

INEQUALITY IN BELARUS FROM 1995 TO 2007

MAKSIM YEMELYANAU*
BEROC[†] and CERGE-EI[‡]

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Abstract

Income and consumption inequality increased in all transition economies, albeit to very different levels. Existing literature suggests that countries that were slow to undertake pro-market reforms experienced the largest increase in inequality, with the notable exception of Belarus, one of the least reformed ex-Soviet republics, that nevertheless has inequality comparable to the most advanced and least unequal transition countries of Central Europe. This article studies the evolution of inequality in Belarus in 1995-2007, decomposes inequality by sources of income, and provides a cross-country comparison of Belarus and Ukraine, which suggests that the large difference in inequality levels is due to different income policies of the two countries: Belarus not only avoided mass privatization, but also kept many of the old-style Soviet social security features.

Keywords: Belarus, Ukraine, transition, income inequality, expenditure inequality, social security

JEL classification: D31, D63, H55, O15

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[†]Belarusian Economic Research and Outreach Center, 41 Nizhniy Val Street, Office 55, 04071 Kyiv, Ukraine. Tel./Fax: +380 44 425 7386; e-mail: maksim.yemelyanau@eerc.kiev.ua. BEROC is a joint project of EERC and SIDA.

[‡]CERGE-EI, Politických vězňů 7, 111 21 Prague, Czech Republic. Web: <http://home.cerge-ei.cz/yemelyanau/> CERGE-EI is a joint workplace of the Center for Economic Research and Graduate Education, Charles University in Prague, and the Economics Institute of Academy of Sciences of the Czech Republic.

1. Introduction

Since the collapse of the central planning system in the transition economies, income and consumption inequality are of high policy concern in these countries, as this is one of the most illustrative economic indicators, easily understandable by the general public. It is now well documented that inequality increased from the initial artificially low levels in all ex-socialist countries, albeit to varying extents. While it rose only moderately in most central European economies, it increased rapidly in most post-Soviet countries. The existing literature (e.g., World Bank, 2000) suggests that post-communist countries that implemented slower and less consistent pro-market reforms also witnessed the largest increases in overall inequality, with the notable exception of the Republic of Belarus.

Although there is much research on inequality in other transition countries, especially Russia and Ukraine, the existing literature on inequality in Belarus does not go beyond mentioning the overall inequality level there (e.g., Milanovic, 1998; World Bank, 2000, 2004). This paper intends to fill this gap in the literature and provide the first detailed analysis of inequality in Belarus, a country with an atypical transition path.

The lack of research on inequality in Belarus is not surprising given that Belarus remains the least known European country for Western researchers and one of the least known countries of the former USSR.¹ Yet, thanks to its lack of reforms, both of the supply side of the economy and of its social support system (International Monetary Fund [IMF], 2005, 2006), Belarus offers an interesting benchmark case for studying many economic questions including inequality.

Figure 1 here.

Within the Soviet Union, Belarus had the lowest inequality level, closely followed by Russia and Ukraine (Dikhanov, 1996; Kakwani, 1995). These three coun-

¹As of November 2008, the Scopus database lists only 54 economics, econometrics, and finance articles containing the word “Belarus” in their titles or abstracts, versus 1358 for Russia, 230 for Ukraine, 719 for Poland, and 141 and 74 for the small countries of Lithuania and Latvia, respectively. If one takes comparable CEE countries, the numbers are 764 for the Czech Republic and 642 for Hungary.

tries historically have tight political, cultural, and economic links and also share somewhat similar paths of transition, at least for the most of the 1990s (World Bank, 2002, Figure 2.1). In spite of those inherited links and similarities, Figure 1 shows that the evolution of inequality in these economies is strikingly different. While in Russia and Ukraine inequality doubled within a few years of independence, reaching levels typical for some of the most unequal countries in the World, inequality evolution in Belarus remained similar to those of the Czech Republic and Hungary—transition countries that experienced significant pro-market reforms but also maintained their income equality with generous, western-style social support systems (World Bank, 2000).

This paper aims to explain this surprising contradiction. Using the data from the Belarusian Household Budget Survey, it answers the following three questions: (i) What is the structure of household income and expenditure inequality in Belarus? (ii) What was the influence of the 1998 Russian financial crisis on the level of inequality? (iii) Do demographic and labor market characteristics that explain the inequality gap between Belarus and Ukraine after 10 years of transition?

The paper is structured as follows: Section 2 provides a brief review of the literature on inequality in other transition countries; Section 3 gives some background information on the transition path of the Belarusian economy; Section 4 describes the data used; Section 5 provides detailed information on inequality in Belarus and its breakdown by sources; Section 6 offers a comparison of Belarus and Ukraine using the DiNardo-Fortin-Lemieux Counterfactual Kernel Densities; and Section 7 concludes.

2. Inequality in the transition countries

A 2005 World Bank survey of poverty and inequality in Eastern Europe and the Former Soviet Union during transition (Alam et al., 2005) recounts:

The wage distribution was compressed under central planning because of the egalitarian ideology and the centralized wage-setting mech-

anism. [...] The new market economy environment has contributed to the widening of wage disparities. Although the increase in wage disparities is consistent with growing productivity differentials, market distortions have also played a role (particularly pronounced in CIS countries). The worst affected have typically been those who are the most vulnerable to shocks and least able to adjust to the new market paradigms: mostly less skilled and older workers (p.14).

Indeed, income inequality increased in all transition economies during the late 1980s and 1990s. In central European countries such as Hungary, the Czech Republic, Poland or the Baltic republics, this increase was modest. On the other hand, the inequality rise was dramatic in the Commonwealth of Independent States (CIS). In Russia, Armenia, Moldova, Tajikistan, and Turkmenistan, the Gini coefficients for income almost doubled according to World Bank's WDI and UNICEF's Trans-MONEE databases that collect information from national statistical offices.² With Gini coefficients of 0.5 or more, inequality in these countries is now comparable to that observed in some of the most highly unequal economies in Latin America. However, unlike in Latin America, where inequality has been high but fairly stable, the deterioration of the income distribution in the CIS has occurred within only a few years, resulting in an unprecedented magnitude and speed of inequality change. In Russia this increase in income inequality was associated with a sharp increase in mortality, discussed by Brainerd³ (1998, 2002), who finds a negative and statistically significant correlation between income inequality and the change in life expectancy in Russia. The mortality crisis has been heavily concentrated among working age men, which in turn suggests that it was at least partially linked with the substantial changes in the labor market.⁴

²According to Luttmer (2001), these numbers may be overestimated by 10-45 percent because of measurement errors and otherwise noisy data. On the other hand, they may have been underestimated before - see footnote 5.

³She calls it "an upsurge in mortality and decline in life expectancy of a magnitude never experienced by a country at peace" (Brainerd, 2002, p. 162).

⁴An example from a totally different country - Lynch et al. (1998) find that higher inequality is associated with higher mortality across U.S. Metropolitan Areas, even after controlling for per

Some researchers (e.g., Garner & Terrell, 1998; Keane & Prasad, 2002) ask whether the comparison of inequality indices before and after the transition is meaningful at all. They note the distortion of pre-transition figures on income distribution and the use of surveys with differing methodologies, coverage, and objectives.⁵ On the other hand, others (e.g., Milanovic, 1998) argue that the real increase in wage disparities was the most important factor behind the increase in income inequality in transition, not the underestimated and underreported inequality in the past.

Government transfers and taxes are another key factor, in many countries—such as the Czech and Slovak Republics, Estonia, Hungary, and Poland—they have played a significant equalizing role, alleviating the effect of rising earnings inequality. In other countries, those transfers had almost no effect. In still others, most notably in Russia and to a lesser extent in other CIS countries, they have actually contributed to increasing inequality, as government size and transfers have declined sharply (World Bank, 2000).

Rising educational premia played a much less prominent role in the CIS, than in CEE, according to Alam et al. (2005), Lindauer (1998), and Yemtsov (2001), among others. They find that education explains only a small share of observed wage inequality, which could be interpreted as reflecting the low market value of the stock of education inherited from the Soviet Union.

The countries that had quicker and more determined reforms witnessed the smallest increases in overall inequality. On the other hand, the countries that have lagged in reforms, or undertaken reforms in an incomplete and inconsistent manner, have experienced the largest increases in inequality. World Bank (2000) summarizes this by three interrelated institutional factors:

capita income and other factors such as median household size or proportion of the population below poverty line.

⁵According to the World Bank (2000), “pre-transition surveys were usually not designed to be representative of the entire population but rather of certain socioeconomic groups. As a result, they tended to be biased toward the average household and to exclude nonstandard households—in particular, marginal groups with a high probability of being poor. Thus, the distribution of income was usually truncated, leading to an underestimation of true income disparities” (p. 142).

First, [...] the failure to put in place the policies and institutions needed to allow product and factor markets to operate effectively as the main mechanism to allocate resources. A socially costly consequence of this failure has been the disintegration of the formal labor market (falling employment, collapsing wages, and growing wage arrears), which has pushed many people into self-employment and led directly to widening disparities in income. The second factor is the co-opting of national governments by vested interests. These interests have blocked reforms that would erode their privileges and allow for a more equal distribution of opportunities and incomes. Finally, widespread rent-seeking behaviors and corruption in public administration at the local and national levels have also contributed to high inequality. Such behaviors constrain the emergence of new private activity and nurture dysfunctional governments. [...] Each of these factors has played a role, and together they have powerfully reinforced the adverse distributional consequences (pp.163-164).

Dikhanov (1996, Table A-1) calculates several inequality measures (including the Gini coefficient and the Theil index) for each of the former Soviet republics in 1990. The calculations are based on incomplete information on income intervals, but still provide the best available source of information on inequality in the Soviet Union just before the start of transition. Dikhanov shows that the three Slavic republics—Belarus, Russia, and Ukraine—had the lowest levels of all inequality measures in 1990, closely followed by the three Baltic republics. The other Soviet republics (of Caucasus and Central Asia) had much higher levels of inequality.

These findings are fully supported by Kakwani (1995, Table 20). Combining them with later studies of inequality in the ex-Soviet Union (consistent yearly data are available starting from 1995-1996 from, e.g., the World Bank), one can divide the former Soviet republics into 3 groups: those that kept low levels of inequality (Baltic countries and Belarus); those that had dramatic increases in

inequality (Russia and Ukraine); and those that had their inequality steadily high (all other republics). Belarus stands out as an interesting case because it is one of the least reformed post-Soviet countries, yet it has low inequality typical of the most advanced transition countries of Central Europe.

There is a growing literature on the sources of income inequality increase in post-soviet countries. According to Aghion and Commander (1999), the Kuznets curve representation does not apply in Russia (and other former Soviet Union countries), meaning that inequality is not likely to fall away from its peak (as in Central Europe), it settles early at a higher persistent level mainly because of high differences in labour income within the private sector. In the long run, Aghion and Commander predict increases in both between and within group inequality because a deterioration in the education systems will further amplify wage and earnings differences between the skilled and the unskilled or between the adaptable and the non-adaptable. In the Belarusian case, the state creates additional confusion by the reform that changes the education system back and forth.⁶

Aivazian and Kolenikov (2001) assert that the shifts of human capital and skills demand during the transition have ousted the “Soviet middle class”, i.e., relatively qualified workers, who have had to look for other, usually less profitable, income sources. This search has been adversely affected by low labor mobility (primarily, geographical) typical for Russia. At the same time, new “extra rich” population groups have acquired substantial rent flows. According to Aivazian and Kolenikov, these two factors explain much of the increase in inequality in post-communist Russia.

Berkowitz and Jackson (2006) attribute the differences in the evolution of Polish and Russian income distributions during the transition to different rates of entry of new enterprises. According to them, Poland’s greater success in *de novo* firm entry contributes to its more equitable income distribution. Berkowitz and Jackson find

⁶In 1998 the Belarusian government introduced a new “European” 12-year school system instead of the old “Soviet” 11-year one. In May 2008, less than 10 years after the start of the reform, it was decided to switch the system back to 11 years by September 2009.

that new firm creation is associated with both larger income and a larger portion of income distributed to the lower quintiles, decreasing both poverty and inequality.

Brück, Danzer, Muravyev, and Weißhaar (2007) study poverty and inequality in Ukraine. Using data from two household budget surveys (1996 - the year of severe economic depression; and 2004 - the year of relative recovery), they find a substantial level of extreme poverty in Ukraine in the middle of the recession and greater poverty among households with children and with less education. When comparing the years 1996 and 2004, Brück et al. find some decline in both poverty and inequality over the eight-year period, especially when measured by income. On the other hand, they document an increase in socioeconomic stratification over time and across space.

Ganguli and Terrell (2005, 2006) examine changes in wage inequality in Ukraine from 1986 to 2003. They find that wage inequality rose moderately and more for men than for women. Applying the DiNardo, Fortin, and Lemieux (1996) counterfactual decomposition method, they assert that changes in the wage structure explain almost the entire rise in inequality. Although less important in its impact, changes in the composition of the labor force did also affect inequality: they contributed to a reduction in overall wage inequality of men, but to an increase in inequality in the top half of women's wage distribution.

Ersado (2006) aims to explain why Azerbaijan Household Income and Expenditure Survey (AHIES) data show extremely low inequality measures, which would suggest that Azerbaijan is one of the most or perhaps the most equal country in the world, while according to Dikhanov (1996) and Kakwani (1995), Azerbaijan had the highest inequality levels among all Soviet republics in 1990. Ersado finds that AHIES is unrepresentative of living conditions of the population because of the fact that the richer households are disproportionately less willing to participate in the surveys. He also asserts that transfers have an inequality reducing effect, and there is a significant amount of transfer income going into the hands of Azeri households. Inequality in the AHIES data would increase significantly—more than

two-fold—if the effects of top-income truncation and of transfers were accounted for (the Gini coefficient would increase from around 0.18 to more than 0.45).

Griffin (2002) finds a precipitous fall in the average standard of living and a dramatic rise in income inequality in Armenia since the transition to a market economy began. As in Ukraine, this is attributed mainly to widening wage differentials. The distribution of expenditure tends to be less unequal than the distribution of income, and this is indeed what Griffin finds in Armenia.

Yemtsov (2001) studies income inequality in Georgia and finds that it is comparable to that of Latin America countries with the Gini coefficient of about 0.6. Yemtsov argues that consumption is a much better indicator of welfare,⁷ especially in the Georgian context of high informalization and demonetization of the economy. Using consumption measures, he finds high, but not exceptional inequality levels (the Gini coefficient of 0.36). He attributes inequality to high informal incomes and to the dramatic decline in state transfers.

To sum up, most studies attribute the inequality increase in transition countries to the increase in wage dispersion and the destruction of old social security and government transfers. In this paper, I check whether this is true for Belarus.

3. Institutional and economic background in Belarus

After the collapse of the USSR in 1991, all ex-Soviet republics experienced major macroeconomic instability and sharp output declines. In Belarus, this fall was the deepest in 1992–94; this was also the period of some initial and indecisive market reforms. Since the mid-1990s the country has pursued a strategy of re-establishing centralized state control over the economy. As a result, for the first years of transition Belarus had essentially the same transition path as other countries in the region, but since 1995 they diverged. While several reform measures were

⁷Which is true for some other transition countries as well, according to World Bank (2000): “In fact, the existence of large differences between consumption inequality and income inequality correlates with our low/high inequality split. In other words, those countries that show the highest levels of income inequality reveal the largest gap between consumption-based measures and income-based measures” (p. 143).

undertaken (notably the lifting of price controls and the elimination of most, but not all, energy cross-subsidization), the economy of Belarus was and still remains highly regulated and under strict state control.⁸ The share of the private sector in GDP is only 25% percent, the lowest among all transition economies except Turkmenistan (IMF, 2005). The majority of population still works at state-owned enterprises (SOEs): according to the Belarusian Ministry of Statistics and Analysis, in 1995 this share was almost 60%. While it was decreasing ever since, reaching 50% in 2007,⁹ large post-communist enterprises still employ virtually as many workers as during the Soviet time.

As for inflation, the Belarusian government brought it down only by the beginning of the 2000s (see Figure A1), not by the middle of the 1990s as most other transition countries did. The Russian 1998 financial crisis was a major shock to the Belarusian economy because of tight economic links between the two countries.¹⁰ Inflation in Belarus (measured by the CPI) reached 182% p.a. in 1998 and 251% p.a. in 1999. Even in 2007, 16 years after the start of transition, inflation was 12% p.a., which is very low by Belarusian standards, but still high compared with other transition economies. Inflation was accompanied by a rapid depreciation of the national currency; the latter, but not the former, stopped in 2003, and the exchange rate of the Belarusian ruble has been de-facto pegged to US dollar till the end of 2008 (see Table A1).¹¹

Unlike other transition economies, Belarus managed to overcome the initial GDP decline very quickly (at least, according to the official data). The country enjoyed steady GDP growth¹² since the mid-1990s, sometimes reaching 10% p.a.

⁸Nevertheless, it is clearly not a socialist economy any more.

⁹<http://belstat.gov.by/homep/en/indicators/labor.php>

¹⁰At that time, Russia accounted for almost 2/3 of Belarusian exports and more than 1/2 of imports. The situation reversed since - Belarusian exports became more diversified, while the reliance on Russian raw materials and other supplies increased.

¹¹As suggested by Randall K. Filer, inflation can have direct effect on inequality measures, because real prices can be more or less biased for products consumed by high or low income consumers, meaning that reported changes in inequality will be biased as well. Unfortunately, the separate data on those price changes is not available.

¹²Despite an extensive literature on inequality and growth, the exact nature of their relationship is still disputed. Some studies (e.g. Miyazawa, 2006; Sukiassyan, 2007) find that the relation is negative, others assert it is positive (e.g. García-Peñalosa and Turnovsky, 2006; Lopez, 2007). In

However, this did not have much effect on real wages: after the 1998 crisis, they fell to USD40 per month, but then slowly recovered, reaching USD100 (a symbolical bar set by the Belarusian government long ago) only in 2003, USD200 in 2005 and USD300 in 2007.

Unemployment remained low during the whole transition period, but again this is according to the official data, which does not take into account hidden unemployment and the workers employed at mostly inefficient and over-staffed large state-owned enterprises.

One of the most particular features of the Belarusian transition path is that in spite of having inflation, depreciation, and wage levels comparable to Russia and Ukraine, it did not experience a similar increase in inequality. The three Soviet republics that had the lowest inequality levels in 1990 – Belarus, Russia, and Ukraine – have seen very different changes in inequality during their transition (see Figure 1). In Russia and Ukraine it doubled by the mid-1990s, while in Belarus it increased only slightly, remaining very low, at the level of the most successful and advanced transition countries of Hungary and the Czech Republic. Even in Poland, inequality increased more than in Belarus.

In this paper I explore three main reasons for such a low inequality level in Belarus during the transition period. The first one is that the Belarusian population has some inherent features that assure low inequality even during such major social and economic changes as the transition “from plan to market” (e.g., Belarusians may have more homogeneous skills and education). The second is that the Belarusian government deliberately kept inequality low (and inflation/depreciation high), mainly by keeping many of the old Soviet social guarantees, which were almost entirely abolished in Russia and Ukraine. The third is that in Belarus the large Soviet enterprises have not been privatized, keeping many people covered by

the case of Belarus, I didn't find any significant dependence between them. The Gini index for income fluctuates within less than 1 percentage point for the whole 13 years of my sample, and its 95% confidence intervals hardly change at all (see Figure 2). When the data on subsequent years become available (and if income inequality in Belarus changes more significantly), I may be able to identify some relationship.

the “Soviet” wage grid. I investigate these possible causes in Section 6, but first I need to describe my methodology and give some overall information on inequality in Belarus, its evolution over time and decomposition by sources and population subgroups.

4. Methodology and data description

Studies of inequality using income data are made difficult in Russia and other post-Soviet countries by the expansion of wage arrears and the increasing importance of informal economic activities in the 1990s (the income from these activities is very unlikely to be reported truthfully). This is why I apply the standard inequality measures (see Appendix for description) and their decompositions both to expenditure inequality and to income inequality.

Unfortunately, there are no reliable and consistent data on inequality in Belarus for the first years of transition (1991-1994). Only from 1995 when the Belarusian Household Budget Survey¹³ (BHBS) was started can one construct adequate measures of inequality among the Belarusian population. The Survey is designed to be representative of the total Belarusian population, unlike Soviet surveys usually including only workers.

The data used in this paper are pooled cross-sections from 1995 to 2007 obtained from the Ministry of Statistics and Analysis of the Republic of Belarus.¹⁴ Each cross-section contains approximately 5,000 households representing the whole population of Belarus. Each observation includes detailed information about the

¹³This project was established with the assistance from the World Bank and the Statistical Office of the European Commission (Eurostat); the quality of the data is at the level of similar surveys in other European countries. The results are published on regular basis, see, e.g., <http://belstat.gov.by/homep/en/publications/1-09n.htm> and <http://belstat.gov.by/homep/en/publications/2-11n.htm>

¹⁴It is not possible to follow the same individuals and/or households over years. To overcome this limitation, I tried the approach by Deaton (1998, p. 117), constructing and following over time the average income of cohorts of individuals defined by their year of birth. Studying Taiwan, Deaton finds that income profiles usually move upward over time with economic growth as each generation becomes better off than its predecessors. This is exactly what I find for Belarus. I also find the dependence of earnings on age has a very well-known “inverted U” shape, where the maximum is reached between 40 and 50 years, meaning that income structure in Belarus is not distorted and thus can be compared with other countries.

household and its members, a breakdown of income and expenditures by categories, a more detailed data on food consumption, and information about dwellings. The data on income and expenditure are monthly averages for a given year. They are collected quarterly using a diary completed by household and survey questions asked by interviewers.

I also use data on individuals that form the households in question (approximately 14,000 observations for each yearly cross-section), including their age, socio-economic status, wages and other sources of income, number of children, information on their education, work experience and health.

This dataset has been used little in the Western scientific literature, the only articles are written by Pastore and Verashchagina to study the returns to human capital and the gender wage gap in 1996 and 2001.

The data are in nominal terms, which in the Belarusian case complicates the comparisons with other countries and between different years, mainly because of high inflation in 1991-2001 and de-facto pegged exchange rate in 2004-2007, so neither the use of CPI nor the exchange rate (market or PPP) lends to consistent figures in real terms. While inequality measures are relative¹⁵ and thus do not depend on the choice of base year or exchange rate, to study poverty (a phenomenon tightly linked with inequality) in Belarus one needs to find a good way to convert all data into real terms. Because this methodological problem has not been solved yet, in this article I study only inequality¹⁶.

5. Inequality evolution and its decomposition

Figure 2 here.

Income inequality in Belarus reached its maximum in the mid-1990s (see Figure 1). After 1995 it stayed at a low and quite stable level¹⁷ (as Figure 2 shows),

¹⁵If incomes of all households are scaled up or down with the same factor, by construction Gini and Theil indices do not change.

¹⁶I also try not to duplicate, but to complement a 2004 World Bank report that studies poverty in Belarus in much detail, but touches inequality only briefly.

¹⁷These results are consistent with the data from the other sources, e.g. the TransMONEE

regardless of whether it is measured by Theil or Gini indices (for both income and expenditure). Expenditure (but not income) inequality increased in 1999, right after the Russian financial crisis, and it followed a downward trend afterwards. This trend reversed in 2004, when both income and expenditure inequality started to rise.

Remarkably, Belarusian inequality of expenditure is much higher than inequality of income (I consider this atypical phenomenon in more detail in Section 5.2). Nevertheless, they both inequality measures are still lower than in other post-Soviet countries.

The regional income inequality in Belarus is spread almost uniformly across regions, none of the regions contribution is significantly different from that of the others. However, the country-wide changes in inequality levels over the years are mainly due to changing inequality in Minsk city (the capital), which also has slightly higher inequality level, compared to other regions (these results are available upon request).

5.1. Inequality decomposition by sources.

Figure 3 and tables 1 and 2 here.

As attested by Table 1, wages are by far the most important source of income in Belarus. Income from small land plots (both monetary and in-kind) was the second most important income source in the mid-1990s, but its share has been steadily decreasing ever since. The share of pensions (retirement benefits), on the contrary, is rising (see also the first graph of Figure 3). This may be one of the factors that keep overall inequality low as the contribution of pensions to the total inequality is much smaller than their contribution to the total income (Table 2) – a sign of the importance of government transfers.

Database (UNICEF IRC, Florence), where they are “...collected directly from National Statistical Offices using a standardized template. Indicators are calculated by the TransMONEE database manager on the base of raw data and using standardized methodologies”. There are some minor discrepancies (still within 95% confidence interval) that are most probably due to some differences in methodologies, equivalence scales and sampling weights, but the overall trend is clearly the same.

Note that the contribution of pensions is negative until 2005, meaning that this source of income has an equalizing effect. This contribution is positive from 2005 on (when there was a change in the retirement law – new pensions became less egalitarian and more dependent on the previous wages of the retiree), coinciding with a small growth of income inequality (Figure 2), so most probably pensions are behind this inequality increase. The inequality contributions and the share of “Income from small land plots” and “Self-employment income” are decreasing.¹⁸

The total income as defined by the Belarusian Ministry of Statistics and Analysis includes the “receipts from sale of real estate” and other similar items (e.g. loans and operations with shares and other securities) that are more related to assets than to income¹⁹. To obtain a better and more methodologically sound estimates of inequality, I subtract those sources from income and expenditure. All graphs and tables in this paper contain the updated estimates.

5.2. Income versus expenditure inequality

One of the interesting features of inequality in Belarus is that inequality of income is *lower* than inequality of expenditure, while studies of other transition economies (e.g., Yemtsov, 2001, for Georgia) usually find that income inequality is *higher* than consumption inequality, because low-income households tend to borrow to sustain a higher consumption level.

Let’s assume for now that there is no underreporting, i.e., that all income and consumption is reported wholly and truly. Then differences in income and consumption/expenditure inequality would imply different savings levels for different income levels, as in principle the equality $savings = income - consumption$ should hold. If there is underreporting of income, higher inequality of expenditure may mean that underreporting is more prevalent for people with higher income. In Belarus, both underreporting of income *and* underreporting of expenditure are

¹⁸The share of this income source remaining stable, the decrease in inequality contribution may be explained by the fact that while in the 1990-s the self-employed usually had higher than average income, in the 2000-s their income became virtually the same.

¹⁹I thank Randall K. Filer for pointing this out.

likely to be present: because of higher prices and narrower choice of high-quality imported goods and services, many Belarusians prefer to go shopping abroad, usually to Moscow, Kiev, Vilnius or Warsaw. Of course, this applies mostly to more affluent people and is virtually impossible to measure directly. The apparent convergence of income and expenditure inequality (Figure 2) may thus mean that the underreporting of expenditures increases, reaching the level of income underreporting. Again, this phenomenon (when people not only have some “hidden” income, but also spend it secretly) is virtually impossible to measure, only some very rough indirect estimates can be constructed, e.g., by using the number of visas issued to Belarusians²⁰.

Figure 4 here.

When I compare inequality for different income levels (see Figure 4), the 10% richest and the 10% poorest have the lowest levels of income inequality (the first graph). Inequality is substantially higher for the top and bottom halves, meaning that income inequality is “concentrated” (more prevalent) at the middle of income distribution (or, in other words, there is no relatively stable and homogeneous “middle class” in Belarus). The picture is different for expenditure (the second graph), where inequality is the highest among the poorest and decreases with the increase of income. The expenditure inequality is the highest in 1999, right after the Russian crisis, and goes down ever since. Note that the richest 10% have the smallest difference between expenditure and income inequality, and the poorest 10% - the biggest, which further increases during the crisis. The richest Belarusians have higher income inequality, but lower expenditure inequality.

Figure 5 here.

A decomposition of income and expenditure of Belarusians by deciles reveals two interesting patterns (see Tables A2 and A3 and Figure 5):

First, the shares of decile groups are virtually constant during 1995-2007, with only three exceptions: (a) a huge drop of the *income* share of the poorest 10%

²⁰Unfortunately, even these estimates will necessarily be biased downwards, as Belarusian citizens do not need visas to visit Ukraine and Russia.

of the population due to the 1998 Russian financial crisis (from 4.2% in 1997 to 2.7% in 1998 and 3.1% in 1999²¹) – apparently the poorest managed to somehow smooth their *expenditure* during the crisis; (b) a drop in the expenditure share of the poorest decile from 3.6% in 2004 to 2.4% in 2005 (most probably this is an isolated “jump”, as it then reached 3.7% in 2007); (c) a gradual decrease of the expenditure share of the richest 10% (but not of the corresponding income share) that is most likely to be the prime reason for the overall decrease in expenditure inequality (Figure 2), but may correspond as well to an increase in expenditure underreporting.

Second, except for the poorest 10% of population (whose income and expenditure shares change considerably from one year to another), the difference between income and expenditure shares decreases with the increase of income, but almost doesn't change over time. The poorest have income shares considerably higher than expenditure shares, while the richest have expenditure shares that are higher but decreasing (Figure 5). This is indeed a sign of income underreporting among richer Belarusians, but there is no sign that it is decreasing - on the contrary, it is likely to be accompanied by growing expenditure underreporting.

The topic of income and expenditure underreporting in transition countries (and particularly in Belarus) could be a promising area for future research, but one needs to find some reliable measures first.

6. Belarus versus Ukraine

6.1. Transition paths and inequality

Although Belarus has tighter economic links with Russia than with Ukraine, because of their relative sizes (population, territory, GDP) it is preferable to compare Belarus with the latter than with the former.

Before comparing Belarus and Ukraine using DiNardo-Fortin-Lemieux Coun-

²¹Taking into consideration the overall decrease of income, this relative drop is even higher in absolute terms.

terfactual Kernel Densities in Section 6.2, I give some basic comparisons of income and expenditure in the two countries. To keep the comparisons simple and save space, I compare the “snapshots” of the two economies in 2002 – by that time both countries had already 10 years of transition and the impact of the 1998 Russian crisis was already smoothed away (all figures in this section are for year 2002 and come from Belarusian and Ukrainian national statistical offices²², unless explicitly noted otherwise).

Ukrainian households were getting an average income of 114.1 USD (or 44.3 USD per capita) in 2002: 42.8% of their income came from wages, 3.2% from self-employment, 20.4% were pensions, stipends and other social security transfers, came 15.3% from their land plots (both from sales and in-kind) and the rest from other sources, including 8.6% as a “financial assistance received from relatives, friends or charitable organizations”. However, when I re-calculate these shares using the micro-data from Ukrainian Household Budget Survey (similar in construction to BHBS), I obtain slightly different results (see Table 3).

Table 3 here.

The income decompositions by sources are quite similar in both countries, with two notable exceptions. The share of pensions in Ukraine is 15%, while in Belarus it is 20%. Income from land plots is significantly more important in Ukraine by both share (20% vs. 13%) and inequality contribution (25% vs. 6%).²³

It may appear that the social security systems are quite similar in both countries, but in fact they are not. The first reason is that in Ukraine the unemployed form 10.3% (official figure²⁴) or 17.2% (my calculations from UHBS) of the economically active population while in Belarus the corresponding estimates are only 3.0%²⁵ or 5.8% respectively. Yet the average shares and contributions of unemployment benefits are very close in both countries meaning that, in Belarus, unem-

²²Ukrainian State Statistics Committee and Belarusian Ministry of Statistics and Analysis, renamed Committee in August 2008.

²³I investigate the phenomenon of small land plots in more detail in a companion paper.

²⁴http://www.ukrstat.gov.ua/operativ/operativ2006/rp/prc_rik/prc_r/osp_rik_r.htm

²⁵http://www.belstat.gov.by/homep/ru/indicators/svodn_2000-2005.php

ployment benefits are more generous. The second reason is that payment arrears are still widely spread in Ukraine as of 2002 (Berry and Schelzig, 2005) but virtually eliminated in Belarus. Furthermore, the “financial assistance received from relatives, friends or charitable organizations” is very significant in Ukraine (8.6% of total income) while in Belarus it is not.

As for the expenditures, Ukrainian households spent on average 123.5 USD per month and per household, of which 59.1% on food, while in Belarus households spent 154 USD and with the food share being only 43.9%, suggesting that Ukrainian households are on average poorer than Belarusian ones. They also spend more than they get (on average), which can be explained by borrowing and income underreporting.

I calculate Gini and Theil indices for Ukraine, using the micro-data from the Ukrainian HBS and the same methods and formulas I applied to BHBS. The results for Ukraine are the following: Gini coefficients for income/expenditure 0.418/0.411 and Theil 0.291/0.280. Note that the coefficients for income and expenditure are very close, in fact their 95% confidence intervals overlap. Note also that in Ukraine the inequality of income is higher than the inequality of expenditure, which is more intuitive than the Belarusian case.

Table 4 here.

The comparison of decile shares for income and expenditure in Table 4 reveals additional interesting patterns. Income and expenditure decile shares are almost equal in Ukraine but very different in Belarus (see section 5.2 for a discussion). Nevertheless, the distribution of income is clearly more compressed in Belarus.

A World Bank (2007) country brief characterizes Belarus as having a “...comprehensive social security and good basic health and education services [that] have been sustained since independence and remain available.” Another World Bank (2004) report states that “... the Republic of Belarus has a well-developed system of social support. More than 14% of GDP or 31% of the consolidated budget ex-

penditure in 2002 were channeled to social assistance and insurance programs.²⁶ In addition, it is estimated that quasi-fiscal social transfers by enterprises were equivalent to about 2-3% of GDP” (p.59). As for Ukraine, a similar report (World Bank, 2005) explains: “The differences in coverage and on pension benefits across income groups result in a regressive incidence. Pension benefits are similar across beneficiary households, with the poor earning 8 percent lower pensions compared to the better off. These smaller pensions, combined with slightly lower coverage of pensions among the poor result in an unequal distribution of benefits... There are major gaps in terms of coverage and targeting of the poor” (p. 45). This explains why pensions play an important role in reducing inequality in Belarus, but not in Ukraine.

On the other hand, the share of people working in state enterprises is high in Belarus, decreasing from 60% in 1995 to slightly more than 50% in 2007. In Ukraine this share was much lower already in 1999, reaching only 31%.²⁷ Because wages are by far the most important sources of income and contributors to inequality in both countries, this should explain, at least partially, lower inequality levels in Belarus.

My overall conclusion about the two countries’ transition paths is that they started their transition with the same income distributions, and by 2002 they had grown apart in some features, but remained close in others.

6.2. DFL

DiNardo et al. (1996) [DFL] present a way of studying the effect of changes in structural variables on the distribution of income (or expenditure), and in particular on income inequality. Their semiparametric approach is based on the construction of counterfactual *densities* by reweighting the original population according to the changes in underlying characteristics (generalizing the ideas of Oaxaca, 1973,

²⁶However, among all social security transfers, only pensions play a significant role, while all other transfers (e.g., unemployment benefits) are negligible and received by few households.

²⁷http://www.ukrstat.gov.ua/druk/katalog/kat_e/cat8_e.htm

who calculated counterfactual *means*). The DFL procedure allows for referring to the distribution as a whole, instead of focusing on specific aggregate measures. The results can be visualized and the effects of particular variables isolated in a well-defined way.

The methodology of DFL can be presented as follows: each individual observation is viewed as a vector (w, z, t) , where w is the wage (or income/expenditure), z is the vector of individual attributes, and t is the date. The joint distribution of wages and attributes conditional on the date can be defined as $F(w, z|t)$. The density of wages at some time, $f_t(w)$ is then expressed as the integral of the density of wages, conditional on some individual attributes and on the date t_w , $f(w|z, t_w)$, over the distribution of individual attributes $F(z|t_z)$ at date t_z , or:

$$f(w; t_w = t, t_z = t) = \int_z dF(w, z|t_w, z = t) \quad (1)$$

where the set of wages w come from period t_w and the set of characteristics z come from period t_z .

The counterfactual for z from τ , $f(w; t_w = t, t_z = \tau)$, can be expressed as re-weighted actual

$$f(w; t_w = t, t_z = \tau) = \int_z f(w|z, t_w = t) \Psi_z(z) dF(z|t_z = t), \quad (2)$$

where

$$\Psi_z(z) = \frac{dF(z|t_z = \tau)}{dF(z|t_z = t)} \quad (3)$$

Instead of two different dates one can use other binary criteria, say women/men, employed/unemployed etc., or compare the populations of two different countries.²⁸ The continuous version of the DFL method was implemented in Stata software (starting from version 9.0) by de Azevedo.²⁹

²⁸Data comparability across countries might be a problem, but not in my case as I am using the data from two identically constructed household budget surveys.

²⁹His `.ado` code is based on the original DFL paper and on Van Kerm (2003).

Using the semiparametric procedure from DFL, I develop counterfactual densities of total expenditure³⁰ of Belarusian and Ukrainian population in 2002. For instance, I estimate the density that would have existed in Belarus if the distribution of demographic and other characteristics of the population was as in Ukraine:

$$f(w; t_w = \textit{Belarus}, t_z = \textit{Ukraine}) = \int f(w|z, t_w = \textit{Belarus}) \Psi_z(z) dF(z|t_z = \textit{Belarus}) \quad (4)$$

and $\Psi_z(z)$ is a “reweighting” function where

$$\Psi_z(z) = \frac{dF(z|t_z = \textit{Ukraine})}{dF(z|t_z = \textit{Belarus})} = \frac{\textit{Prob}(t_z = \textit{Ukraine}|z) \textit{Prob}(t_z = \textit{Belarus})}{\textit{Prob}(t_z = \textit{Belarus}|z) \textit{Prob}(t_z = \textit{Ukraine})} \quad (5)$$

The weight $\Psi_z(z)$ —the probability of living in country t , given individual’s characteristics z —is estimated using a logit³¹ or probit model, which predicts the probability $\textit{Prob}(t_z = \textit{Ukraine}|z)$ and $\textit{Prob}(t_z = \textit{Belarus}|z)$ for each individual in the sample. Using the reweighted sample, I then calculate the counterfactual measures of income and expenditure levels, and use kernel density estimates to draw their counterfactual densities. These counterfactual density functions show the expenditure density that would have prevailed in Belarus if the distribution of demographic and other characteristics³² there was as in Ukraine.

The application of DFL Counterfactual Kernel Densities method to Belarus and Ukraine in 2002 yields the following results (see Figure 6).

Figure 6 here.

The first graph compares the actual distribution of expenditure of Belarusians with the counterfactual distribution (“if Belarusians were Ukrainians”). The coun-

³⁰Expenditure is used instead of income to offset for underreporting of income, especially in Ukraine.

³¹The logit model I use is of the form $p(\textit{Ukraine} = 1) = \exp(\beta_0 + \beta_z Z) / (1 + \exp(\beta_0 + \beta_z Z))$. The reweight is created by multiplying the sample weight by $p/(1 - p)$, where p is the predicted probability from the logit model.

³²I use age, gender, place of residence (capital/city/town/village), land plot ownership, number of children, education, employment status and socio-economic category.

terfactual density has lower mean and higher dispersion, meaning that if Belarusians were Ukrainians, they would be poorer and have higher expenditure inequality. The second graph compares the counterfactual distribution for Belarus with the actual distribution for Ukraine. The two densities are much closer than on the first graph, meaning that the differences are mainly due to different βs (government and labor market conditions) than to different $z s$ (demographic and other characteristics).

The differences in inequality between Belarus and Ukraine should thus be attributed to different policies of their governments, not to different characteristics of their people, as on average both populations have similar education, work experience, age and other characteristics. The growing share of retirement benefits in the income of Belarusians (see Section 5.2, Table 1, and Figure 3) would suggest that inequality in Belarus was preserved at low levels (compared to Ukraine) by keeping many of the old Soviet social security features (and government transfers) in Belarus and dismantling/reducing them in Ukraine, but also because most people in Belarus still work at large SOEs.

7. Conclusions

Using the data from Belarusian Household Budget Survey (BHBS), I find that inequality in Belarus was low and virtually stable in 1995-2007, but with a small rise in 1998 due to the Russian financial crisis. This result is the same whether I use Gini or Theil indices and whether I calculate them for income or expenditures.

The inequality decomposition by income sources shows that the income sources with the highest share (wages, pensions, income from the land plots and self-employment income) have the highest contribution to total inequality, with the share and contribution of wages growing over time and those of self-employment income and income from small land plots decreasing.

The two Soviet Republics that had the lowest inequality levels in 1990 have seen very different evolution of inequality during the transition period: in Ukraine

it almost doubled, in Belarus it remained very close to the pre-transition level. The application of the DFL method to both countries shows that (in 2002) their populations on average have the same demographic, employment and other characteristics, and the differences in inequality levels are due to government policies, most probably keeping many of old Soviet social security features (and government transfers) in Belarus and dismantling/reducing them in Ukraine and by keeping large Belarusian SOEs unprivatized. Another important factor is pensions – they are an important income source in both countries, but in Belarus they contribute to equality, in contrast to Ukraine.

The overall conclusion is that the Belarusian government was quite successful in building an egalitarian society, as economic growth (6% p.a. on average during the last decade, IMF, 2006) didn't result in a significant increase of inequality among people.

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Tables and figures

Table 1. Share in total income

income source	1995	1999	2003	2007
wages	52.3%	54.0%	63.5%	61.5%
self-employment income	3.6%	3.3%	3.1%	2.6%
pensions	12.9%	11.8%	15.6%	20.5%
income from small land plots	25.6%	21.6%	12.6%	7.2%
other	5.1%	9.2%	5.0%	8.3%
Total	100.0%	100.0%	100.0%	100.0%

Table 2. Proportionate contribution to total inequality

income source	1995	1999	2003	2007
wages	64.3%	66.2%	75.8%	73.4%
self-employment income	9.5%	10.4%	3.6%	5.9%
pensions	-2.0%	-2.2%	-0.4%	12.7%
income from small land plots	20.6%	16.9%	5.0%	1.8%
other	6.5%	8.5%	16.0%	6.2%
Total	100.0%	100.0%	100.0%	100.0%

Source: author's own calculations based on BHBS.

Notes: "Income from small land plots" includes both sales of agricultural products and income in kind; "other" includes dividends and unemployment benefits, child allowances, other state subsidies and financial assistance received from friends and relatives, but *excludes* receipts from personal and household property sale and receipts from sale of real estate. Both share and contribution of dividends and unemployment benefits, taken separately, are insignificant.

Table 3. Inequality decomposition by income sources (in 2002)

income source	source's share		source's contribution to inequality (absolute)		source's contribution to Gini index	
	Ukraine	Belarus	Ukraine	Belarus	Ukraine	Belarus
wages	50.1%	61.3%	48.0%	74.3%	20.1	17.5
self-employment income	4.0%	3.9%	4.2%	7.1%	1.8	1.7
pensions	15.0%	15.9%	9.7%	-0.4%	4.1	-0.1
income from land plots	20.1%	13.4%	25.2%	6.3%	10.5	1.5
other	10.8%	5.5%	12.9%	12.7%	5.3	3.0
Total	100.0%	100.0%	100.0%	100.0%	41.8	23.6

Source: author's own calculations based on BHBS and UHBS.

Note: the decomposition by income sources was performed in Stata using `ineqfac` .ado module.

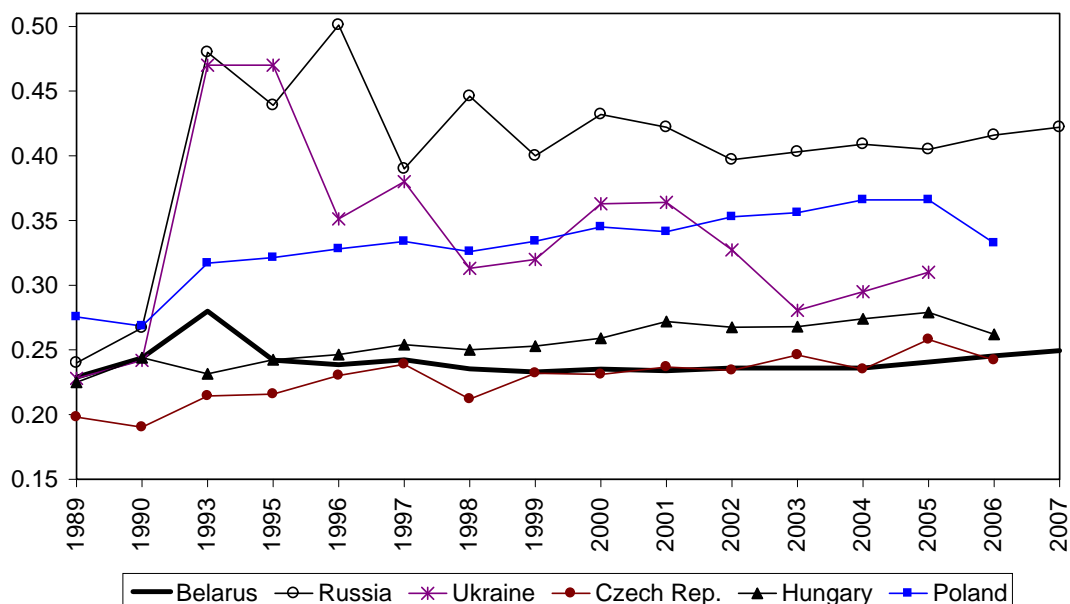
Table 4. Decile shares of income and expenditure

Decile group	Income share			Expenditure share		
	Ukraine	Belarus	difference, p.p.	Ukraine	Belarus	difference, p.p.
bottom 10%	0.9%	3.7%	-2.9	1.3%	3.2%	-1.9
2	2.9%	6.0%	-3.0	2.9%	5.1%	-2.1
3	4.2%	7.1%	-2.9	4.3%	6.2%	-1.9
4	5.6%	8.0%	-2.4	5.8%	7.2%	-1.4
5	7.0%	8.8%	-1.8	7.2%	8.3%	-1.0
6	8.8%	9.7%	-0.9	8.8%	9.4%	-0.6
7	10.9%	10.7%	0.2	10.9%	10.7%	0.2
8	13.7%	12.1%	1.7	13.6%	12.4%	1.2
9	17.6%	14.1%	3.6	17.3%	14.9%	2.4
top 10%	28.4%	20.0%	8.4	27.9%	22.7%	5.2

Source: author's own calculations based on BHBS and UHBS.

Note: negative difference means that the decile group in Ukraine is getting a lower income (expenditure) share than the same decile group in Belarus. The bigger the negative difference, the poorer the Ukrainian decile is relative to the Belarusian decile, and vice versa.

Figure 1. Evolution of income inequality in selected transition countries measured by Gini Index, 1989-2007



Source: TransMONEE 2008 Database³³, UNICEF Innocenti Research Centre, Florence – unless noted otherwise; Milanovic (1998, Table 4.1) – for Belarus, Russia and Ukraine in 1989 and 1993; Kakwani (1995, Table 20) – for Belarus, Russia and Ukraine in 1990; Russian GKS³⁴ - for Russia 1997, 1999, 2002-2007; World Bank WDI³⁵ - for Ukraine 1996-1997, 2003-2005; author's own calculations based on BHBS – for Belarus 1995-2007.

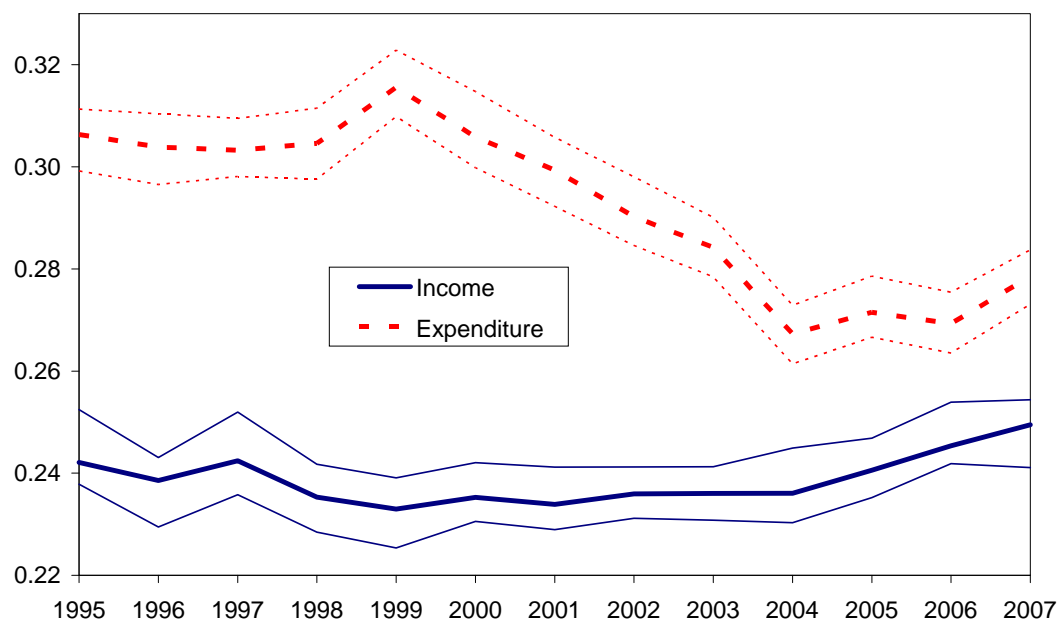
Notes: The data for Belarus, Russia and Ukraine, especially pre-1995, are not very reliable. They are taken from different sources and may be not directly comparable with both previous and subsequent periods and with other countries (due primarily to the lack of data and different methodologies used).

³³<http://www.unicef-irc.org/databases/transmonee/>

³⁴http://www.gks.ru/free_doc/2005/b05_13/06-01.htm and http://www.gks.ru/free_doc/2006/b06_13/06-01.htm

³⁵<http://go.worldbank.org/6HAYAHG8H0>

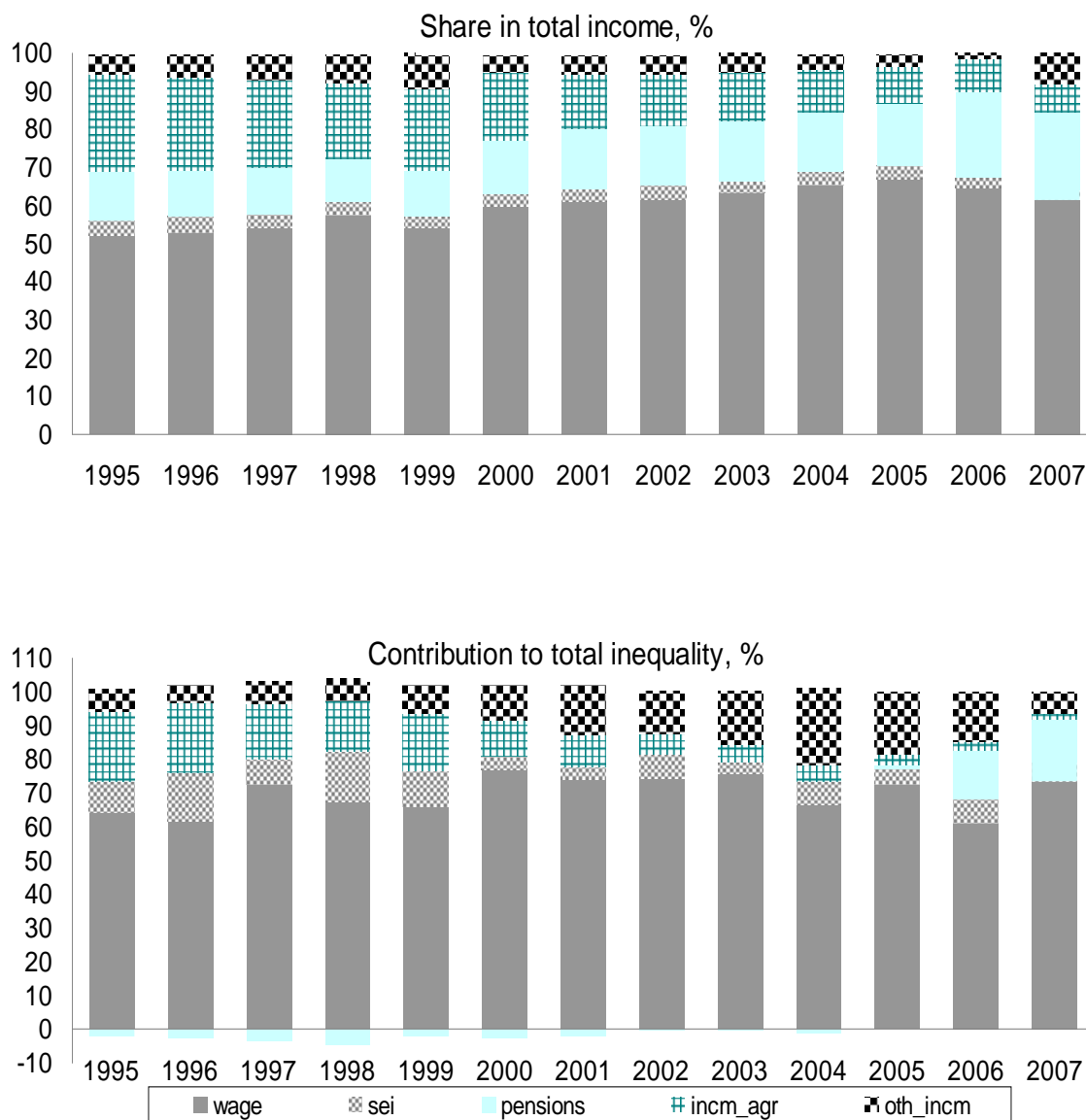
Figure 2. The evolution of Gini index in Belarus



Source: author's own calculations based on BHBS.

Notes: Thin lines show 95% confidence intervals calculated with bootstrapping (100 repetitions). Constructed in Stata using the `ineqerr` .ado module.

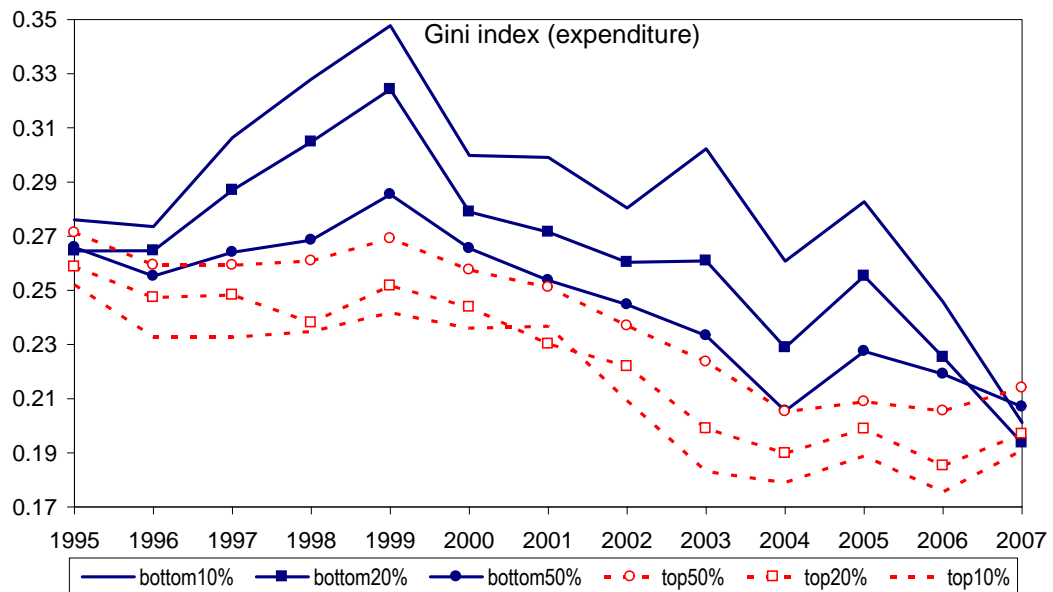
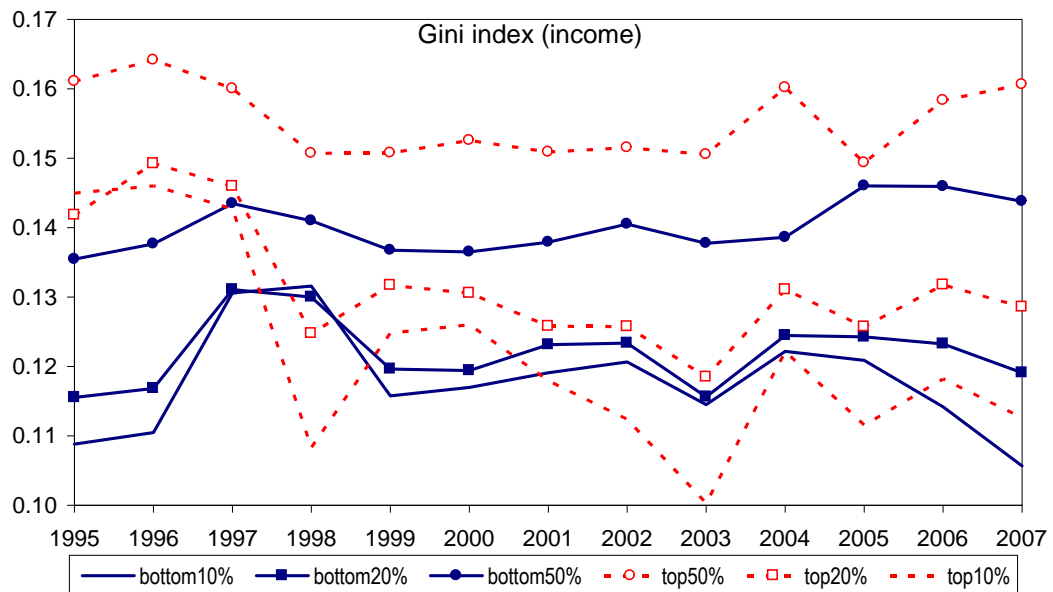
Figure 3. Inequality decomposition by income sources



Source: author's own calculations based on BHBS.

Notes: The decomposition by income sources was performed in Stata using `ineqfac` .ado module; `sei` = self-employment income; `incm_agr` = income from sale of agricultural products from small land plots plus income in kind; `oth_incm` includes dividends, unemployment benefits; child allowances, other state subsidies, financial assistance received from friends and relatives. The contribution of pensions is negative except for 2005-2007.

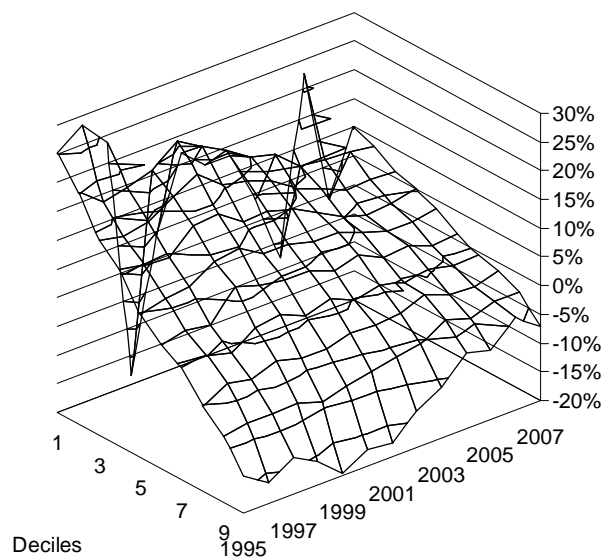
Figure 4. Inequality by income levels



Source: author's own calculations based on BHBS.

Note: The Gini indices are calculated for the given income groups, showing the “within group” inequality, which (in the case of the Gini index) can be higher as well as lower than the total inequality.

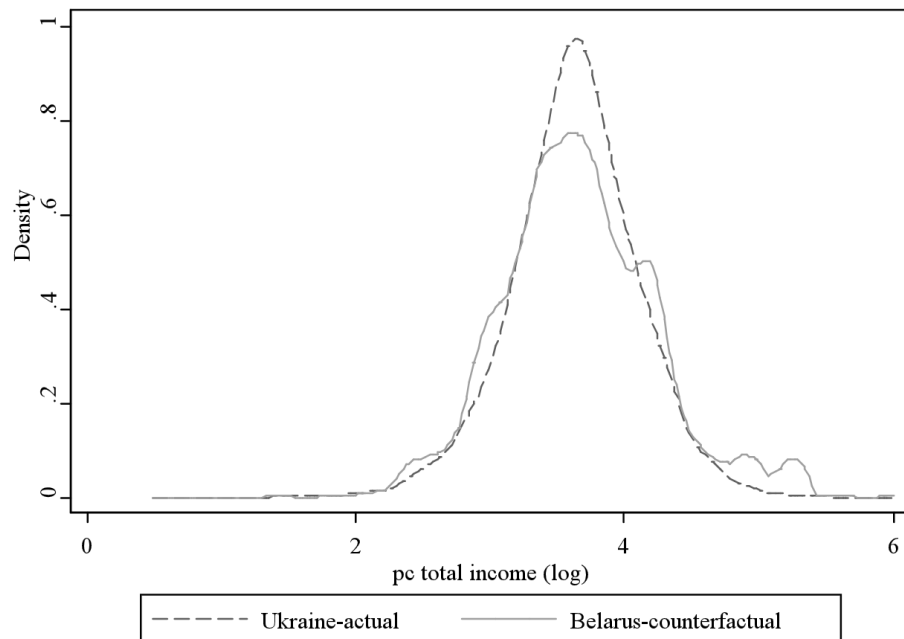
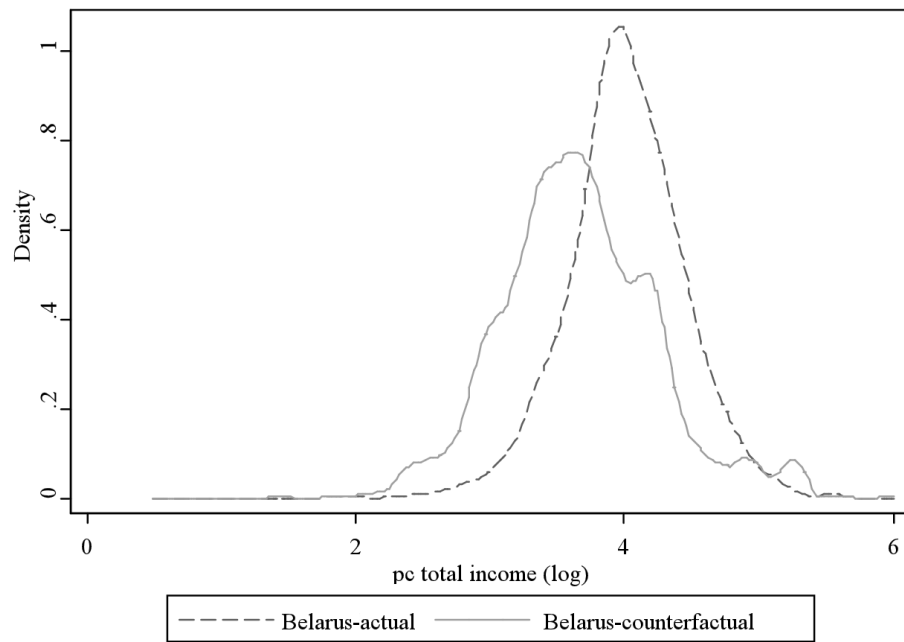
Figure 5. Relative differences between income shares and expenditure shares



Source: author's own calculations based on BHBS.

Note: Positive values mean that the income share is higher than the expenditure share for a given decile. Any changes are relative (to the position of other decile groups).

Figure 6. DFL Counterfactual Kernel Densities estimation



Source: author's own calculations based on BHBS.

Note: Constructed in Stata using the `df1` .ado (written by de Azevedo, University of Newcastle).

Appendix

Inequality measures

There are many measures of income/expenditure inequality³⁶; the most popular and widely used is the Gini index³⁷, which is easily available for virtually all countries and for many years, making possible cross-country and inter-temporal comparisons. It can be calculated for any type of income/wealth as well as for expenditure/consumption, the second option is more preferable because of systematic underreporting of income in the surveys in post-Soviet countries (for discussion see, e.g., Yemtsov, 2001). To overcome this drawback, I calculate and report inequality indices for both income and expenditure.

The Gini coefficient is calculated (for the whole population) using the following formula:

$$G = \frac{1}{n} \left(n + 1 - 2 \frac{\sum_{i=1}^N (n + 1 - i) y_i}{\sum_{i=1}^N y_i} \right), \text{ where } y_i \leq y_{i+1}. \quad (1)$$

The smaller the coefficient, the less unequal the distribution. When it equals 0, meaning perfect equality, everyone has the same income or consumption, when it equals 1, meaning total inequality, one person possesses all the income.

For a random sample S of size n with the values of y_i ($i = 1$ to n) that are ranked in non-decreasing order the statistic

$$G(S) = \frac{1}{n-1} \left(n + 1 - 2 \frac{\sum_{i=1}^N (n + 1 - i) y_i}{\sum_{i=1}^N y_i} \right) \quad (2)$$

is a consistent estimator of the population Gini coefficient.

The Gini coefficient is the most popular and widely used inequality measure, but unfortunately it is not directly decomposable, even though various indirect methods of decomposition exist, e.g. the one proposed by Shorrocks (1982). The contribution of any income source to overall income inequality is:

$$s_k(I) = \frac{S(Y^k, Y)}{I(Y)} = \frac{cov(Y^k, Y)}{\sigma^2(Y)} \text{ for all } Y \neq \bar{y}, \quad (3)$$

³⁶They date back to the seminal work of Dalton (1920) and the works of Gini and other Italian researchers.

³⁷The Gini index is the Gini coefficient expressed as a percentage.

where Y_i^k denote the income of individual i ($i = 1, \dots, N$) from the source k ($k = 1, \dots, K$); $Y = (Y_1, \dots, Y_N) = \sum_k Y_k$ represents the distribution of total incomes; $S_k(Y_1, \dots, Y_k; K)$ represents the absolute contribution of the source k to the total inequality. This decomposition does not depend on the choice of inequality measure, but is usually applied to the Gini index.

Foster, Greer, and Thorbecke (1984) proposed a set of decomposable inequality and poverty measures which allows for the analysis of the relation between poverty and specific household characteristics. One of the special cases of their measures is the Theil index. This summary statistic measures income inequality based on information entropy. It is similar to, but less commonly used than the Gini coefficient. The Theil index can be expressed as:

$$T = \sum_{i=1}^N \left(\frac{y_i}{\sum_{j=1}^N y_j} \ln \frac{y_i}{\bar{y}} \right) \quad (4)$$

The first term inside the sum stands for the individual's share of aggregate income, and the second term is that person's income relative to the mean. If everyone has the same income, then the index equals 0 (perfect equality). If one person has all the income, then the index equals $\ln(N)$.

The advantage of this inequality measure over Gini is that the underlying population can be divided into groups using any criteria (regional, demographic, socio-economic etc.), and the Theil index for the whole population will (by construction) be equal to the weighted sum of Theil indices for groups plus the Theil index for inequality between groups, so the Theil index is directly decomposable without any special methods. The Theil index for a country with the population of N people living in K regions can be decomposed into 2 parts:

$$T_{country} = T_{within_regions} + T_{between_regions}, \text{ where} \quad (5)$$

$$T_{within_regions} = \sum_{l=1}^K \left[\frac{N_l}{N} \sum_{i=1}^{N_k} \left(\frac{y_i}{\sum_{j=1}^{N_k} y_j} \ln \frac{y_i}{\bar{y}} \right) \right] \quad (6)$$

(each region K has a population N_K) and

$$T_{between_regions} = \sum_{l=1}^K \left(\frac{y_l}{\sum_{j=1}^K y_j} \ln \frac{y_l}{\bar{y}} \right) \quad (7)$$

(derived from Conceição & Ferreira, 2000).

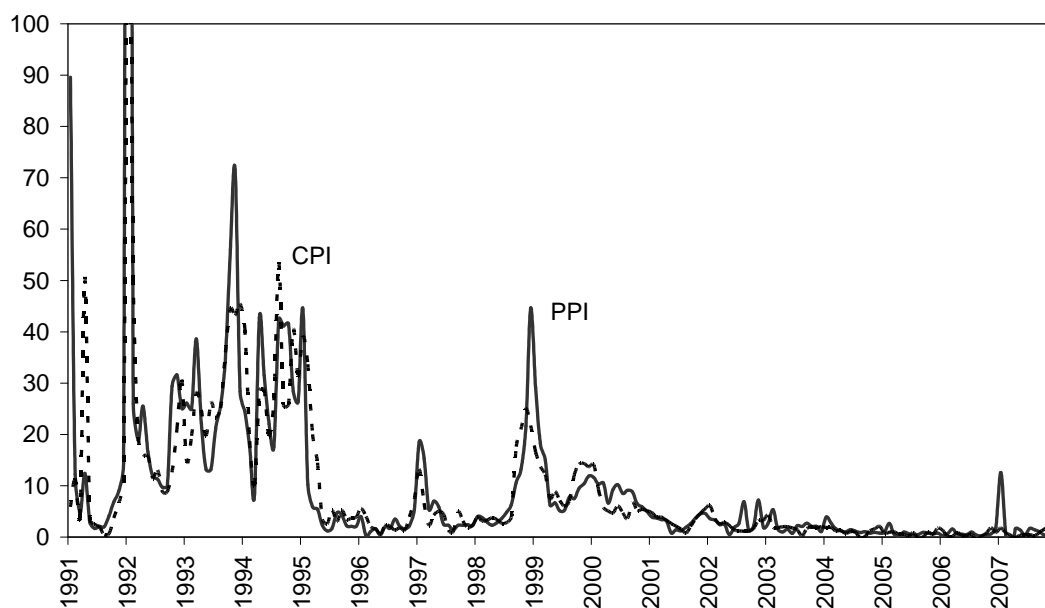
Another commonly used inequality measure is the coefficient of variation which is a measure of dispersion of a probability distribution. It is defined as the ratio of the standard deviation σ to the mean μ :

$$c_v = \frac{\sigma}{\mu} \tag{8}$$

The coefficient of variation is a dimensionless number. For distributions of positive-valued random variables, it allows comparison of the variation of populations that have significantly different mean values. It is often reported as a percentage by multiplying the result of calculation by 100. The absolute value of the coefficient of variation expressed as a percentage is often referred to as the relative standard deviation (RSD or %RSD).

Apart from the Gini and Theil indices and the coefficient of variation there are other insightful but less commonly used inequality measures which include Kakwani measure and Atkinson's social-welfare measures (Atkinson, 1970; Kakwani, 1979, 1981).

Figure A1. Monthly price indices in Belarus (in %)



Source: IPM Research Center (Minsk, Belarus; <http://www.research.by>).

Note: In January 1992, when the major wave of price liberalization took place, CPI and PPI rose 159% and 383% (per month) respectively. This peak is not shown on the graph to keep all other peaks visible.

Table A1. Descriptive macroeconomic statistics

	1995	1999	2003	2007
GDP growth, % p.a.	-10.4%	3.4%	7.0%	8.2%
PPI, p.a.	117.6%	245.0%	28.1%	17.2%
CPI, p.a.	244.0%	251.2%	25.4%	12.1%
Market exchange rate, BYR per USD, mid-year	11.5	542.5	2,045	2,140
Exchange rate change, p.a.	37.6%	142.7%	12.4%	0.3%
Average wage, USD	\$65.2	\$40.4	\$123.5	\$323.0
Registered unemployment, percentage of economically active population	2.2%	2.1%	3.3%	1.2%

Source: IPM Research Center (Minsk, Belarus; <http://www.research.by>); Belarusian Ministry of Statistics and Analysis.

Note: For figures in USD market exchange rate is used.

Table A2. Decile shares of income

decile group	1995	1999	2003	2007
bottom 10%	4.1%	3.1%	3.6%	4.1%
2	6.0%	6.1%	6.0%	5.7%
3	6.9%	7.1%	7.0%	6.8%
4	7.8%	8.0%	7.9%	7.7%
5	8.6%	8.9%	8.8%	8.6%
6	9.5%	9.8%	9.7%	9.5%
7	10.6%	10.8%	10.7%	10.6%
8	12.0%	12.1%	12.1%	12.1%
9	14.0%	14.0%	14.2%	14.4%
top 10%	20.5%	20.1%	20.0%	20.6%

Table A3. Decile shares of expenditure

decile group	1995	1999	2003	2007
bottom 10%	3.1%	3.0%	3.4%	3.7%
2	4.8%	4.7%	5.2%	5.2%
3	5.9%	5.8%	6.3%	6.4%
4	7.0%	6.9%	7.3%	7.3%
5	8.2%	8.0%	8.3%	8.3%
6	9.4%	9.2%	9.3%	9.4%
7	10.7%	10.6%	10.7%	10.6%
8	12.6%	12.5%	12.3%	12.2%
9	15.2%	15.3%	15.0%	14.8%
top 10%	23.3%	24.1%	22.2%	22.1%

Source: author's own calculations based on BHBS.

Note: the tables give the shares of income (expenditure) by population income (expenditure) deciles.