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# Pension Reform in a Highly Informalized Post-Soviet Economy

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# PENSION REFORM IN A HIGHLY INFORMALIZED POST-SOVIET ECONOMY

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# Abstract

Pension reform is now on the national agenda in most post-Soviet countries. These countries have highly informalized economies, which means that large areas of economic activity go unreported to the authorities. This paper deals with the problem of pension reform in a highly informalized post-Soviet economy, Ukraine. It includes an analysis of causes and consequences of informalization, a general description and analysis of trends in the Ukrainian pension system, and a discussion of different approaches to reform. The paper describes an approach to modeling labor and capital flows between the formal and informal sectors using a gravity model. It also reports and discusses results of simulations of different scenarios of pension reform in Ukraine. Policy-relevant findings of the study are as follows:

- Public trust in reform is crucial. Therefore, in designing and implementing reforms exceptional attention should be paid to trust-building measures;

- Debt-financed transition to a fully-funded pension system in an informalized post-Soviet economy can lead to higher efficiency gains than a tax-financed transition. This is due to an alleviation of the tax burden, which encourages a decline in unreported economic activity.

- Provided that public trust in the reform is sufficient, the larger the fully-funded system, the greater will be the decline in informalization.

## Acknowledgments

## About the Authors

Anton Dobronogov first joined IIASA's Social Security Reform project in 1998 as a participant of the Young Scientists Summer Program. He returned to the institute in 1999 as a Peccei Scholar, and then continued to work for IIASA as a local research associate in Kiev, Ukraine. He has also worked as assistant professor for the National Technical University of Ukraine "Kiev Polytechnic Institute", as a leader of the subgroup for quantitative studies for the Inter-Agency Expert Working Group on Pension Reform for the Cabinet of Ministers of Ukraine, and as a consultant for the Harvard Institute for International Development. Anton Dobronogov holds a PhD in systems analysis and optimal decisions theory from the V.M.Glushkov Institute of Cybernetics, and was a recipient of the Soros PhD student grant from the International Science Foundation in 1997. He is currently a graduate student at the Center for International Development of the Harvard Kennedy School of Government in Cambridge, Massachusetts.

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# PENSION REFORM IN A HIGHLY INFORMALIZED POST-SOVIET ECONOMY

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## 1.      INTRODUCTION

The problem of pension reform is currently on the national agenda of many countries. One can classify modern pension systems according to two methods of benefit calculation - "defined benefit" (DB, which means that the pension level is determined by the history of a person's wages and working record) or "defined contributions" (DC, which means that a pension level is determined by a person's contributions to the system); two types of financing - "fully-funded" (FF, which means that workers invest some part of their earnings to special retirement accounts and "dissave" this money after retirement) or "pay-as-you-go" (PAYG, which means that contributions of the current generation of workers are directly transferred to the current generation of retirees); and two forms of management - privately or publicly managed. A country might have a pension system of one type or combine systems of different types.

The system which currently dominates is the publicly managed pay-as-you-go defined-benefit system, which is the most sensitive (and therefore vulnerable) to demographic changes and, in addition, causes relatively high labor market distortions. This creates different incentives for pension reform in different countries. In industrialized economies the necessity of reform is caused, first of all, by the trend of population aging, which resulted from a strong decrease in fertility rates in the last 40 years of the 20th century. For most of the developing countries the main reason for reform is underdevelopment of the current pension systems, which have both a low participation ratio and provide a low pension level. For post-Soviet economies the objective of reforms is both, to overcome the impacts of population aging, and to adapt the pension system to the socioeconomic context of the market economy. The presence of a large informal sector in the two latter cases, where the share of this sector usually varies between 25% and 65% of the economy, is a significant consideration, and should be taken into account during planning and implementation of any reform.

An "informal sector" is present in all types of modern societies. The reasons for its existence, however, differ from country to country. In developed western economies, where the informal sectors are relatively small, among the factors promoting informalization are (Leiter and Tedstrom, 1997): high official production costs, high official unemployment and relatively high minimum wage rates that discourage

employers from hiring the unemployed, and significant restrictions on employment of foreign workers. In Latin America, where the share of the informal sector is comparable to that in the former USSR, the incentives for the informal sector are as follows (Loayza, 1997): high costs of entering the formal market due to numerous licenses and other requirements, extremely long procedures of enterprise registration, high taxes, administrative overregulation of the formal sector of the economy. Informalization in a post-Soviet economy has its specific features, which we will discuss further.

The objective of this paper is to analyze possible approaches to pension reform in the highly informalized transition economy of Ukraine. The following section gives the policy background for this paper, including an analysis of causes and consequences of the informalization of the economy in Ukraine, a general description and analysis of trends in the Ukrainian pension system, and a discussion of different approaches to the pension reform in the country. The third section is dedicated to the description of the approach to the model-based analysis of the options for pension reform in an economy with a large informal sector. It discusses the goals of the modeling, provides a general description of a two-sector (formal and informal) model of the economy, as well as an approach for modeling labor flows between the formal and informal sectors, as well as capital flows inside and outside the economy. Section 4 describes the set of scenarios for simulations, reports and discusses their results. The fifth section is reserved for concluding remarks.

## 2. POLICY BACKGROUND

### 2.1. Informalization of the economy: causes and consequences

The phenomenon of informalization has been very common in the former Soviet countries in the 1990s - Kaufmann and Kaliberda (1996) studied 11 countries in the region and discovered that the share of the informal sector in total GDP exceeds 30% in 7 of them. For a better understanding this phenomenon one needs to investigate both the long-term and short-term causes.

### 2.1.1. *Deep roots: informal economy in the Soviet Union*

The long-term roots of the present situation lie in the Soviet era. The Soviet Union, like any country in the world, had an informal sector in its economy. The factors causing its appearance and development, however, were not quite the same as those of market economies. As already mentioned, in the latter case the main incentives for both employers and workers to informalize production and labor are the desire to evade taxes and labor market restrictions. In socialist economies, the main factor was an attempt by the state to eliminate virtually all individual economic decisions. Almost all property in the country belonged to the state and was often considered "up for grabs", nearly all private productive activities were prohibited, virtually all prices and trade as whole were under state control, a wide range of consumer goods and services was banned for ideological reasons. Such overregulation itself created incentives for the development of informal activities. In addition, central economic planning acted as a drag anchor on the formal production and distribution mechanisms, leading to the development of huge

horizontal informal networks, vertical patron-client links and corruption. These factors help to fuel economic informalization (Grossman, 1989). In terms of social protection the state provided both explicit social transfer systems such as the PAYG DB pension system, and implicit mechanisms such as full employment, free medical care, subsidized food, housing and other services. Such mechanisms were mostly irrelevant to a person's reported earnings, which produced additional incentives for informalization.

Specific types of informalization were responsible for specific types of informal activity. The goal of a company in a market economy is maximization of profits. The goal of a company in a socialist economy was the implementation of the plan. This led to overreporting (a situation where the state company reports about never-produced output), which is cited by Borodiuk and Turchinov (1999) as one of the most frequent informal activities in the Soviet economy. Among other informal activities were large-scale plundering of state-owned material, technical and financial resources; mass small-scale misappropriations in the state and cooperative sectors of the economy, clandestine business and production activity, production of non-accounted goods, unofficial provision of services, resale of household appliances and foodstuffs outside the framework of state trade (speculation), criminal lines of business, and corruption (ibid).

It was a difficult task to make systematic estimates of the scale of the informal economy for both Soviet scholars (due to ideological reasons) and western researchers (due to the lack of data). The results of the Berkeley-Duke studies on the second economy in the Soviet Union, however, might be taken as first approximations of an estimation of the size of the informal sector. In Grossman (1987) private income was estimated to be between 28 and 33 percent of the total household income. According to Treml (1992) the second economy employed between 10 and 12 percent of the total labor force. Many papers (Brezinski, 1983, Grossman, 1989, Treml and Alexeev, 1993) observe that there was rapid growth of the second economy in the USSR in the 1970s and 1980s.

There are different opinions about the impact of informalization on the stability of the Soviet economy. Brezinski (1983) argued that "the second economy has a stabilizing impact on economy which works to the benefit of Soviet leadership". On the other hand, Treml and Alexeev (1993) concluded that the second economy "contributed to the deterioration of the Soviet economic performance in the 1970s and 1980s". In 1990 the authors of the "500 days" economic reforms program expected that 90% of the informal economic activities would be absorbed by the emerging (formal) free markets (Shatalin et al., 1990). However, in reality this did not happen. One possible reason was that the growth of the informal economy in the late Soviet period was both a cause and consequence of the deterioration of personal and societal morals which were the result of differences in ideology and "natural" behavior. The next subsection will try to analyze how this factor influenced the huge increase of informal activities, which was observed in the 1990s.

*2.1.2. Informalization in the transition period*

In the early 1990s Ukraine started a process of triple transition: from totalitarianism to democracy, from central planning to a market economy, from being part of the Soviet Union to being an independent state. This extremely complex social process led to many turbulent social and economic developments, one of which was the informalization of the economy. The share of the informal sector reached, according to different estimates, 40-60 percent of total GDP. Virtually all enterprises today operate either in the informal sector only, or both in the formal and informal sectors. To analyze the different forms of informalization, we will use the framework proposed by Kaufmann and Kaliberda (1996). They hypothesize the following factors as playing an important role in influencing the costs and benefits of an enterprise operating unofficially, and thus its decision of whether, and to what extent, it will be operating unofficially. They include the:

- degree of political liberalization versus repression;
- extent of underdevelopment in the rule of law and related institutional enforcement mechanisms in a market economy;
- degree of administrative control versus economic liberalization of the official economy;
- official tax burden;
- extent of macroeconomic instability; and
- type of activity.

The Soviet system was essentially based on "fear", which is of course incompatible with political and economic freedom. The society, and especially its bureaucratic system, was built on vertical relations of authority and dependency. Due to the process of political liberalization, which started in the 1980s, the fear factor strongly decreased, but since democratic traditions were absent in the country, this did not lead to the development of horizontal relations of reciprocity and co-operation. Rather, and especially in power structures, it led to greater freedom to engage in corruption, "shadowization" of public finance, illegal privatization, and misappropriation of the state-owned assets.

Every component of the triple transition needed by itself a development of new legislation and a new institutional framework. However, national authorities neither had the skills nor enough resources for such an endeavor[1]. This caused chaos in the legal and institutional framework of the economy, which led to the development of informal "rules of the game", tax evading, increase of criminal activities, and plunder of enterprises and other organizations.

As already mentioned, the economy in the Soviet Union was extremely overregulated. Since many of the people making economic decisions in Ukraine remain

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[1] Putnam (1993) quotes Bates (1988), saying that "both absolute power and absence of power can be corrupting, for both instill a sense of irresponsibility". In the 1990s the Ukrainian bureaucratic system combined both absolute power (in terms of the spirit) and absence of power (in terms of skills to manage democratic society and market economy).

the same, they have continued their efforts to control the economic activity in essentially the same way. This has led to a very high degree of official administrative control, some of which are of a non-economic nature. For example, the so-called "kartoteka # 2" is a regulation, according to which all money paid into the account of an indebted enterprise is automatically transferred to its creditors. After ideological tools for control were eliminated, the state started to use the tax system as the main tool for the administrative control of the economy. A lack of economic expertise within national authorities, however, gave rise to a quite unreasonable tax system which changed frequently. For example, in 1992 corporate income was taxed according to income, in the first quarter of 1993 according to profits, from the second quarter of 1993 until the end of 1994 by income again, and in 1995 to 1998 by profits. Changes in the tax base were combined with changes in tax rates – downward changes in profit tax rates (from 45% in 1991 to 30% in 1995) and upward changes in income tax rates (from 18% in 1992 to 22% in 1994). The top marginal personal income tax attained 90% in 1993 (Luzik, 1999) while social contributions reached the level of 52% in 1997, though were reduced to 39% in 1999. Not surprisingly administrative controls and the heavy tax burden led to a concealment of real profits by enterprises and entrepreneurial structures and an increase in share of unreported economic activities.

The macroeconomic situation was extremely unstable in Ukraine in the 1990s. Real formal GDP in 1997 was reduced by 54.3% compared to 1990, and there was hyperinflation (in 1991-95 the inflation index ranged from 280 to 10,260% per year). As mentioned before, this macroeconomic chaos was complemented (and partially caused) by the instability in the fiscal legislation and led to the "dollarization" of the economy, capital flight abroad and barter transactions.

Macroeconomic instability combined with the absence of capital necessary for investment led to the development, first of all, of economic activities such as trade and commerce, which bring relatively quick returns (something which had been relatively underdeveloped in Soviet times). These activities tend to become more informal than, for instance, the activities of large industrial enterprises, and this fact also contributed to the informalization process.

*2.1.3. Consequences of the informalization*

Informalization of the economy in Ukraine has had both positive and negative consequences. As already mentioned the absence of a legal and institutional framework for the development of the market economy, as well as an ineffective governmental macroeconomic policy, led to very unfavorable business conditions. Informalization provided possibilities to maintain economic activities (including means to accumulate shadow capital required for this purpose) and thus means to survive and improve the living standards of the majority of citizens (Borodiuk and Turchinov, 1999). The negative consequences of informalization, however, are, on balance, greater than its benefits (Kaufmann and Kaliberda, 1996). Most importantly, it has undermined effective management of the economy by the government, reduced tax revenues and thus increased public debt (according to different estimations, funds needed to serve external Ukrainian debt might be between 9% and 12% of the country's GDP), and

diminished state expenditures on science, education, health care, and the pension system. It has also increased criminality (in particular the growth of organized crime), thus increasing transaction costs associated with bribes, poor contract enforcement, and low property security. It also decreased the attractiveness of the country to foreign investors and, as noted above, promoted capital flight. Finally, due to the prevailing short-term perspective in the informal sector, it has virtually eliminated long-term investments. This in turn has slowed down the development of financial markets in the country and led to a growing technological gap compared with other economies.

## 2.2. Pension system in Ukraine: status and trends

With the above as context we now turn to a brief description of the current state, trends, and needs for improvement in the Ukrainian pension system. More detailed analysis is given in Dobronogov (1998) and in Appendix 1.

The Ukrainian pension system is a publicly managed pay-as-you-go defined-benefit system. The social security tax ratio is 33% of wages, 32% of which are paid by the employers and 1% by the employees. The standard retirement age in Ukraine is 60 years for men and 55 years for women; the working record necessary to get full pension is 25 years for men and 20 years for women. In this sense it is very generous system in comparison with western countries where retirement ages and the qualifying periods are higher.

Despite the fact that the share of pension fund expenditures in GDP remained practically constant during the years of transition, the deep economic crisis taking place in Ukraine during the past several years had an inevitable impact on the financial state of the pension system. The decrease in production, for example, resulted in a sharp reduction of the real budget of the pension fund. As a result of informalization and delays in payment of wages, around 7.5 million people make either delayed contributions or no contributions to the pension fund, thereby raising the effective system dependency between current pensioners and contributors (Libanova, 1998).

One of the disadvantages of the Ukrainian pension system is the very high level of contributions to the pension fund paid by the employers. These contributions are 32% of the total amount of wages, with an additional 5.5% being paid to the employment fund and the social insurance fund. This encourages employers to decrease formal wages, which leads to a labor flow into the informal sector and this in turn has a negative impact on both the pension system and the national economy as a whole.

A reduction of the pension level has taken place as a result of the reduction in real contributions to the pension fund. In spring 2000 the average monthly pension (70.0 hryvnias; approximately USD 13) was about the same as the minimum cost of food (69.6 hrn); most retirees received a pension that was less than the official poverty line (90.7 hrn). The delays in wage payments also caused non-payments to the pension fund which amounted to 1,310 million hrn in April 2000 and, as a result, pension arrears, which amounted to 1,310.2 million hrn (1.3 of total monthly benefits or 1.0% of the

1999 GDP). Hence, the living standard provided by the Ukrainian pension system for the retirees should be judged as being very poor.

As mentioned before, the retirement age in Ukraine is relatively low. In addition, in the 1990s the Ukrainian parliament accepted a series of legislative acts that increased the number of people entitled to early retirement (representatives of about 20 professions have such an entitlement nowadays). As a result, the real average retirement age decreased to 58 years for men and to 54 years for women. The average working record (according to official data for 1996) was 36 years for men and 29 years for women, and the real average term of contributions to the pension fund was 30 years for men and 21 years for women. Life expectancy at the average retirement age is 15.1 years for men and 23.1 years for women. Taking into account that an average salary for a relatively short term is used to calculate a pension, there is the possibility that an individual's pension would considerably exceed his/her contributions to the pension fund (Libanova and Yatsenko, 1997). A further threat to the viability of the pension system is the clear trend towards population aging (Figure 1).

According to IIASA's population projections, and assuming the retirement age remains constant, the demographic dependency ratio (persons in retirement age per persons in working age) will increase from 0.41 in 1997 to 0.56 in 2027. Consequently, if the current pension system is maintained, the "affordable" system replacement ratio (i.e. average pension assuming no deficit in pension fund divided by average wage) will significantly decrease (Figure 2). As was shown in Dobronogov (1998), pension reform in the country is unlikely to be possible unless there is an increase in retirement age.

The pension system of Ukraine is highly redistributive and has considerable disadvantages from the viewpoint of equity and fairness. For most retirees it is effectively a "flat benefit" system, because the lack of money in the pension fund has resulted in a very low maximum pension level where the duration of their working record and their average wage levels have usually not been reflected in the pension levels, because most people are entitled to maximum pension or one close to the maximum. On the other hand, according to the "status" laws of Ukraine, there are certain categories of people who can get pensions several times higher than the usual maximum pension. Therefore, the differentiation of pension levels is both socially unfair and economically inefficient, which in turn creates labor market distortions. Another problem is that the working record requirements that should be fulfilled to get a full pension are too generous. To calculate pension levels, the average monthly wages over a short period[2] of time are taken into account. There is a maximum pension level, but there is no maximum wage level above which earnings do not require contributions to the pension fund.

The social unfairness and financial problems of the pension system are leading to intergenerational conflict. The current generation of retirees, who used to finance the old pension system during their working life, receive a pension of much lower purchasing power than in previous years. At the same time, the current working

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[2] See Appendix 1 for details.

population realize that if the current pension system is maintained, they will not receive an appropriate pension themselves, which increases their reluctance to finance the system, and encourages them to evade social security tax.
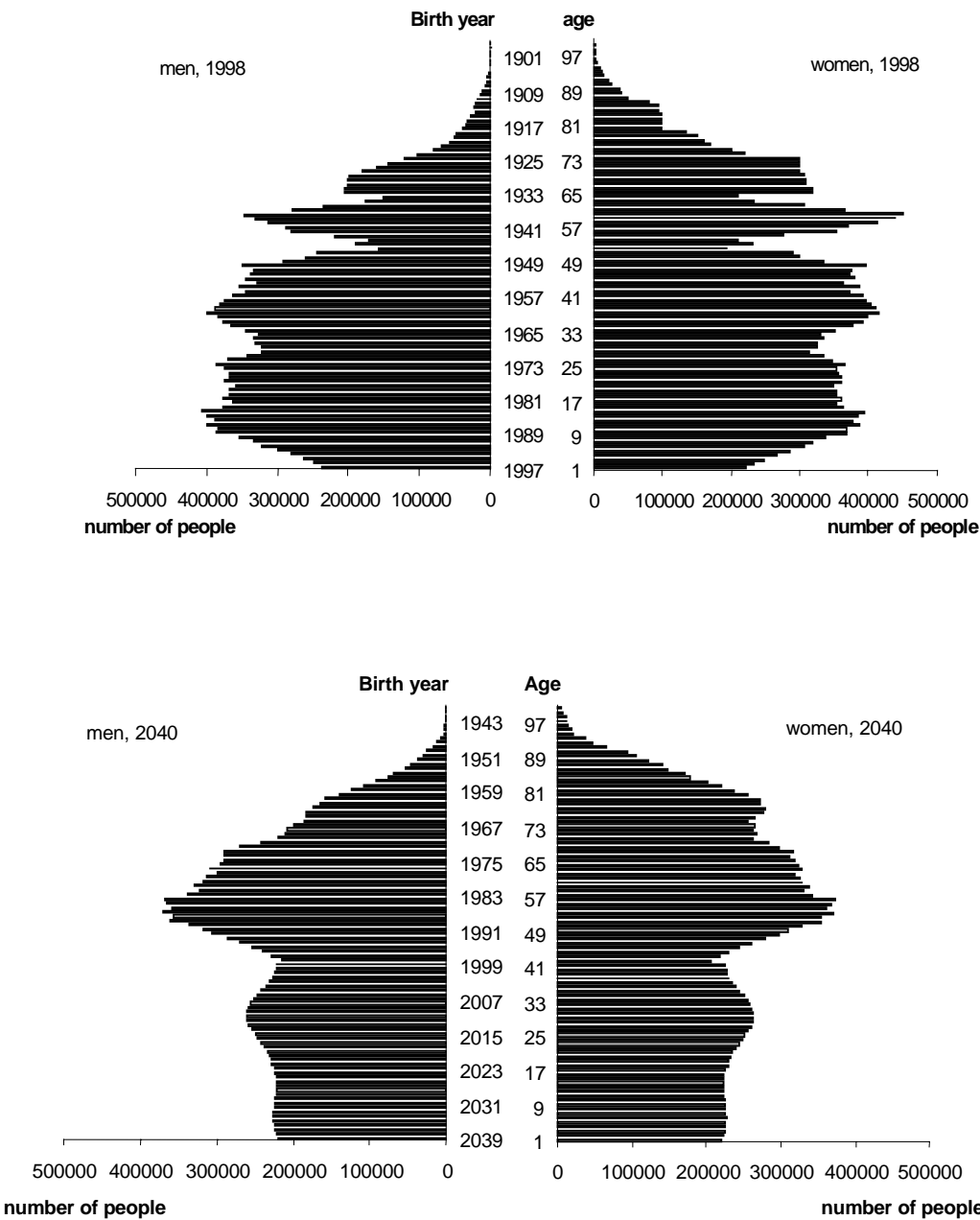


Figure 1. Population by age and gender, 1998 and 2040.

Source: Snelbecker, 1999.
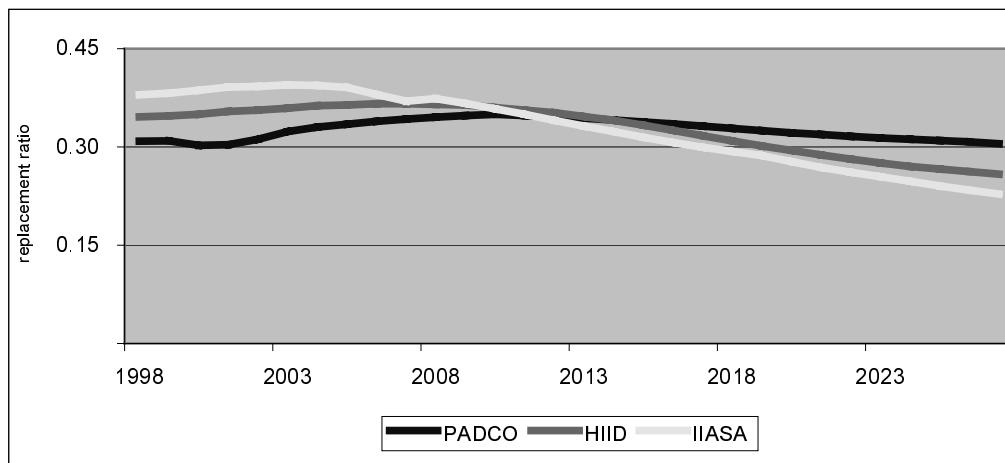
Figure 2. Projections of affordable replacement ratio calculated by different models.
Source: based on calculations by IIASA, HIID, and PADCO discussed at the meeting of international pension experts working in Ukraine in November 1999.

Summarizing, the existing Ukrainian pension system still contains many features of the former Soviet system, some of which make its effective functioning under present conditions impossible. Maintaining this system will inevitably lead to a series of negative consequences, including:

- A further deterioration of the living standards of retirees;

- The necessity of a further increase in social security taxes, and, as a result, increases in labor force costs, a reduction in demand for labor, and an increase in the informal sector in the economy;

- The necessity to increase pension system spending, and, as a result, an increase of the budget deficit, and a reduction of budget expenditures in other spheres such as health care, science, and education, which will lead to a deceleration of economic growth;

- Aggravation of intergenerational tensions.

Thus, there is a clear necessity to undertake pension reform in Ukraine. The next subsection will be dedicated to the problem how to design the reform.

### 2.3. Different approaches to the pension reform and their possible impacts on informalization of the economy

There are two principal types of pension reform, which might be considered suitable in Ukraine.

1. *Parametric reform.* This type of reform means that only some parameters of the current pension system are to be changed, while the basic structure of the system remains the same. Given demographic trends in the country, it is unlikely to be possible

to overcome or significantly alleviate the severe problems of the Ukrainian pension system using only such measures. However, parametric reform of the current system might be quite useful as a part of more radical transformation. In particular, an increase of retirement age, an increase in qualifying years, the elimination of the non-payment periods from the working record for pension eligibility, an improvement of the link between contributions and pensions, a decrease in number of early-age retirees, total or partial cancellation of pensions for those who continue to work, and a shift of the social pensions from the pension fund to the state budget would improve the chances of successful pension reform.

2. *Reform based on the concept of notional defined-contribution (NDC) accounts.* Such a reform has been implemented in Latvia (De Castello Branco, 1998). The concept is that future benefits are calculated on the basis of a person's contributions to a notional individual account with the "rate of return" determined by the government, taking into account economic and demographic indicators. No real funds are accumulated into the accounts, and financing the current cohort of retirees is based on payroll contributions. In other words, this is a PAYG DC system. In a further stage of reform Latvia is going to introduce into the pension system a privately managed FF DC pillar. Pension reform based on the NDC concept might cause a slight shift of labor from the informal to the formal sector, mainly due to improving the link between contributions and benefits and thus encouraging participation in the pension system and, consequently, in the formal sector. However, this is unlikely to cause any significant decrease of the informalization of the economy, since, as we show below, returns to PAYG contributions, and therefore the attractiveness of participation in the system for people, will remain low during next several decades.

3. *Partial or total replacement of the current system by a fully-funded defined-contribution system.* Such a reform seems to be highly desirable for Ukraine since it might solve, at least partially, the above-mentioned problems of the Ukrainian pension system, as well as have a number of positive impacts on the development of the national economy. In particular, it would encourage the shift of wage payment from the informal to the formal sector, and promote the development of financial markets as well as the creation of capital stock for investment in the formal sector of the economy (Snelbecker, 1999). However, there are numerous problems complicating this type of reform, which have been shown, in particular, by the experience of Kazakhstan, where a radical variant of such a reform was adopted in 1997 (currently, 15.5% out of the former 25.5% payroll contributions are to be paid to the PAYG system, and 10% to the FF DC system; the rate of contributions to the PAYG system is to gradually decline to 0). Among the problems are the low level of public trust in both state and private financial structures; macroeconomic instability in the state, an insufficient development of financial institutions, and, as a result, the absence of necessary saving mechanisms; the lack of professionals in the field of pension insurance; the impossibility of insuring against many risks such as inflation, economic recession, investment mistakes, long life, etc. (Wiener, 1998, UNDP, 1997). Another important issue is financing the transition. Although outstanding pension liability in Ukraine is relatively small – depending on

method of calculation it might be between 65% and 141% of GDP, which is considerably lower than, for instance, in Poland, where this indicator is between 153% and 218% (Snelbecker, 1999) – the country has both a very high tax burden in the formal sector and high public debt, which complicates transition financing. One of the possible solutions to this problem is as follows: during the first period of the reform a considerable part of the funds of the FF system might be invested into the special low-interest government bonds and used for financing the pensions of current cohorts of retirees. Eventually, along with solving the problems mentioned earlier, the increasing share of funds of the FF tier could be invested into the private sector, both in Ukraine and overseas (the latter would alleviate the problem of underdevelopment of financial markets in the country). This concept of the reform would not significantly increase public debt, but would rather make implicit pension liabilities explicit, thus encouraging participation in the system, and at the same time providing a smooth shift from one type of pension system to another.

Pension reform based on the introduction of a substantial FF tier into the system might influence three of the six factors forming our framework for analyzing the impact on the informal economy (see page 4). In the long run it might decrease macroeconomic instability by partially or completely eliminating the budget deficit necessary to cope with a rising pension system dependency ratio. It might also influence the distribution of the type of activities in the economy, promoting activities, which need long-run investments. The major impact of the reform on the informalization might be a decrease in the official tax burden because of a decrease of the social security tax rate. This tax, however, will be replaced by contributions to the FF tier. In this regard, the important issue is the public trust in the new pension system. If people trust the system, they will not consider contributions to individual accounts as a tax, but rather as a part of their income. If they distrust the system and believe that they may lose money accumulated in their individual retirement accounts, they will not make a difference between paying taxes and FF contributions. This factor is likely to have an impact on the participation ratio, and thus on the reform's influence on redistribution of labor between the formal and informal sectors and on the size of capital stock invested in the formal sector.

The important question is how large the share of the PAYG and FF components of the pension system should be. The current draft law "On mandatory state pension insurance" being developed by the government of Ukraine suggests that contributions to the PAYG pension system should be gradually (during four years) reduced from 33% to 26% and contributions to the FF pillar should be gradually increased to 7%. Let us analyze the consequences of implementation of this scenario. Figure 3 shows the replacement ratio (defined as average pension divided by average wage) provided by the PAYG system under the assumption that the pension fund does not have any deficit and this draft law is passed. Since the draft law envisages a gradual increase of the pension age for both men and women up to 65, while allowing for early retirement (accompanied by a simultaneous reduction of pension payments), two variants of implementation of the draft law were considered in our analysis. Under the "optimistic"

scenario the effective retirement age was increased to 65 years, and under the "realistic" scenario it increases to 63 years for men and 60 years for women.
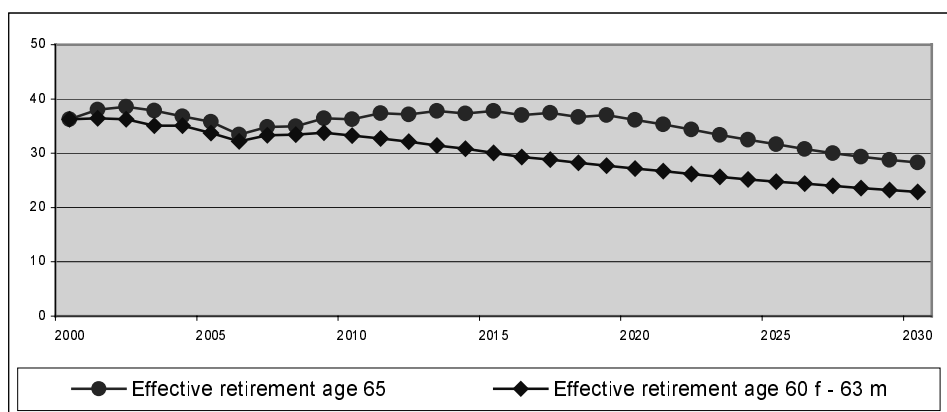


Figure. 3. Projections of the replacement ratio provided by the PAYG pension system under the no-deficit scenario.
Source: IIASA model[3].

Such a considerable decrease of the replacement ratio (in the mid-term perspective it may even become lower than the contribution rate to the PAYG pension system) is likely to precipitate the further reluctance of employees to participate in this system as well as to promote a continuing informalization of the Ukraine's economy. Let us look at the situation from the viewpoint of a male cohort, which is going to be 20 years old in 2003. Our calculations show that the real internal rate of return of the PAYG pension system, based on this draft law, for this cohort will be very low (or even negative given pessimistic assumptions on fertility rate, Table 1). From a microeconomic perspective, this could reduce the participation in the system and lead, therefore, to a continuation (or even an increase) in the informalization of labor, which in turn will impact negatively on the pension system and the economy as a whole.

Table 1. Real internal rate of return of the PAYG system for different demographic scenarios

| Equilibrium total fertility rate[4] | 0.9 | 1.1 | 1.3 (baseline) | 1.5 | 1.8 |
|---|---|---|---|---|---|
| Real internal rate of return, % | -0.3 | -0.1 | 0.1 | 0.3 | 0.5 |

Source: IIASA model.

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[3] Selected assumptions used for these and further simulations are presented in Appendix 2.
[4] We assume that during 20 years the total fertility rate will change from the current level of 1.3 to some equilibrium level and will then remain constant.
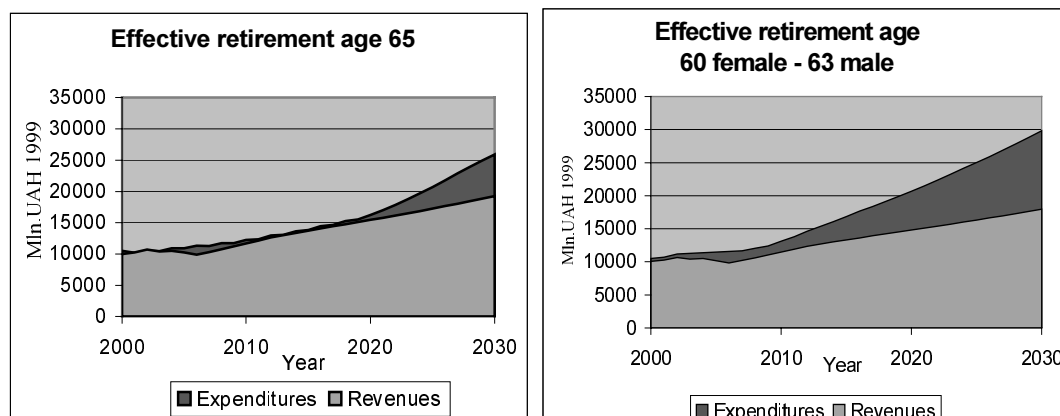
Figure 4. Revenues and expenditures of the PAYG pillar assuming a replacement ratio of 38%.
Source: IIASA model.

It has been proposed that the long-term financial problems of the PAYG pension system may be resolved through the creation of strategic reserves, which might be spent when the demographic situation worsens significantly. However, the creation of such a reserve fund does not seem to be feasible, since the PAYG system is vulnerable to political risks, and because of the sharp decrease in the replacement ratio, shown in Figure 3, any surplus of the system is likely to be channeled into raising pension payments instead of the creation of a reserve fund. Another alternative is the creation of a pension fund deficit. Figure 4 shows the possible amount of pension fund deficit if the replacement ratio amounts to 38%. However, this approach does not seem feasible either, as it is not clear how such a deficit could be financed.

The introduction of a fully-funded pillar of the pension system might be the only chance to reduce the pressure of demographic trends on the financial status of Ukraine's pension system. At the same time, a fully-funded system is characterized by high level of administrative expenses. The experiences of countries which introduced fully-funded systems show that these expenditures do not depend significantly on the rate of contributions to fully-funded system. Rather, they tend to be a certain portion of the total wage bill. The average rate for nine Latin American countries which have fully-funded systems amounts to 1.84% (James et al., 1999). This actually implies that the lower the contribution rate to the fully-funded system, the higher will be the share of contributions to cover administrative expenses and, hence, the lower the profitability of the system. Table 2 shows the internal rate of return of the PAYG and FF components of the pension system for periods 10 and 20 years following the beginning of the working career and at the retirement age for the cohort described above.

Table 2. Internal rate of return of different pillars of the pension system for different scenarios of reform

| Contribution rate, % of taxation base | | Internal rate of return, % | | | |
|---|---|---|---|---|---|
| PAYG Pillar | FF pillar | PAYG pillar | FF pillar, after 10 years of contributions | FF pillar, after 20 years of contributions | FF pillar, at retirement |
| 26 | 7 | 0.1 | -4.5 | 0.0 | 2.3 |
| 22 | 11 | 0.1 | 0.0 | 1.7 | 3.0 |
| 18 | 15 | 0.2 | 0.4 | 1.9 | 3.1 |

Source: IIASA model.

These results show that the pension reform scenario presented in the draft law is likely to result in a negative internal rate of return of the fully-funded system for at least 20 years. In practice, this may precipitate a loss of public trust in reforms and, hence, further reluctance of employees to participate in the pension system and consequently further informalization of the economy. Second, the internal rate of return of the fully-funded system is higher if the contribution rate to the FF system is higher, which, assuming that the FF system works properly, eventually leads to the increase in the aggregate pension payments.

## 3. MODELING THE PENSION REFORM IN AN ECONOMY WITH A LARGE INFORMAL SECTOR

### 3.1 Goals of the modeling

As we have already shown earlier (Dobronogov, 1998), pension reform based on the introduction of the FF DC component into the pension system is unlikely to be possible in Ukraine unless the share of the informal sector in the economy decreases. However, the informal sector share will not decrease by itself, without systemic economic reforms to eliminate incentives to informalize labor and capital. To what extent and with which preconditions would the FF DC element of pension reform contribute to a decrease in informalization? Introduction of the FF DC component into the pension system would usually be expected to promote economic growth due to the capitalization of the economy. In an economy with a large informal sector the same effect could result from a decrease in informalization, assuming that the formal sector is, or will become, more efficient than the informal one. How would different scenarios based on the introduction of a FF DC component influence the total output in the Ukrainian economy? These are some of the general questions we need to address, but there are some more specific questions too.

Since incomes of retirees are extremely low now, it is obvious that neither current nor future retirees can reasonably be expected to bear the burden of the shift from the PAYG DB to the FF DC or a multipillar pension system. Rather, this burden should be met by working-age cohorts. Two approaches to financing the shift are possible: tax-financed or debt-financed transition. It is generally agreed that for OECD-type economies long-run efficiency gains of tax-financed transition exceed those of debt-financed transition. "The costs of it [i.e. tax-financed transition] are, first, no efficiency gains in the first generation, second, greater overall financial contributions of the current generation" (Sachs, 1999). In the stagnating Ukrainian economy with its large informal sector and heavy tax burden, these costs could be too high for the formal sector. In turn, a decrease in the share of the formal sector, which tends to have higher productivity growth due to lower transactions costs, would have a negative impact on the general efficiency of the economy. As has been shown in Snelbecker (1999), in Ukraine under some sets of conditions, including a tipping tendency in the economy (i.e., a trend towards either a very large or a very small informal sector), a debt-financed transition could lead more quickly to a higher growth path than a tax-financed transition. The first question then is w*hat will be the impact of different types of shift financing on the share of the informal sector of the economy and on total GDP?*

The conclusion about the higher long-term efficiency of tax-financed transition for OECD-type economies is also based on the assumption that contributions to FF DC are not viewed as a tax, and thus do not impose any additional distortions on the labor market. In Ukraine, however, households have recently lost their savings due to hyperinflation and dubious financial schemes such as pyramid selling. Therefore, the level of public trust in both public and private financial institutions is already low; thus workers are likely to distrust pension funds and view contributions to the FF DC system as a tax. To be more specific, *how might the "trust factor" influence the impact of pension reform on the informalization of the economy and total GDP?*

Finally, different proportions of the PAYG and FF tiers are possible within a reformed pension system. *How might the size of the FF tier influence the informalization of the economy and total GDP?*

Our simulations are directed at answering all these questions.

## 3.2. Two-sector model of the national economy

This model is an extension of the economic demographic model developed by IIASA's Social Security Reform Project (MacKellar and Ermolieva, 1999). This is a two-sector (formal and informal) neoclassic model employing the Cobb-Douglas production function. The Gross Domestic Product (GDP) in sector i is calculated as

$$GDP_i(t) = \alpha(t)(1+g)^t K_i(t)^{\beta_i} L_i(t)^{1-\beta_i}$$

where

$K_i(t)$ is total capital in sector i;

$L_i(t)$ is total labor in sector i;

g is the average rate of total factor productivity growth;

α(t) is a scaling factor (usually a constant);

$β_i$ is an exogenous coefficient.

The gross profit rate (i.e., including depreciation and indirect taxes) is calculated as

$$R_i(t) = β_i \left[ GDP_i(t) / K_i(t) \right]$$

and the average wage rate in sector i is

$$w_i(t) = (1 - β_i)\left[\frac{GDP_i(t)}{L_i(t)}\right]$$

The model tracks receipts and disbursements, and thus net savings, by the institutional sector (households, firms, and government). The capital of the formal sector consists of residential capital, capital operated by private unincorporated enterprises (PUEs), and capital operated by firms (i.e., corporate enterprises). Capital in the informal sector includes residential capital (apartments and houses rented without declaring received income) and capital of PUEs (i.e., firms operate only in the formal sector). In both sectors imputed rents (in the case of residential capital) and the profits of PUEs accrue directly to the households.

In the formal sector firms earn profits, pay taxes and distribute dividends to holders of claims. These claims are held on behalf of households by two financial intermediaries: the fully-funded defined-contribution pension system (DCPS) and other institutions (OIs), which include banks, insurance companies, mutual funds, and other financial intermediaries apart from pension funds. Implicitly, OIs also include individual households, to the extent that the latter directly hold financial claims.

Both labor and capital flow between sectors. The only exception is claims held by the fully-funded defined-contribution pension system. We assume that this portion of capital by definition belongs to the formal sector, since, due to long-term nature of FF, pension system corporate governance of pension funds will do their best to prevent informalization of the assets. The capital allocated in the informal sector may flow abroad.

Persons of working age earn wages, out of which they and their employers make contributions to PAYG and FF pension systems; they also earn profits on PUEs and receive imputed services from their share of the housing stock. Persons in the retirement age bracket, in addition to receiving wages (if they work), receive annuity income from the DCPS and OIs based on their assets, annuitize their residential capital and capital of PUE, and and receive PAYG benefits.

### 3.3. Modeling labor and capital flows between sectors

To model the interaction between the formal and informal sectors of the economy we draw on gravity models, which are widely used in areas ranging from transport planning to health care (Wilson, 1970, Mayhew and Taket, 1980).

### 3.3.1. Modeling labor flows

In the case of the labor market we apply the hypothesis that the flow of workers between sectors is proportional to the labor force of each and inversely depends on the differences in average net wages. This means, for example, that in an economy where labor market regulations are poorly enforced and sizes of formal and informal sectors are close to each other, more people will choose to work in the informal sector if there is a positive financial inducement to do so in terms of higher after-tax wages.

The model is behavioral in the sense that it reflects current labor market dynamics and contains a behavioral parameter which must be calibrated from existing data as far as this is possible. The model functions by updating the size of each sector between periods based on changes in labor market, demography and wage levels. As labor markets develop, change and become mature it is possible that the parameter as well as the size of each sector will alter, although we do not take this possibility into account here.

There are several forms and specifications of the gravity model available. In our case we also need to take account of the fact that the number of workers leaving a sector cannot exceed the number of workers in it and therefore the model must be constrained accordingly.

Mathematically we represent this process and the constraint on sector size as follows (time index is suppressed):

$$T_{ij}^L = \frac{W_i^L D_j^L f_{ij}^L}{\psi_i^L},$$

where

$T_{ij}^L$ is an origin-destination matrix of the number of workers moving from sector i to sector j;

$W_i^L$ is the number of workers in sector i;

$D_j^L$ is the number of vacancies in sector j which might be potentially occupied by workers from other sectors;

$f_{ij}^L$ is a deterrent factor, representing the "frictional" effect of a changing sector;

$\psi_i^L$ is a balancing factor ensuring that the number of workers leaving sector i does not exceed the number of workers in sector i;

$$\psi_i^L = \sum_j D_j^L f_{ij}^L.$$

i.e. $\sum_j T_{ij} = W_i$

Following the standard approach for this type of models we define $f_{ij}^L$ as an exponential function

$$f_{ij}^L = e^{\delta_i^L c_{ij}^L},$$

where

$c_{ij}^L$ is a change in a worker's absolute salary resulting from moving from sector i to sector j;

$\delta_i^L$ is an exogenous coefficient calibrated on the basis of two years' data.

We assume that those workers who work in the informal sector do not pay either taxes or legal penalties; those who work in the formal sector are assumed to pay direct tax and social security payroll contributions. Thus,

$$c_{formal-\inf ormal}^L = w_{\inf ormal} - (1-\tau) w_{formal}$$

$$c_{\inf ormal-formal}^L = (1-\tau) w_{formal} - w_{\inf ormal}$$

$w_{formal}$ is an average wage in the formal sector;

$w_{\inf ormal}$ is an average wage in the informal sector;

$\tau = DirTaxRate + SocSecTaxRate + (1 - TrustFactor)*FFContrRate,$

where *DirTaxRate* is a direct tax rate,

*SocSecTaxRate* is a social security payroll tax rate,

*FFContRate* is contributions rate to fully-funded pension system,

*TrustFactor* $\in$ [0;1] is a degree to which the population considers contributions to fully-funded system as a tax (0 corresponds to absence of trust, 1 corresponds to absolute trust).

According to the evidence, the share of both the formal and the informal sector in the economy cannot be equal to zero. This means that a situation where all informal workers move to the formal sector is not possible, neither is the reverse. For the sake of simplicity we assume that there is some share of total labor which belongs to some sector and does not move anywhere. This leaves us with

$$W_i^L = L_i - \alpha_i^L (L_{formal} + L_{inf\,ormal})$$

$$D_j^L = L_j$$

where $\alpha_i^L$ is a minimum share of sector $i$ in total labor.

### 3.3.2. *Modeling capital flows*

For modeling capital flows between the formal and informal sectors we use the same specification of the gravity model as in the case of labor markets:

$$T_{ij}^K = \frac{W_i^K D_j^K f_{ij}^K}{\psi_i^K},$$

where

$T_{ij}^K$ is an origin-destination matrix of the number of capital units moving from sector i to sector j;

$W_i^K$ is the number of capital units in sector i;

$D_j^K$ is the number of capital units available in sector j;

$f_{ij}^K$ is a deterrent factor representing the ease with which capital can move between sectors;

$\psi_i^K$ is a balancing factor as before, where

$$\psi_i^K = \sum_j D_j^K f_{ij}^K.$$

We assume that capital flows between sectors depend on the difference between the net rates of return to capital in those sectors. Using the same approach as in the case of labor flows, we define $f_{ij}^C$ as exponential function

$$f_{ij}^K = e^{\delta_i^K c_{ij}^K},$$

where

$c_{ij}^K$ is a change in the net rate of return to capital resulting from moving from sector i to sector j;

$\delta_i^K$ is an exogenous coefficient, calibrated on the basis of two years' data.

We assume that indirect taxes in the formal sector and penalties and bribes in the informal sector are to be paid out of the returns to capital operated in those sectors.

$$c_{formal-\inf ormal}^K = (1-\lambda)\, r_{\inf ormal} - (1-\mu)\, r_{formal}$$

$$c_{\inf ormal-formal}^K = (1-\mu)\, r_{formal} - (1-\lambda)\, r_{\inf ormal}$$

$r_{formal}$ is the rate of return to capital in the formal sector;

$r_{\inf ormal}$ is the rate of return to capital in the informal sector;

λ rate of penalties and bribes paid by entrepreneurs in the informal sector;

μ is an indirect tax rate.

There are four types of capital in our model – capital of private unincorporated enterprises, residential capital, capital operated by firms and held by the private pension system, and capital operated by firms and held by other financial institutions. All of these types of capital are present in the formal sector. We assume the capital of the fully-funded pension system is by definition formal. We also assume that there are no other financial institutions in the informal sector. This means that only two types of capital are present in the informal sector: capital of private unincorporated enterprises and residential capital. Analogously, with the case of labor flows, we also assume that some shares of total capital belong to some sectors and do not move anywhere.

The above set of assumptions leads us to expressions for $W_i^C$ and $D_j^C$ as follows:

$$W_{formal}^K = KPUE_{formal} + K\operatorname{Re}s_{formal} + KOI_{formal} - \alpha_{formal}^K KM$$

$$W_{\inf ormal}^K = KPUE_{\inf ormal} + K\operatorname{Re}s_{\inf ormal} - \alpha_{\inf ormal}^K KM$$

$$D_{formal}^K = KPUE_{formal} + KRes_{formal} + KOI_{formal}$$

$$D_{informal}^K = KPUE_{informal} + KRes_{informal}$$

where

KPUE is capital of private unincorporated enterprises,

KRes is residential capital,

KOI is capital of other institutions,

KM is total "movable" capital,

$$KM = KPUE_{formal} + KRes_{formal} + KOI_{formal} + KPUE_{informal} + KRes_{informal}$$

In other words, KM is the total capital in the economy out of the capital of fully-funded pension system.

### 3.3.3. *Modeling capital flight abroad*

Under some conditions, including those which might apply to Ukraine, the informal sector of the economy might perform more effectively than the formal sector. The question is, what would be the purpose of decreasing informalization in this case? One of the answers is because informalization promotes capital flight abroad, thus strongly decelerating economic growth.

The capital flight is a complex economic phenomenon, and its detailed investigation is far beyond the framework of this paper. However, to present it in the form of a simple model, we make the following assumption:

$$\frac{K_{abroad}}{Y_{\inf orm}} = \varphi$$

where $K_{abroad}$ is a total capital stock resulting from capital flight abroad[5].

This assumption means that if informal output grows, some part of its surplus is exported from the country, if informal output declines, then some part of the capital returns.

Let us test this assumption using the data which we have available. Borodiuk and Turchinov (1999) estimate the total capital stock resulting from capital flight abroad for the end of 1998 to amount to USD 20-25 billion. Turchinov et al. (1997) estimate the stock for 1996 to be USD 15-20 billion. We may assume that capital flight before 1992 was zero, because the economy was closed. Taking average values (17.5 billion for 1996 and 22.5 for 1998) and making a linear interpolation, we can fill data gaps for the years 1992 – 1998 (the eligibility of the linear interpolation might be confirmed, in particular, by estimates of Leiter and Tedstrom (1997), who estimated capital flight from Russia to be constant for every year). Now, using the above mentioned estimates of the share of the informal sector of the economy and data from the State Committee for Statistics of Ukraine (1980-1997) on exchange rates, we estimate the output of the informal sector in USD. Figure 5 shows that our assumption is reasonable and φ might be assumed to equal 0.35.

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[5] As it is virtually impossible to export capital from Ukraine in a legal way, we assume that all capital installed abroad belongs to the informal sector.
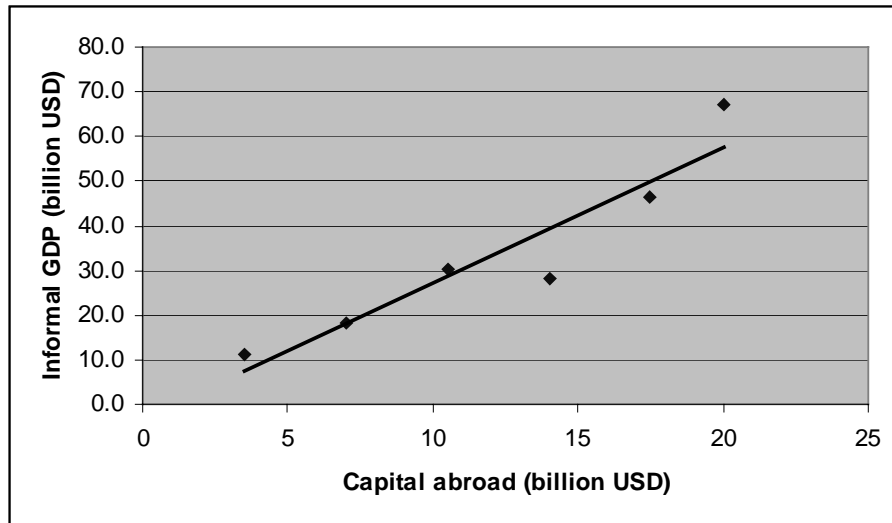
Figure 5. Dependency between estimated output of the informal sector and estimated capital abroad.

## 4. SIMULATIONS

### 4.1. Set of scenarios

Based on the above considerations, we propose three criteria for each scenario.

The first criterion is based on the size of a fully-funded reformed pension system tier. We assume that contributions to this tier might be

(1) 7% of formal wages;

(2) 11% of formal wages;

(3) 15% of formal wages.

The second criterion is based on the method of financing the transition. Two groups of scenarios are worthy of consideration:

(1) the government does not decrease the social security payroll tax (i.e. tax financing);

(2) the government cuts the social security payroll tax rate by the FF contribution rate and issues debt for paying pensions to current cohorts of retirees (i.e. debt financing).

The third criterion is the degree of the public trust in reform. Here there are three groups of scenarios:

(1) the workers do not consider contributions to the FF DC system as a tax;

(2) the workers consider half of the contributions as a tax;

(3) the workers consider all contributions as a tax.

Thus, in total there are 18 scenarios. Of course, this still does not cover all the possible variants of pension reform in the country, and each scenario might have a different probability of realization. However, these scenarios, by providing a spread of possible alternatives, allow us to investigate the possible impact of the reform on the informalization of the economy.

## 4.2. Simulations results

The simulations were made for a period of 30 years with the reform starting in the year 2001. Since we have shown earlier that a successful pension reform is unlikely to be possible unless the retirement age is changed, for all of these simulations we assumed that the retirement age will be gradually raised and will reach 65 for both sexes in 2010. We focused primarily on two indicators: share of informal GDP in total GDP and total GDP itself. Tables 3-4 show the results of the simulations.

Table 3. Simulation results: share of informal output in total GDP.

| No. | Type of transition | FF contribution rate | Trust factor | 2000 | 2010 | 2020 | 2030 |
|-----|--------------------|--------------------|-----|------|------|------|------|
| 1 | Debt-Financed | 7% | 0 | 0.49 | 0.44 | 0.43 | 0.47 |
| 2 | | | 0.5 | 0.49 | 0.43 | 0.41 | 0.45 |
| 3 | | | 1 | 0.49 | 0.42 | 0.39 | 0.43 |
| 4 | | 11% | 0 | 0.49 | 0.44 | 0.43 | 0.46 |
| 5 | | | 0.5 | 0.49 | 0.42 | 0.40 | 0.43 |
| 6 | | | 1 | 0.49 | 0.40 | 0.37 | 0.40 |
| 7 | | 15% | 0 | 0.49 | 0.44 | 0.43 | 0.46 |
| 8 | | | 0.5 | 0.49 | 0.42 | 0.40 | 0.43 |
| 9 | | | 1 | 0.49 | 0.38 | 0.35 | 0.38 |
| 10 | Tax-Financed | 7% | 0 | 0.49 | 0.48 | 0.49 | 0.52 |
| 11 | | | 0.5 | 0.49 | 0.46 | 0.47 | 0.50 |
| 12 | | | 1 | 0.49 | 0.45 | 0.45 | 0.48 |
| 13 | | 11% | 0 | 0.49 | 0.49 | 0.53 | 0.56 |
| 14 | | | 0.5 | 0.49 | 0.46 | 0.47 | 0.50 |
| 15 | | | 1 | 0.49 | 0.45 | 0.45 | 0.50 |
| 16 | | 15% | 0 | 0.49 | 0.51 | 0.56 | 0.60 |
| 17 | | | 0.5 | 0.49 | 0.48 | 0.51 | 0.55 |
| 18 | | | 1 | 0.49 | 0.45 | 0.46 | 0.51 |

Table 4. Simulation results: total GDP, billion 1998 UAH

| No. | Type Of Transition | FF contribution rate | Trust level | 2000 | 2010 | 2020 | 2030 |
|-----|-----|-----|-----|------|------|------|------|
| 1 | | | 0 | 209 | 260 | 330 | 420 |
| 2 | | 7% | 0.5 | 209 | 261 | 334 | 427 |
| 3 | | | 1 | 209 | 262 | 337 | 432 |
| 4 | Debt- | | 0 | 209 | 260 | 331 | 422 |
| 5 | Financed | 11% | 0.5 | 209 | 262 | 337 | 431 |
| 6 | | | 1 | 209 | 264 | 341 | 438 |
| 7 | | | 0 | 209 | 260 | 332 | 423 |
| 8 | | 15% | 0.5 | 209 | 262 | 337 | 431 |
| 9 | | | 1 | 209 | 265 | 344 | 443 |
| 10 | | | 0 | 209 | 260 | 330 | 417 |
| 11 | | 7% | 0.5 | 209 | 262 | 335 | 426 |
| 12 | | | 1 | 209 | 264 | 339 | 434 |
| 13 | Tax- | | 0 | 209 | 261 | 329 | 411 |
| 14 | Financed | 11% | 0.5 | 209 | 262 | 335 | 426 |
| 15 | | | 1 | 209 | 266 | 345 | 443 |
| 16 | | | 0 | 209 | 261 | 326 | 401 |
| 17 | | 15% | 0.5 | 209 | 265 | 340 | 430 |
| 18 | | | 1 | 209 | 269 | 351 | 452 |

## 4.3. Discussion of the results

The results of the simulations show that, first, **public trust in the reform plays a crucial role in the reform's impact on informalization of the economy**. Figure 6 illustrates the difference in the informal sector share of GDP for scenarios with a FF contributions rate of 11%, debt-financed transition, based on different assumptions. On the other hand, Figure 7 suggests that there is virtually no difference in informalization for scenarios with debt-financed transition, low trust and different contributions to the FF tier. The latter fact leads us to the conclusion that most of the effects of pension reform on the informalization of the economy are due to the shift of labor, not capital, from the informal to the formal sector.
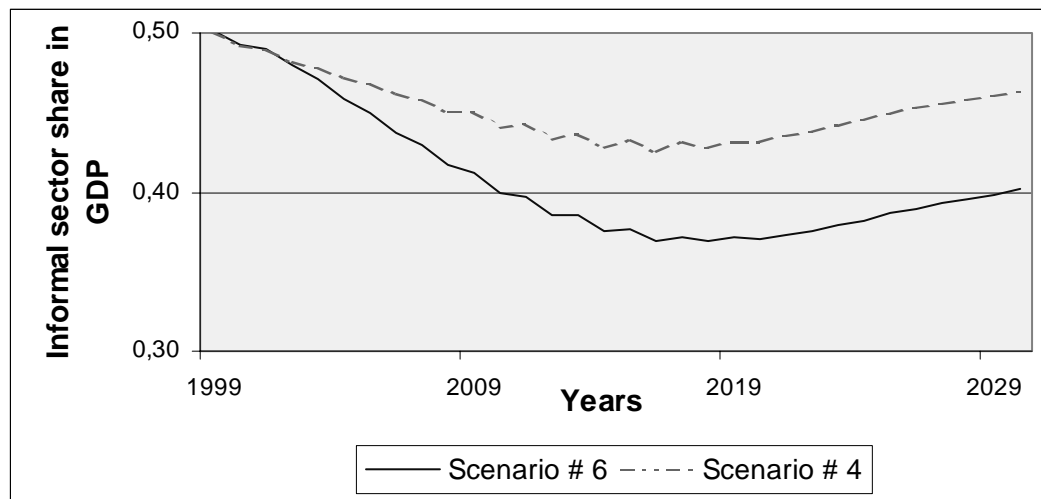
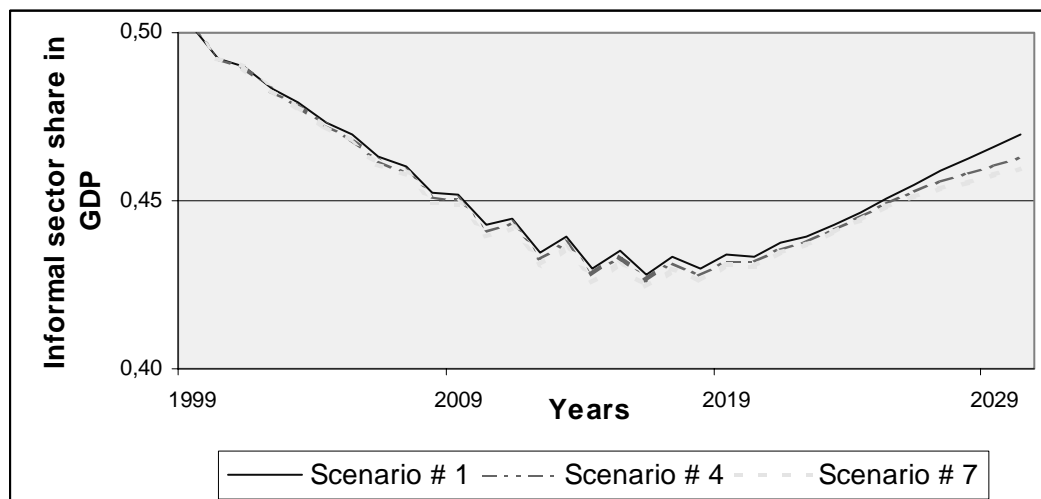Figure 6. Share of informal sector in GDP for scenarios 6 and 14.



Figure 7. Share of informal sector in GDP for scenarios 1, 4 and 7.

Second, debt-financed transition, according to our simulations, will lead to stronger decreases in informalization. For example, in the scenarios 5 (debt-financed transition) and 14 (tax-financed transition), which are in a middle position according to other criteria (trust level = 0.5, FF contributions rate = 11%), the difference in shares of the informal sector in GDP grows to 9% in 2030 (Figure 8). For other analogous pairs of scenarios this difference varies between 5% and 14%. For tax-financed transition the share of the informal sector in GDP never goes below 45%, whereas for debt-financed transition it might reach 35%. If we look at the total GDP for each scenario, which differ only by type of transition, we can see that the total GDP is higher for debt-financed transition scenarios in all pairs with trust levels 0.5 and 0, and for tax-financed transition scenarios if the trust level is set to 0. However, the probability of realizing the scenarios where the level of informalization of the economy remains high and at the same time trust is also high, is insignificant. Thus, we may reach the conclusion that in

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an economy with a large informal sector long-run efficiency gains of debt-financed transition are likely to exceed those of tax-financed transition.
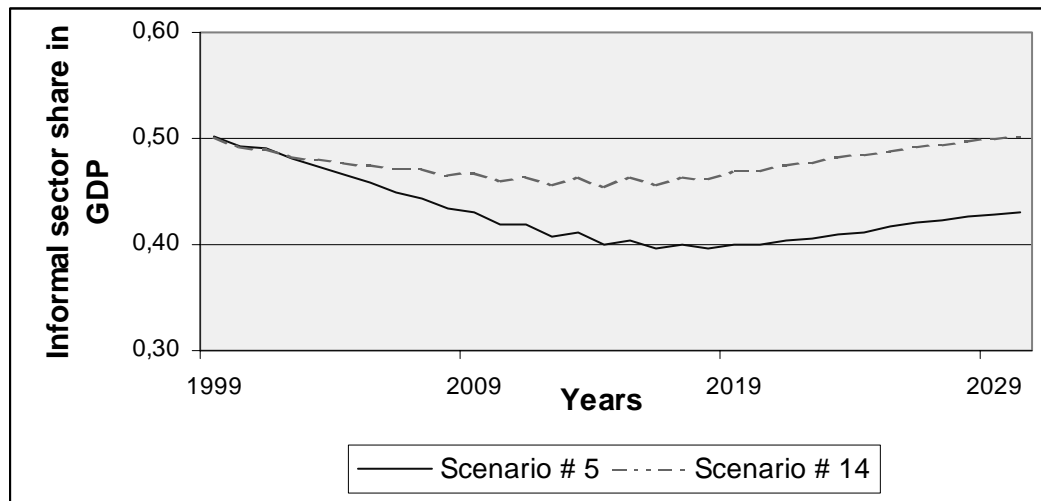


Figure 8. Share of informal sector in GDP for scenarios 5 and 14.

Third, all the above graphs show that after 2020 there is a trend to increase the share of the informal sector. The reason is the additional burden that is placed on the formal sector by rising demographic dependency due to population aging. We can see, however, that successful pension reform with debt-financed transition might alleviate this problem: Figure 9 compares the share of the informal sector for scenario 1 (debt-financed, FF contributions = 7%, trust level = 0) and scenario 6 (debt-financed, FF contributions = 11%, trust level = 1).
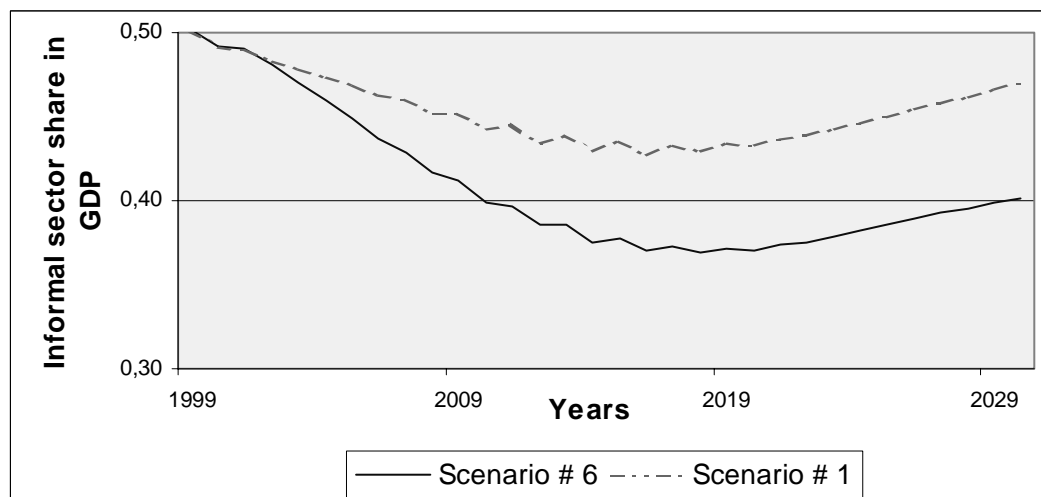


Figure 9. Share of informal sector in GDP for scenarios 1 and 6.

Finally, our results show that **informalization declines and GDP increases with an increase of the contributions to the FF tier (with other conditions being equal)**. However, the public trust in reform also plays an extremely important role: comparing total GDP for scenarios 5 (debt-financed transition, FF contributions rate = 11%, trust = 0.5), 6 (debt-financed transition, FF contributions rate = 11%, trust = 0), and 8 (debt-financed transition, FF contributions rate = 15%, trust = 0.5), one can see that the efficiency gains are higher even in case of a smaller FF pillar if public trust in reform is higher.


## 5.    CONCLUDING REMARKS

The deterioration of personal and societal morals due to double standards in behavior in the Soviet era, followed by political liberalization in the absence of economic reforms and a huge increase of the tax burden, have led to a growing informalization of the Ukrainian economy during the transition period. Together with a decline in formal output and an increase in unemployment, informalization became one of the main reasons for the severe crisis in the Ukrainian PAYG pension system. Population aging is expected to place additional pressures on the pension system and could promote even further informalization. Pension reform based on the introduction of a fully-funded defined contribution component into the system might alleviate some of the negative impacts of population aging on the pension system and contribute to the development of a mature market economy by promoting economic growth and decreasing incentives to informalize.

Our analysis has shown that public trust in the reform plays a crucial role in achieving the above-mentioned goal and in the success of the reform in general. Thus, in designing and implementing any reform special attention should be paid to trust-increasing measures, including the development of a reliable institutional framework for reform, comprehensive legislation to underpin and enforce it, and an effective public relations drive in the media. Investing part of the funds of the fully-funded system abroad would also increase the trust in the system.

In contrast to OECD-type economies, debt-financed transition to a fully-funded pension system in a highly informalized post-Soviet economy would, according to the results of our simulations, lead to higher efficiency gains than would a tax-financed transition. This is probably due to the decrease in informalization caused by reductions in the tax burden. The implementation of this type of transition, however, might be complicated by high public debt and the underdevelopment of capital markets. Thus, for the first stages of the reform it might be better to invest a considerable part of the funds of the fully-funded pension system into low-interest government bonds, providing a smoother shift from one type of pension system to another.

Our results suggest, provided public trust in the reform is sufficient, the larger the fully-funded pillar of the pension system, the larger the decrease of informalization. However, if the pillar is too large, the transition might lead either to considerable increase of public debt and, consequently, to macroeconomic instability, or to the necessity of investing the bulk of funds of the fully-funded pillar into low interest government bonds for a long period of time. In both cases public trust in the reform is likely to decrease, what might diminish the positive impacts of the reform. The

contribution rate to the fully-funded pillar at the level close to 11% of formal wages might be considered, taking into account both sides of the problem.


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**APPENDIX 1. DESCRIPTION OF THE UKRAINIAN PENSION SYSTEM**

**Administrative and legislative structure of the pension system**

The legislative base of the Ukrainian pension system was formed in a period of socioeconomic crisis. This resulted in a series of ad-hoc "catching-up" laws, which caused the pension system to become more complicated and unclear from a public perspective. The assignment and payment of pensions is based on the Law of Ukraine "On Pension Maintenance" accepted in 1991, and on some other laws regulating payment of pensions for certain categories of people (laws "On the Status of People Deputy", "On the State Service", "On the Status of Judges", "On the Public Prosecutor's Office", "On Pensions of Servicemen and the Officers and Men of the Agencies of Internal Affairs", "On the Status of War Veterans and Guarantees of their Social Security", "On the Basic Principles of Social Security of Labor Veterans and Other Elderly Citizens", Custom Code of Ukraine). Funding of the pension system is regulated by the Law of Ukraine "On Tax for Mandatory State Pension Insurance" adopted in 1997.

In April 1998 the president of Ukraine affirmed the Basic Principles of Pension Reform in Ukraine. According to the Basic Principles, the main tasks of the pension reform in Ukraine are to:

- implement the constitutional rights of citizens to social security;

- create conditions for the development of insurance principles in the pension system;

- increase the personal interest and personal responsibility of the worker for his/her living standard after retirement;

- take into account a worker's career in determining pension levels;

- reduce demographic pressure on the financial basis of the pension system;

- introduce a non-state pension insurance.

The Basic Principles stipulate the multistage introduction of a multipillar pension system in Ukraine. The pension reform is expected to have three stages.

In the first stage it is planned to carry out the reform of a mandatory pension insurance, decrease the number of preferential treatments and compensations in the pension system, divide financial sources for different types of pensions, liquidate debts in pensions payments, and develop a system of the minimum state social standards.

During the second stage the reform of the administrative structure of the pension system should be maintained, an additional non-state pension should be introduced, social pensions should be transferred to the system of social assistance, and in favorable conditions the defined-benefit pension system should be introduced.

The third stage stipulates providing minimum social standards for the population and full realization of the multipillar pension system.

The administrative structure of the pension system includes three organizations.

The Ministry of Labor and Social Policy is responsible for setting state policy and developing drafts of laws in the field of the pension system, assigning and

calculating the pension level according to legislative regulations, controlling the use of the funds of the pension fund of Ukraine, developing international cooperation in the field of the pension system, and promoting the development of non-state pension systems.

The pension fund collects the social security contributions into the fund through its regional branches and keeps them on account in a special postal-pension bank.

The ministry of communications provides pension payments through the local post offices.

According to the Basic Principles of Pension Reform in Ukraine, the functions of assigning and paying state labor pensions are expected to be fulfilled by the pension fund of Ukraine after the implementation of individualized registration of contribution for obligatory state pension insurance.

In April 1999 the Prime Minister of Ukraine issued a decree creating an Inter-Agency Expert Working Group for Pension Reform – a national expert committee advising the government on pension reform. The Working Group has developed two draft laws which are expected to be cornerstones of pension reform legislation – "On mandatory pension insurance" and "On non-state pension funds", and the draft laws were submitted to the Parliament for consideration.


**Types and criteria of pension assignment and pension level calculation**

According to the law of Ukraine "On Pension Maintenance", there are two basic types of pensions: labor pensions and social pensions.

Labor pensions include four types of pensions: old-age pensions, invalidity pensions, survivor pensions, and time-of-service pensions.

Old-age pensions are assigned to people who have reached retirement age and have the necessary working record. The level of an old-age pension is 55% of the average monthly wage, but cannot be less than the minimum pension. The pension is to be increased by 1% each full year of service, but this increment cannot be more than 75% of the pension. The minimum pension is defined by the parliament, the maximum is three times (for representatives of some professions and persons having suffered from the Chernobyl disaster – four times) more than the minimum pension. If the working record is not sufficient, the level of pension is pro-rata-tempore of the full pension, but not less than 30% of the minimum old-age pension.

Invalidity pensions are assigned to people who have partially or totally lost their working capacity. To be eligible for invalidity pensions one should have a working record of 1 - 15 years depending on age. Depending on the degree of capacity loss, disabled persons are categorized into three groups. The invalidity pension level is for group 1, 70% of earnings; for group 2, 60% of earnings; and for group 3, 40% of earnings. The minimum labor invalidity pension is equal to the social pension for the respective disability group; the maximum pension is three (four) times the minimum.

Survivor pensions are assigned to disabled dependents of the deceased worker. The level of pension is 30% of the worker's earnings, but not less than the social pension for the respective category of disabled.

The years-of-service pensions are assigned to people whose professions might cause the loss of their working capacity prior to their normal retirement age. The service pension level is determined analogously with the age pension level.

Average monthly wages for determining the levels of labor pensions are calculated (according to the choice of the person requesting a pension) either over the last 24 months of work without interruption before retirement, or over 60 months of work without interruption during the whole working career. Earnings exceeding 10 minimum wages are not considered for the pension level determination. That part of the earnings which is not higher than four minimum wages is taken into full account, the fifth minimum wage is calculated with a coefficient 0.85, the sixth minimum wage with a coefficient 0.7, the seventh with 0.55, the eighth with 0.40, the ninth with 0.25, and the tenth with 0.15.

According to the laws of Ukraine, there is an exception for some state workers whose pensions are placed at the level of 50% to 90% of their earnings without a maximum limit.

War veterans and persons having special labor services are entitled to receive an increment for their pension at a level from 50% to 400% of the minimum labor age pension.

Social pensions are assigned to invalids, persons having reached retirement age, and children who lose the working parent's income, if they do not have an entitlement to labor pensions. The social pension level for different categories of beneficiaries are from 30% to 200% of the minimum old-age pension.

### Retirement age and working record

The retirement age in Ukraine is 60 years for men and 55 years for women. The working record necessary to get a full pension is 25 years for men and 20 years for women. For people with dangerous jobs, the retirement age is decreased to 55 years for men and 50 years for women, and the necessary working record is decreased to 20 and 15 years for men and women, respectively. According to the Ukrainian laws, the periods when a person does not contribute to the pension fund (military service, studying at the university, childcare) are also included in the working record. People who reach retirement age have a right to pension payment regardless of whether they continue to work or not.

### Social Security taxes and expenses of the pension fund

According to the law, employers must contribute 32% of the total wages of their companies to the pension fund (if employees of the company have a right to preferential treatment, this rate is higher), employees contribute 1% of the wage, and self-employed workers and lawyers pay 32% of their earnings (until February 1996 - 9%). The reserves of the pension fund are not included in the state budget, other budgets, and funds. The only admissible operation directed toward reproduction of the fund reserves is a purchase of state securities.

Funds of the pension fund are spent as follows:

- Payment of the labor and social pensions specified by the law;

- Child care assistance and under-age child assistance, defined by the law;

- Additional monetary payments to the retirees due to retail price increases;

- Realization of the state programs in the field of social support of retirees, disabled, children, and other categories of people;

- Organization of current activities, supply of equipment, maintenance of managerial structures of the pension fund, and providing population with information about activities of the pension fund.

## APPENDIX 2. SELECTED MODEL PARAMETERS AND ASSUMPTIONS

### Demographic assumptions

According to the central scenario developed by the IIASA Population Project for European ex-USSR countries (Lutz, 1996), we assumed that fertility in Ukraine will increase to 17 per 1,000 women, and the life expectancy will increase to 67.1 years for men and 78.8 for women by the year 2030. The IIASA population projection model was used to provide assumptions on the age structure of the population.

Based on ILO estimates, the labor age participation rate for all cohorts of the working age population is assumed to be 0.75. The labor force participation rate for the retired population is assumed to be 0.15 (data for Ukraine in 1996). We assume that due to the stabilization of the economy it will decrease to 0.07 in 2040.

### The production functions

Parameters of production functions of the formal and informal sectors were calculated based on official data of the State Committee for Statistics of Ukraine (1980-1997) on formal GDP, formal average wage, labor force, and capital stock, and estimations of those parameters for the informal sector in 1998 (output and average wage in informal sector were assumed to be equal to the output and average after-tax wage in the formal sector, respectively). To calculate the scaling factor $\alpha$ and coefficient $\beta$ we used equations for GDP and average wage from section 3.2. The values of the parameters for the formal sector are: $\alpha=0.1$, $\beta=0.69$; for the informal sector $\alpha =0.076$, $\beta=0.9$. The high value of the capital coefficient • might be explained, first, by the fact that labor costs in Ukraine are very low in comparison with cost of capital, and second, by the low precision of national statistics on capital stock.

### Social security contribution rates

Contributions to FF pension system are assumed to be 0 until 2001. The social security contribution rate was 33% (16.5%); the employers share was 0.97.

### Consumption/saving rates

According to State Committee for Statistics of Ukraine (1980-1997), the savings of households were about 2.4% of their income. Taking into account this information, we assume that for the working-age population's propensity to consume, the disposable wage income, entrepreneurial income, and transfers/bequests was 0.99, 0.7, and 0.7, respectively, in 1998, which will decrease to 0.95, 0.5, and 0.5, respectively, by 2030. For the retirement age population we assume that all income was consumed in 1998, and the consumption rate of wage income is assumed to decrease to 0.95 in 2030.

**Taxes and government consumption**

According to data of the State Committee for Statistics of Ukraine (1980-1997), the direct tax rate (relative to wages and profits) was 0.17 in 1998. The indirect tax rate (relative to GDP) was 0.36. Government consumption was 42% of GDP in 1998.

**Residential investment and investment in PUE**

The share of net domestic savings allocated to residential investment is assumed to be 20%. The share of private unincorporated enterprises in total investment is assumed to be 20%.

**Initializing capital stocks**

According to data of the State Committee for Statistics of Ukraine (1980-1997), the total capital was 848 billion hryvnias in 1998, and the residential capital was 165 billion hryvnias (19.5%). The capital of private unincorporated enterprises can be estimated as 85 billion hryvnias (10%), and the capital of the fully-funded defined-contribution pension system is assumed to be 0. Therefore, the capital of other financial institutions is assumed to be 598 billion hryvnias (70.5%). Capital abroad was assumed to be 135 billion hryvnias.

**Initializing distribution of labor and capital between the formal and informal sectors**

Based on data of the Ministry of Labor and Social Policy on the number of people contributing to the pension fund, we estimate the share of informal labor in Ukraine to be 0.35. Since most of enterprises in the country take part in both the formal and informal sectors operating the same capital, we assume that share of informal capital is 0.5.