the Atkinson indexes with different values of $\boldsymbol{e}$.

Based on the theory discussed in Chapter 3, we expect the independent variables to have an influence in the direction indicated in table below.

TABLE 4.1. VARIABLES DESCRIPTION.

Independent variable	Description of variable	Unit of measurement	Expected effect on social welfare
Minimum wage	Level of the minimum wage in Ukraine in time period *t*	Hryvnas	Positive

Table 4.1. - Continued.

Independent variable	Description of variable	Unit of measurement	Expected effect on social welfare
GDP per capita	Gross domestic product per capita in Ukraine in time period *t*	Hryvnas	Positive
Unemployment rate	Unemployment rate in Ukraine in time period *t*	Percents	Negative
Wage Arrears	Total wage arrears in Ukraine in time period *t*	Million of hryvnas	Negative

Data description.

The data for this paper are taken from Derzkomstat and UEPLAC publications. Differentiation of population by the level of income is made based on total households' expenditure, because, during period of transition indexes of expenditure characterize the real state of population material welfare more precisely than income indexes, as people are inclined to misrepresent information about real income. Data for deciles distribution of aggregate expenditure of households are taken from quarterly statistics bulletin of Derzkomstat of Ukraine "Vytraty i dohody domogospodarstv Ukrainy" ("Expenditures and income of Ukrainian households"), which is based on selective examination of living standard of Ukrainian households. The description of the quality of data is presented in the Appendix 2.

Values of the wage arrears are taken from Ukrainian-European Policy and Legal Advice Centre (UEPLAC) publications. Data measure total arrears in all Ukrainian industries. Data provided by UEPLAC is cumulative. In order to

estimate only current period arrears we use it in differences. It is more convenient to use data for wage arrears in the public sectors only because the workers of these sectors mostly are the subjects to the minimum wage law. Unfortunately, this statistics is available starting only from fourth quarter of 1998 year and it is impossible to obtain a sufficient sample size for reliable estimation.

Values for GDP capita are calculated based on the Derzcomstat publications for the Ukrainian real GDP and population size. Values of the minimum wage are taken from Verhovna Rada Decrees. All variables were taken in real values.

Using quarterly data for Ukraine from third quarter of 1995 year to third quarter of 2002, the sample size of 29 time-points is obtained.

Chapter 5

EMPIRICAL FINDINGS.

Before running regressions, we make a qualitative analysis on the basis of linear plots of Atkinson indexes, presented in Figure A.3 in Appendix 1.

We can see that all dependent variables (for different values of inequality aversion, ***e***) have negative trend and decrease gradually during the observed period.

Another inference from the graphs is that dependent variables since 1999 have been decreasing in the first quarter of every year. In addition, all of them dropped drastically in the third quarter of 2002 after the increasing in the minimum wage. This time point is very important for our analysis. It shows that after the increase in the minimum wage in the third quarter of year 2002, the share of income obtained by two of the poorest deciles of population increased from 2.3 to 3.2 and from 3.9 to 4.7 percent respectively.

Parallel inspection of data of the minimum wage in Ukraine with distributions of households by the average expenditure per person (see Figures A.1 and A.2, Appendix 1) leads one to expect that minimum wage variable has a positive influence on social welfare. Graphic evidence shows that shares of households with monthly expenditures up to 60 hryvnas per person decline substantially during recent three years (from 17.5 percent in second quarter of 1999 year to 6.3 percent in second quarter of 2002).

The level of inflation was low in Ukraine during recent three years and can not cause this increasing in the social welfare. The improvement in the wealth of the poorest part of population can be explained by the growth of GDP during recent years or by the growth of the minimum wage; or by both simultaneously. So, presented graphs support idea of positive influence of the minimum wage on social welfare in Ukraine.

Description of the estimation procedure.

The regressions analysis is made with STATA econometrics software[4].

Analysis of data begins from an examination of the correlation matrix between independent variables. The matrix shows the coefficients of correlation between variables. Including highly correlated variables in the model can cause the autocorrelation problem. The minimum wage and unemployment rate have a correlation coefficient equals to 0.8. So, high positive correlation would seem to support the theoretical proposition that increase in the minimum wage causes unemployment growth.

Another STATA function displays the partial correlation coefficient of dependent variable with each variable holding the others constant. The output shows that the minimum wage, wage arrears, real GDP and real GDP per capita have the biggest coefficient of correlation with dependent variable.

[4] Because the procedure of running regression is similar for all seven dependent variables only the procedure for the Atkinson indexes with average inequality aversion (**e** = 1.5) is described here. Other details can be obtained from the author.

A highly useful graphical technique for data screening is a scatterplot matrix (see Figure A.4 Appendix 3). It is very helpful for diagnosing outliers and non-linearity. Additionally, it can give information about the joint distributions of variables that would not be apparent from examining univariate distributions. After looking at the scatterplot matrix for the variables in our regression model, it is obvious that the dependent variable has one outlier. The minimum wage growth in the third quarter of year 2002 is 20 gryvnas. The same increasing in the previous years (for example in the third quarter of 2000) had not so drastic effect on the Atkinson index. So, we should include the dummy variable for the third quarter of year 2002. In addition, we can see linear dependence of AI on minimum wage (**mw**), unemployment (**unempl**). The scatterplot matrix reveals the possible problem in poor linear dependence of AI15 on wage arrears (**wa)** and real GDP per capita (**gdprealp)**.

After series of tries and by excluding from the model the variables where p-value was greater than 0.1, we obtain the results presented in Table A.2 in the Appendix 3. The model with the minimum wage, wage arrears, real GDP per capita and dummy variables for the third quarter of tear 2002 as regressors shows the best result among all. The p-value is lower than five percentage points for every dependent variable. R-squared is 93 percent.

The most interesting and puzzling result is the unexpected sign of *wage arrears*. Negative sign of this variable suggests a positive influence of wage arrear on the social welfare function. How can we unravel this puzzle? We undertake several steps to get at the root of the unexpected sign.

Analysis of the result can be started from investigating whether the model is spurious. That hypothesis was rejected after using the rule of thumb: model

can be suggested as spurious if Durbin-Watson statistics is lower than R-square. This is not the case: 2.46 (Durbin-Watson statistics) is greater than 0.93 (R-square).

We then implement a number of procedures as suggested in Kennedy (2002)[5]. First, we check for the nonstationarity of the dependent variable. Based on the results of the Dickey-Fuller/Generalized Least Squares unit root test and the Phillips-Perron test for unit root, we cannot reject the hypothesis about the stationarity of the dependent variables. Thus, dependent variables are not random walks. So, nonstationary cannot be suggested as the source of the unexpected sign.

Second, model misspecification is checked up. After fulfilling of the Ramsey regression specification error test (RESET) for omitted variables, we can reject the hypothesis about specification error at any practical level of significance.

Third, we check for heteroscedastisity as it could be in another source of an apparently implausible sign. The results of the White heteroscedastisity and Cook-Weisberg test indicate that the regression is not heteroscedastic. Because the White test is test of pure heteroscedastisity, or specification error, or both, we obtain additional confirmation of hypothesis about absence of specification error. The tests outputs exhibit that regression with dependent values corresponding to e lower than 1.5 is more prone to heteroskedasticity. So, for these dependent variables, coefficients of regression should be calculated using White heteroscedastisity variance-covariance matrix. In addition, the plots that

[5] Peter Kennedy's paper "Oh no! Got the wrong sign! What should I do?" contains an insightful discussion of possible sources of unexpected sign.

shows the residuals by fitted (predicted) value gives no clear evidence for heteroscedasticity.

Yet another source of an apparently implausible sign could be a high variance of regressors as a consequence of multicollinearity. In order to check for multicollinearity, we examine the variance-inflating factor (VIF) values (as well as a tolerance, which is 1/VIF). A tolerance is a part of the variance of a dependent variable not explained by the other regressors. A general rule of thumb is that a VIF in excess of 10, or a tolerance of 0.1 or less may be worthy of further investigation for multicollinearity. In our case, we obtain the values of the VIFs for all AIs are no greater than 3.

Next the normality assumption is examined. The small sample size is an obvious problem. It is not possible to obtain perfectly normal distribution of the residuals with 29 observations. However, after visual inspection of the residuals distribution for all dependent variables we see that the residuals have no apparent skeweness (see Figure A.5 in Appendix 3). Moreover, we notice that distribution of the residuals is more likely to be normal for higher degrees of inequality aversion.

The results of performing of the test of normality with EVIEWS are presented in the Table A.1 in the Appendix 3. Based on these results we cannot reject the assumption about asymptotical normality for all dependent values but AI05 and AI001. Thus, violation of the normality assumption cannot be a source of the unexpected sing for all regressions.

As for autocorrelation, it is impossible to make any inference about presence of the first order autocorrelation in the model from Durbin-Watson statistics.

The critical d- values for 29 observations and 4 regressors are d_L=1.124 d_U=1.743. Obtained Durbin-Watson statistics lies within the interval of indecision (2.257; 2.876). So, it is convenient to use Breusch-Godfrey serial correlation LM test for testing of serial correlation. The results of this test are presented in the Table A.4 in the APPENDIX 3. They show the absence of autocorrelation up to seven order for AI10, AI25, AI2, and AI15. BG test statistics for AI1, AI05, and AI001 do not contradict the results of the DW test; thus, we reject the hypothesis about absence of serial autocorrelation up to seventh order. Thus, models for these dependent variables have at least first order autocorrelation.

The simplest way of solving this problem is inclusion of the lagged dependent variable into the regression. After some experimentation with the length of the lag, we conclude that the model with the first-order lagged dependent variable as a regressor has the best "goodness of fit".

Finally, it is helpful to make robust estimation of the model coefficients. The results are shown in Table A.5 in the APPENDIX 3.

Regression Results

For the Atkinson index, a positive coefficient indicates that an increase in the corresponding variable reduces welfare, while a negative coefficient indicates that the variable improves welfare.

Most of the results support the prior expectations.

The sign of the coefficient of the key variable of interest, the minimum wage supports the prediction of its positive influence on social welfare. Thus, holding other variables constant, an increase in the minimum wage raises social welfare. The importance of the minimum wage increases with the growth of the inequality aversion (as shown in Figure A.6 a) in Appendix 3). For instance, for inequality aversion equal to 1.5, the Atkinson index decrease by 0.38 after increasing of the minimum wage by ten gryvnas. This means that after such increase in the minimum wage, only income greater by 0.38 percent than earlier can be socially valued as equivalent. Coefficients are statistically different from zero at the 5 percent level. The only exception is the coefficient for the Atkinson index with inequality aversion equals to 0.01, which represent the utilitarian approach to the measurement of the social welfare.

The Atkinson index has different values for different inequality aversion ***e***. So, it is not obvious from actual values of the coefficients that the minimum wage significance increase with growth of ***e.*** It would be useful to compare the ratio of the minimum wage coefficient to average value of corresponding AI. The result of the calculation is presented in Figure A.6 b) in Appendix 3. The line has positive slope, which signalizes that for greater ***e*** increasing of the minimum leads to greater improvement of the social welfare. Thus, we conclude that the minimum wage does become more important as a policy tool the more we care about the welfare of the poor.

The sign of the coefficient of the real GDP per capita is negative as expected. This suggests that economics growth has positive effect on the social welfare. Again, the influence of the real GDP per capita becomes more important the higher is the inequality aversion. For ***e*** lower than 1.5 it is insignificant at 5 percent level.

The first lag of the dependent variable is included in the models for Atkinson indexes with $\boldsymbol{e}$ less than 1.5. The sign of this determinant reveals a positive influence of the previous period welfare on current welfare as conceptualised by the utilitarians.

Although the theoretical concept of the social welfare emphasizes on the possible negative effect of the minimum wage on it through the unemployment growth, empirical result shows that the effect of the unemployment on the social welfare is insignificant. In order to clarify question of the minimum wage influence on the unemployment rate we run regression for unemployment as dependent variable (see Appendix 4).

The sign of the dummy variable for third quarter of 2002 year shows up sharp increase of the social welfare in this time due to the factor, which is out of the model. The easiest explanation is the populist correction of data by authorities before the beginning of the election campaign.

Thus, the signs of all control variables are in conformity with a priori expectations with the sole exception of *wage arrears*. The sign of *wage arrears* is unexpected but significant at 5 percent level for all values of $\boldsymbol{e}$ and unexpectedly shows a positive influence of this variable on the welfare of the population. That is quite an unexpected result. The possible explanation of this is that people at the bottom of the income ladder are so destitute that society is better off writing off their debts.

Chapter 6

CONCLUSION.

This paper investigates the influence of the minimum wage on social welfare. For this purpose, quarterly time series data with a sample size of 29 were used. The Atkinson index was employed as a proxy for social welfare. In order to investigate the influence of the minimum wage on population welfare under the main approaches to its measurement in modern economy, a range of Atkinson indices for different degrees of inequality aversion was calculated. The research revealed the following:

- The minimum wage does positively affect social welfare, i.e. decreases income inequality.

- The contribution of the minimum wage to social welfare increases with increasing degrees of inequality aversion.

This work may serve as a basis for further research. For instance, it would be insightful to analyze the welfare effect of other government policies, like the unemployment insurance and different public assistance programs. Also, it would be useful to replicate the analysis once more in several years when more data points will be available.

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A P P E N D I C E S

Appendix 1. INPUT DATA

FIGURE A.1. MINIMUM WAGE.

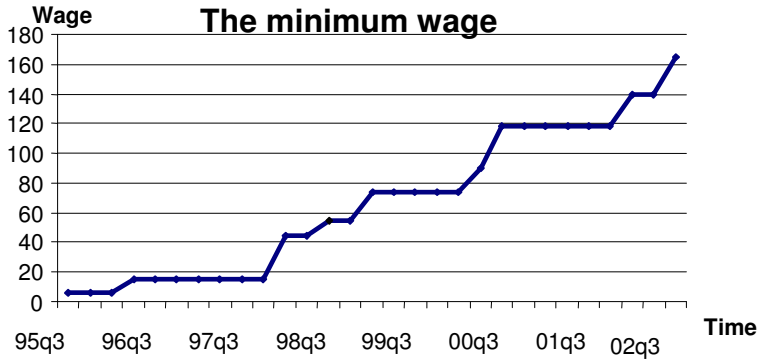
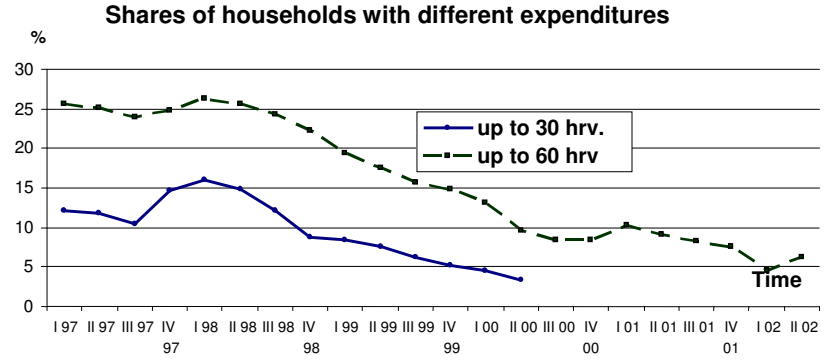
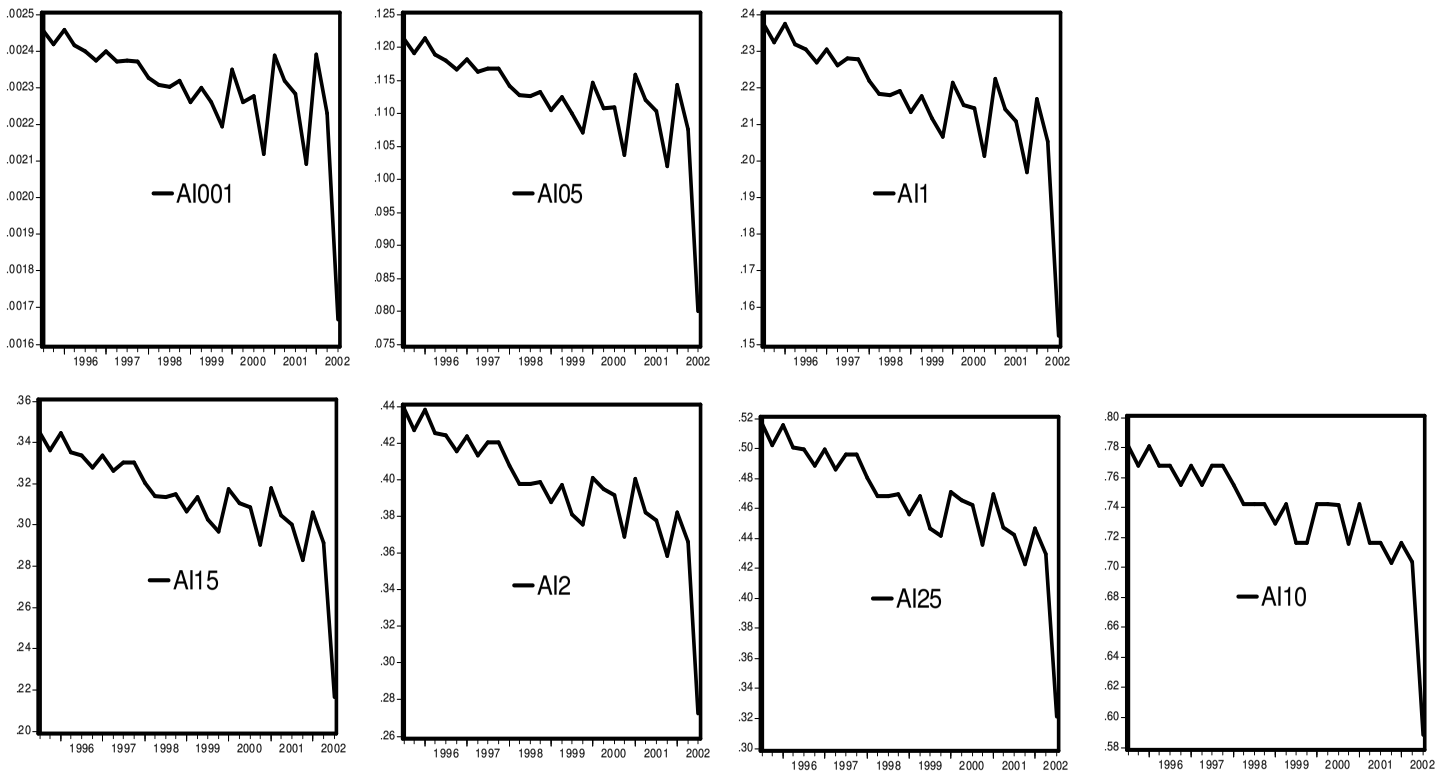


FIGURE A.2. SHARES OF HOUSEHOLDS WITH DIFFERENT EXPENDITURES PER ONE PERSON[6].



[6] Starting from third quarter of year 2000 Derzkomstat stopped to provide data for household with expenditures up to 30 hryvnas since so noticeable improving of population wealth. Its value became comparable with measuring error.

FIGURE A.3. **ATKINSON INDEXES FOR DIFFERENT VALUES OF INEQUALITY**



Appendix *2*. DESCRIPTION OF THE QUALITY OF DATA.

Derzcomstat have used new methodology of households' survey since second half of 1999 years. The sample of households is representative now. Numbers of households with different income in sample are proportional to their weight in total Ukrainian population.

A selection error of data is calculated by the following formula:

$$SE = \sqrt{\frac{\sigma^2}{n}}$$

For sampling with complex design, which the sampling of households actually is, value of σ^2 is calculated by the following formula:

$$\sigma^2 = deff \frac{\sum_{i=1}^{i=u} (y_i - \bar{y})^2}{n},$$

where $deff$ is parameter which represent influence of the sample design on the value of dispersion (design- effect).

LSE is a marginal error. It is calculated by the following formula:

$$LSE = t \cdot SE \ ,$$

where t is number that determines relationship between standard and limit errors under given probability (p). For p = 0.95 t = 1.96, for p = 0.99 t = 2.58.

Relative standard error is calculated by the formula:

$$RSE = \frac{SE}{\bar{y}} \cdot 100\% \quad ,$$

and can be interpreted as coefficient of variation (CV). It is accepted to decide that sample is reliable if $RSE \leq 5\%$. In case if $5\ \% \leq RSE \leq 10\%$ the sample is decided to be acceptable.

The errors for average total expenditure are presented in the table below.

TABLE A.1. ERRORS FOR SURVEY DATA.

Errors	**1999 Q4**	**2001Q4**	**2002 Q3**
LSE (hryvna)	6.04	8.84	11.78
Average RSE for sample, (%)	0.98	1.01	1.08
Maximum RSE , (%)	2.63	2.97	3.82

Because the maximum and average for Ukraine values of RSE are less than 5 percent, Derzhcomstat states that result of households' survey is reliable for any practical use.

Appendix 3. STATA's OUTPUTS:

FIGURE A.4. CORRELATION MATRIX

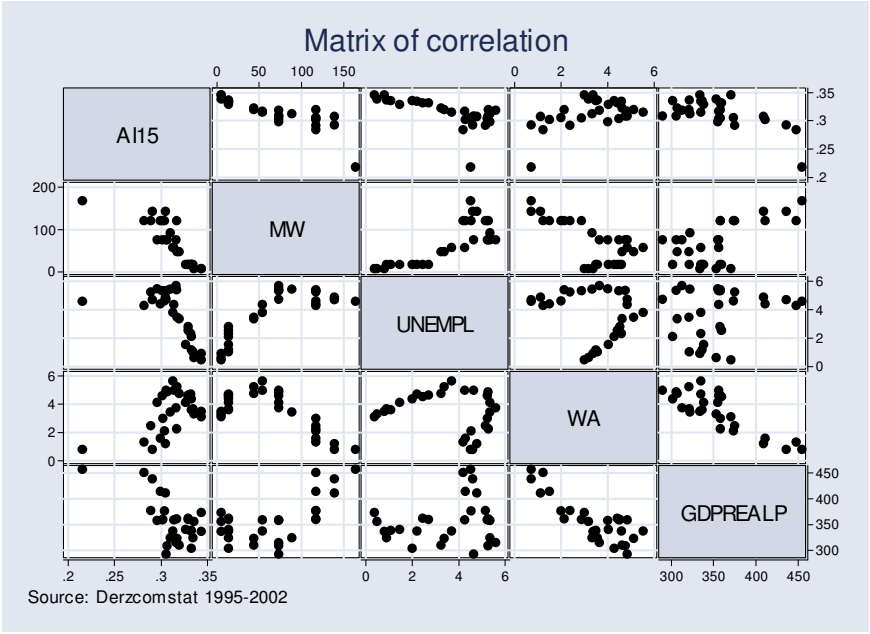


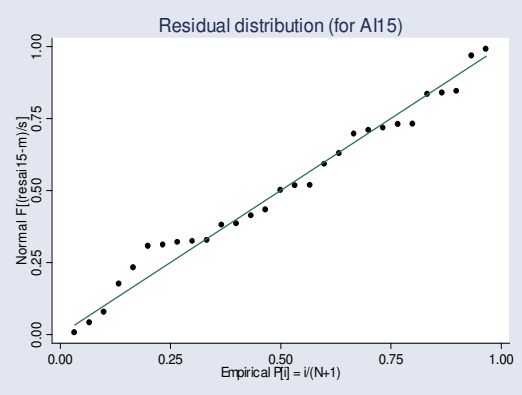
TABLE A.2. REGRESSION OUTPUT.

```
------------------------------------------------------------------------------

Source |       SS       df       MS              Number of obs =      29
-------------+------------------------------           F(  4,    24) =   95.52
       Model |  .016180082     4  .004045021           Prob > F      =  0.0000
    Residual |  .001016328    24  .000042347           R-squared     =  0.9409
-------------+------------------------------           Adj R-squared =  0.9310
       Total |   .01719641    28  .000614157           Root MSE      =  .00651

------------------------------------------------------------------------------
        ai15 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          mw |  -.0003743   .0000356   -10.50   0.000    -.0004478   -.0003007
         wa2 |  -.0069104    .001715    -4.03   0.000      -.01045   -.0033708
    gdprealp |  -.0001557   .0000533    -2.92   0.007    -.0002658   -.0000457
        dum2 |  -.0647469    .007506    -8.63   0.000    -.0802385   -.0492554
       _cons |   .4190824   .0235864    17.77   0.000     .3704025    .4677622
------------------------------------------------------------------------------
```

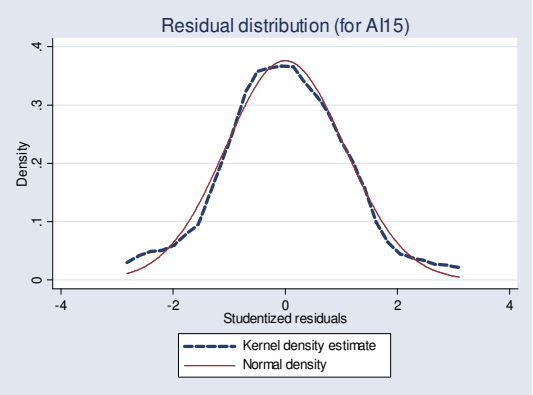
TABLE A.3. RESULTS OF NORMALITY TESTS.

Dependent variable	**Jarque-Bera**	**Probability**
$\mathbf{AI_{0.01}}$	5.845048	0.053798
$\mathbf{AI_{0.5}}$	3.255643	0.196357
$\mathbf{AI_{1.0}}$	1.015582	0.601824
$\mathbf{AI_{1.5}}$	0.054561	0.973088
$\mathbf{AI_{2.0}}$	0.149833	0.927821
$\mathbf{AI_{2.5}}$	0.487231	0.783789
$\mathbf{AI_{10}}$	0.937133	0.625899

FIGURE A.5. DISTRIBUTIONS OF RESIDUALS.



a) Normal probability distribution



b) Kernel residual distribution

TABLE A.4. RESULTS OF THE BREUSCH-GODFREY SERIAL CORRELATION LM TEST[7]:

Dependent variable	**p-values**
$AI_{0.01}$	0.0291
$AI_{0.5}$	0.034
$AI_{1.0}$	0.0488
$AI_{1.5}$	0.0791
$AI_{2.0}$	0.12
$AI_{2.5}$	0.1675
AI_{10}	0.3408

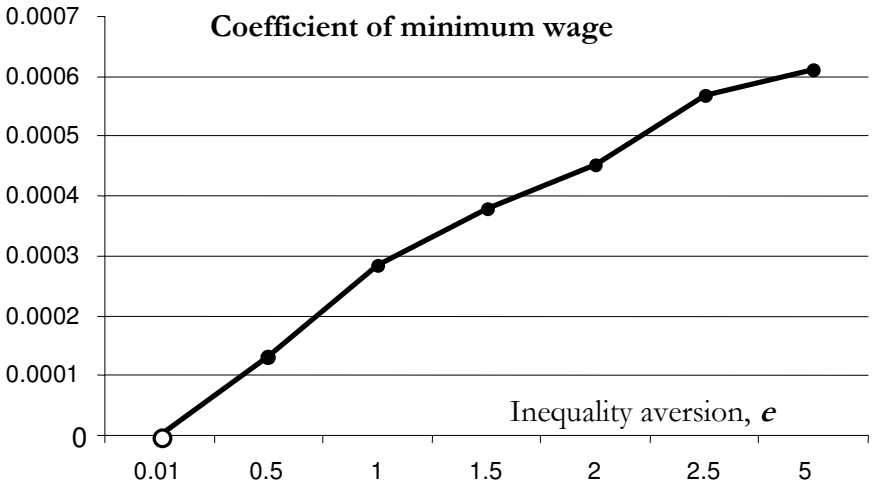
TABLE A.5. OUTPUTS FOR REGRESSIONS*:

	CONS	**MW**	**WA**	**GDPRP**	**DUM**	**AI(-1)**
$AI_{0.01}$	**0.003889 (4.92)**	**-1.38e-06 (1.51)**	**-0.0000521 (4.33)**	**-8.92e-07 (1.62)**	**-0.0005089 (8.56)**	**-0.397466 (1.77)**
$AI_{0.5}$	**0.183218 (13.37)**	**-0.0001326 (9.41)**	**-0.0023533 (5.60)**	**-0.000017 (1.37)**	**-0.0241311 (7.71)**	**-0.406108 (3.98)**
$AI_{1.0}$	**0.3384553 (9.65)**	**-0.000283 (7.51)**	**-0.0045761 (4.47)**	**-0.0000523 (1.74)**	**-0.0515353 (12.26)**	**-0.2954598 (2.24)**
$AI_{1.5}$	**0.3957613 (17.72)**	**-0.00038 (11.26)**	**-0.005785 (3.56)**	**-0.0000992 (1.97)**	**-0.0000992 (1.97)**	
$AI_{2.0}$	**0.534577 (17.38)**	**-0.000453 (10.53)**	**-0.0087331 (4.23)**	**-0.0002072 (2.77)**	**-0.081393 (12.34)**	
$AI_{2.5}$	**0.628035 (17.71)**	**-0.000568 (10.40)**	**-0.0099663 (4.08)**	**-0.0002432 (2.85)**	**-0.0938824 (13.49)**	
AI_{10}	**0.879618 (25.34)**	**-.0006102 (9.04)**	**-0.0079752 (3.19)**	**-0.0002219 (2.72)**	**-0.1040622 (19.36)**	

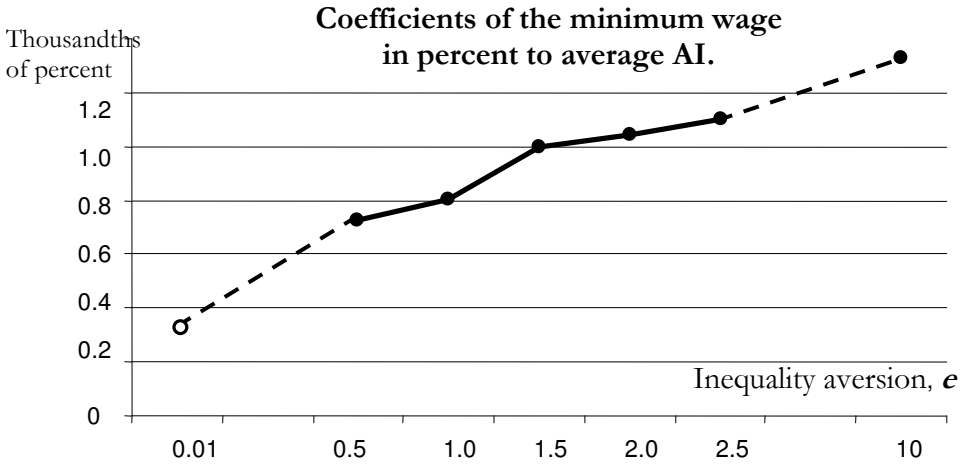
*The values of P-values of each coefficient are presented in brackets.

[7] For correlation up to seven lag.

FIGURE A.6. COEFFICIENTS OF THE MINIMUM WAGE[8].



a)



b)

[8] The coefficient which is statistically different from zero at 5 % level is shown in solid dot; otherwise it is shown as a hollow circle.

Appendix 4. DETERMINANTS OF UNEMPLOYMENT:

The theory suggests some negative correlation between the level of the unemployment and the social welfare. Empirical results revealed that the unemployment affects the social welfare insignificantly. Therefore it is, useful to find the effect of the minimum wage on the unemployment in Ukraine. In order to do this we run regression with unemployment as dependent variable; and the minimum wage (in hryvnas), inflation (in percent), and real GDP growth (in percent).

The result is as follow:

TABLE A.6. REGRESSION OUTPUT.

```
      Source |       SS       df       MS              Number of obs =      29
-------------+------------------------------           F(  3,    25) =   15.97
       Model |  52.7977752     3  17.5992584           Prob > F      =  0.0000
    Residual |  27.5589031    25  1.10235613           R-squared     =  0.7854
-------------+------------------------------           Adj R-squared =  0.7596
       Total |  80.3566784    28  2.86988137           Root MSE      =  1.0499

------------------------------------------------------------------------------
      unempl |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          mw |   .0246556   .0045948     3.69   0.001     .0151924    .0341188
   gdprealg |  -.0018673   .0010368    -1.80   0.084    -.0040065    .0002717
      inflat |  -.0313215   .0114245    -2.74   0.011    -.0548994   -.0077421
       _cons |    226637   .4806308     4.72   0.000     1.276492    3.256247
```

It shows that increasing of the minimum wage by one gryvna causes the increases in the unemployment rate by 0.02 percent.