Income Inequality Effects of Ukraine's Trade Liberalization with the EU. Are there "two Ukraines"?

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Abstract

This paper analyzes the effects of Ukraine's trade liberalization with the EU on income inequality using a computable general equilibrium (CGE)-microsimulation model for Ukraine. Special focus is thereby given to between- and within-parts income inequality to study whether the Western and the Eastern part of Ukraine are affected differently. Even though overall income distribution effects are rather small, Ukraine's unilateral tariff elimination turns out to act more on the within- rather than on the between-parts income inequality.

JEL classification: C35; C68; D31; F15

Keywords: CGE; Microsimulation model; Trade liberalization; Income distribution; Ukraine

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1 Introduction

In 2013, Ukraine was supposed to sign an Association Agreement (AA) including a Deep and Comprehensive Free Trade Agreement (DCFTA) with the European Union (EU). However, the Ukrainian government refused to do so shortly before the Third Eastern Partnership Summit took place in Vilnius in November 2013.[1] Although widely discussed geopolitical reasons were the main force behind the decision not to sign the AA by former President Yanukovych, opinion polls on the economic integration with the EU carried out in Ukraine point to another explanation. Their general finding is that in the West and the center of Ukraine the majority of people is in favor of the AA with the EU whereas there is less support in the East and the South of Ukraine. For example, according to an opinion poll conducted by Deutsche Welle in 2013[2], 69% in the West and the center of Ukraine support the AA with the EU. In contrast, only 50% of the people in the East and the South of Ukraine vote for an EU integration. This is in line with the discussion about the existence of "two Ukraines" (Ryabchuk; 1992, p.19), a Western and an Eastern part[3], which somehow differ from each other but are rather homogenous within each of them. If this is the case, one might conjecture that changes in trade policy (as for example the free trade agreement with the EU) would induce different results across the two parts, but rather similar ones within the Western and the Eastern part. Thinking about the microeconomic effects of trade policy, one might first mention absolute income effects. Those are positive for almost all households and do not exhibit a clear regional pattern as will be further explained in part 4 of this paper. However, people in Ukraine might also care about the distributional effects of trade liberalization, namely the income inequality[4] implications. Therefore, the aim of this paper is to study the effects of Ukraine's unilateral tariff elimination[5] on between- and within-parts income inequality and thereby give an answer to the question whether concerns about between-parts income inequality are one of the reasons[6], why in some

[1] Meanwhile, the AA and the DCFTA became effective.

[2] See http://www.dw.de/dw-trend-більшість-українців-за-вступ-до-єс/a-17230854.

[3] In the following, we refer to the West and the center of Ukraine (including Zakarpats'ka Oblast) as the Western part and to the East and the South of Ukraine as the Eastern part. The Western part comprises the following regions (oblasts): Chmel'nyc'ka, Čerkas'ka, Černihivs'ka, Černivec'ka, Ivano-Frankivs'ka, Kirovohradska, Kyiv City, Kyivs'ka, L'vivs'ka, Poltavs'ka, Rivnens'ka, Sums'ka, Ternopil's'ka, Vinnyc'ka, Volyns'ka, Zakarpats'ka, Žytomyrs'ka. The remaining oblasts (Autonomous Republic of Crimea, Charkivs'ka, Chersons'ka, Dnipropetrovs'ka, Donec'ka, Luhans'ka, Mykolajivs'ka, Odes'ka, Sevastopol' City, Zaporiz'ka) are located in the Eastern part (Klüsener; 2007).

[4] In a question on income inequality in the International Social Survey Programme more than 95% of the respondents agreed or even strongly agreed with the statement that "Differences in income in Ukraine are too large" (ISSP; 2012).

[5] A unilateral tariff elimination is analyzed as the biggest gains from trade liberalization for developing countries are expected to arise from the removal of their own trade barriers (Weisbrot and Baker; 2005).

[6] Of course, there are many other and even more important determinants (like region, language, ethnicity and religion) of mass attitudes in Ukraine (see for example Barrington and Faranda (2009)).

parts of Ukraine there is more public support for a trade integration with the EU than in other parts.[7]

Ukraine's integration into the world economy is widely evaluated. In most of the studies analyzing the effects of Ukraine's accession to the World Trade Organization (WTO)[8] and the DCFTA between the European Union (EU) and Ukraine[9] computable general equilibrium (CGE) models are used. This implies that mainly the macroeconomic effects of trade liberalization (e.g changes in relative prices, production and trade flows) are considered. However, taking into account also the microeconomic consequences is important as trade liberalization might also have an impact on income inequality and might affect various groups differently. Those distributional effects can be analyzed in the context of a CGE-microsimulation model.

The paper is organized as follows. The modeling approach is described in the next section. The subsequent section presents some information on the data. A discussion of the results is provided in section four and section five concludes.

2 Modeling approach

In order to evaluate the microeconomic effects of policy changes at the macro level, a combination of empirical micro and macro models is called for. In general, three different approaches for this combination can be distinguished (Colombo; 2010). The fully integrated approach, which replaces the representative household of a CGE model with real households consulted in surveys, is for instance used by Decaluwé et al. (1999). An example of the top-down or sequential approach can be found in Herault (2007), whereas Savard (2003) applies the top-down/bottom-up approach meaning that the CGE and the microsimulation model are run iteratively to obtain consistent results.

Following Herault (2007) we use a top-down approach to analyze the income distribution effects of trade liberalization in Ukraine. This means that Ukraine's unilateral tariff elimination is first simulated in the CGE model to obtain information on changes in the relevant variables as these are treated as exogenous variables in the microsimulation model. Specifically, those variables include prices for goods and services, wages and returns on capital.[10] Since they change as a result of trade liberalization, the microsimulation model is in

[7] This paper is not meant to be a comprehensive analysis of the attitudes towards and the development of income inequality in Ukraine. For further information on these topics see Gatskova (2013), World Bank (2005) and Grün and Klasen (2001).

[8] Ukraine joined the WTO in 2008. For work on Ukraine's WTO accession see for example Jensen et al. (2005), Pavel et al. (2004) and Kosse (2002).

[9] The EU-Ukraine FTA is for instance discussed by Francois and Manchin (2009), Maliszewska et al. (2009) and Ecorys and CASE-Ukraine (2007).

[10] Note that changes in the employment level are not considered here as labor is assumed to be fully employed in the CGE model.

turn employed to simulate changes in the endogenous variables of the microsimulation model such as labor income.

2.1 CGE Model

The CGE model used here is a static, small open economy model for Ukraine exhibiting perfect competition and constant returns to scale.[11] It incorporates 38 sectors of production. Labor is distinguished based on the level of education (skilled, unskilled) and is assumed to be fully employed. The consumption side is composed of public consumption, investment and intermediate consumption and of final consumption by households. There are four types of households which are differentiated by the place of residence (rural, urban) and the domestic poverty line (poor, non-poor). This level of disaggregation allows only for a very rough analysis of the distributional effects of Ukraine's trade liberalization. Households derive utility from the consumption of goods and services and finance their consumption by income from labor and capital endowments[12] and by received transfers.

As this paper focuses on trade policy, different trading partners are distinguished. Accordingly, Ukraine's exports and imports are merged into the following nine trading regions: EU15, EU12, other Europe, Asia, Africa, America, Commonwealth of Independent States (CIS), Russia and rest of the world (ROW). The first eight regions contain the main trading partners of Ukraine with all remaining countries being summarized as rest of the world. Moreover, different trade regimes are incorporated. Commodity trade with Russia and other CIS countries is modeled as free trade because of the existing FTA between Ukraine and those countries. The most favored nation (MFN) tariff is applied to trade with all other regions as the included countries are either members of the WTO or signed bilateral trade agreements with Ukraine to establish this trade regime.

2.2 Microsimulation Model

The microsimulation model consists of the following equations: a labor income estimation equation, a discrete choice labor supply equation, an equation to calculate household's total income and two arithmetical computation equations for calculating the household specific consumer price index and household's real income.

In order to obtain labor income for those household members who are observed to be unemployed in the

[11] For a detailed model description see Frey and Olekseyuk (2014).

[12] Non-poor households are endowed with both capital and labor (skilled and unskilled) whereas poor households are only endowed with unskilled labor.

survey[13] the following equation is estimated:

$$log(Y_{hm}) = \alpha + \beta X_{hm} + \gamma \lambda_{hm} + \epsilon_{hm} \tag{1}$$

where $log(Y_{hm})$ is the logarithm of labor income of household member m of household h. Vector X_{hm} includes household member m's personal characteristics (such as work experience and place of residence). λ_{hm} is the inverse Mills ratio[14] and the residual term ϵ_{hm} accounts for unobserved characteristics which are affecting log labor income. Using a Heckman two-step selection model Equation (1) is estimated separately for unskilled male and female and skilled male and female household members as the Ukrainian labor market is assumed to be segmented along the lines of different skill levels and gender, which is confirmed by the Chow test.[15]

The choice of the labor market status is represented by the following equation:

$$A_{hm} = a + bZ_{hm} + u_{hm} \tag{2}$$

where A_{hm} is a dichotomous variable indicating the labor market status. Each household member can choose among two alternatives: being employed or being unemployed. This means that the microsimulation model accounts for unemployment despite the full employment assumption in the CGE model. Household member m's individual characteristics (like gender, skill level and log-age) are included in the vector Z_{hm}. This vector also contains the variable income differential[16], which reflects the additional income a household member would get when moving from unemployment to employment. Equation (2) is estimated by the use of a binomial logit model, which assumes that the error terms (u_{hm}) are distributed according to the extreme value distribution[17]. This means that each household member m is assigned to the alternative with the highest probability. For some household members the predicted labor market status does not coincide with the status observed in the survey. Therefore, following Creedy and Kalb (2005) a set of error terms is drawn

[13]Note that for household members who reported to be employed, observed instead of predicted labor income is used.

[14]The inverse Mills ratio indicates a possible correlation between the error terms in the selection and the primary equations.

[15]See for example Pignatti (2012), Pignatti (2010) and UNDP (2011). The Ukrainian labor market is also found to be segmented according to ethnicity (Constant et al.; 2012), but this characteristic cannot be captured here due to a lack of data on ethnicity and language.

[16]The income differential is constructed in the following way. For those household members, who are observed to be unemployed, the income differential is calculated using the information on reported unemployment income and predicted labor income derived from the estimation of Equation (1). The income differential for the initially employed household members is calculated by subtracting the predicted unemployment income from the labor income reported in the household expenditure survey. Unemployment income is estimated using OLS regression. The results are available upon request.

[17]This distribution is also known as the Gumbel distribution.

from the extreme value distribution for each household member. Out of these values, 100 error terms are selected in such a way that the sum of the deterministic part of the model and the error term results in the correctly predicted labor market status of household member m. The deterministic part is recomputed after the simulations (taking into account changes in wages) and added to the stored error terms in order to obtain a probability distribution over the two labor market alternatives.

As complete intra-household income sharing is assumed, total income of household h consists of the endogenous part comprised of income net of taxes[18] of all household members and capital income (calculated on the household level) and other household income (including for instance transfers from other households), which is assumed to be exogenous. Household h's real income is afterwards calculated by dividing total household income by the household specific consumer price index (CPI). This is computed using the information on the observed expenditure shares and the price changes resulting from the CGE model simulations.[19] In the last step, different indices (Gini and Theil)[20] on households' real income distribution are computed applying the "OECD-modified scale" used by Eurostat to account for regional differences in household composition. It assigns a value of one to the first adult person in the household, a value of 0.5 to each additional adult and a value of 0.3 to each child in the household.[21]

3 Data

The backbone of the CGE model is formed by a social accounting matrix (SAM) for the year 2007. It was constructed with the data of the Ukrainian national accounts and input-output tables at basic and consumer prices (publications of the State Statistics Committee of Ukraine). Additional statistics from national sources include information on indirect taxes, labor remuneration and tariff lines. Furthermore, international trade statistics and a household expenditure survey for 2007 covering more than 10,000 Ukrainian households and more than 25,000 household members are used.

The latter is also the basis for the microsimulation model. Concerning the household level, information on expenditures, place of residence and household composition are the most important variables. With respect to household members, information on sex, age, education, labor market status and income are crucial.

[18] In Ukraine, there is a uniform tax of 15% levied on personal income.

[19] Note that this model does not consider changes in expenditure shares.

[20] The Gini index states the extent to which the distribution of income among households differs from a perfectly equal distribution (Atkinson; 1983). The Theil index measures to what extent the structure of the distribution of income across groups deviates from the distribution of the population in the respective groups (Conceição and Ferreira; 2010).

[21] Using income per capita data does result in a slightly higher calculated income inequality in all scenarios except for scenario 3. However, the decomposition in within- and between-parts income inequality gives similar results.

The estimations of the income and selection equations are restricted to the working age population (15-70)[22] and does not include the following groups: pensioners, students, pupils and housewives. This leaves us with 10,418 observations on the household member level. 17.9%[23] of those people reported that they have been unemployed in 2007. Looking at skill levels one can see that the unemployment rate among the unskilled[24] people (26%) is almost three times as high as among the skilled part of the active working age population (9%). In addition, the household members dataset can be further characterized by looking at other socio-demographic indicators. The share of men (51%) and women (49%) is almost the same and is close to the values in the official statistics (52% and 48%).[25] Around 30% of all household members are living in rural areas, which is also in line with the official statistics (31%). Therefore, the dataset is considered to be representative.

4 Simulations and Results

Most obviously, reduced tariff trade barriers lead to a loss of tariff revenues. As income inequality is sensitive to the choice of the mean of compensation (e.g. an increase in the indirect tax rate), three scenarios are analyzed in the CGE model reflecting different possibilities for Ukraine to deal with the loss of tariff revenues resulting from a unilateral tariff elimination with respect to imports from the EU. All counterfactual experiments include the elimination of import tariffs in all commodity groups for the EU-15 and EU-12 regions, while for all other regions the existing import tariffs remain valid. In scenario 1 (S1) there is no possibility for the Ukrainian government to compensate the loss in tariff revenues. Thus, government spending has to be reduced. But it can be held constant in scenario 2 (S2) which involves an increase in the indirect tax rate. Scenario 3 (S3) accounts for compensation by means of additional foreign aid provided by the EU.

After running the simulations in the CGE model, part of the resulting outcome is transferred to the microsimulation model. In particular, the variables which are coming from the CGE model and which are considered to be exogenous in the microsimulation model are prices, wages (for skilled and unskilled labor) and return on capital. Table 1 contains the information on changes in real factor returns resulting from

[22] This is the definition of the working age population of the State Statistics Committee of Ukraine.

[23] The calculated unemployment rate is almost three times as high as the official unemployment rate for 2007 (6.4%). This is most probably due to the fact that in the official statistics, non-market production is considered as economic activity if people are engaged in such an activity for at least 30 hours per week (Ganson and Laux; 2004). These activities cannot be captured in this study as the respective data is not available.

[24] Individuals are considered as unskilled if they obtain a secondary or lower education. Consequently, people with tertiary education are regarded as skilled.

[25] For the official labor market statistics see http://www.ukrstat.gov.ua/.

simulations S1-S3.[26]

variables	S1	S2	S3
real factor return (change in %):			
- return on capital	0.23	-0.08	0.10
- wage rate for unskilled labor	0.22	0.07	0.17
- wage rate for skilled labor	-0.17	0.08	0.19

Table 1: Relevant CGE model results

In S1, reduced government spending on the provision of services such as education and public administration causes a decrease in the factor demand for skilled labor. This leads to a decline in the wage rate for skilled workers, whereas the return on capital and the wage rate for unskilled labor increase. The trade induced reallocation of production factors with unchanged government spending results in a rise in labor remuneration while the return on capital decreases by 0.08%. Foreign aid provision by the EU in S3 is reflected in higher returns to all factors of production.

The results of the income estimation for unskilled male and female and skilled male and female household members are reported in tables 8 to 11 in the Appendix. The purpose of these estimations is to assign a predicted labor income to those household members who are initially unemployed but choose to be employed after the simulations. Table 12 in the Appendix presents the results of the estimation of the binomial logit model.

Concerning the microeconomic results, two effects have to be distingushed. In the present framework, trade liberalization has an impact on the level of income and on income distribution via its effect on prices and factor returns.[27] Overall level effects on the Ukrainian households are positive. In S1, there are only nine[28] out of 10,615 households which are estimated to experience a decrease in their income per equalized person. This means that for almost all households the decline in the wage rate for skilled labor is more than

[26]The information on the changes in prices is available upon request.

[27]This might also induce changes in regional employment levels, as the Ukrainian industries are not equally distributed across the country, which involves high adjustment costs. Although, this effect of the tariff elimination cannot be captured here as workers in the CGE model are assumed to be fully employed and to be able to move freely across sectors, we can still draw some tentative conclusions based on the sectoral results in the CGE model and the sectoral distribution of workers as indicated in the household expenditure survey, even though the sectoral structure does not perfectly coincide. As sectors like agriculture, food-processing and education reduce their output in all scenarios, additional distributional effects might occur in the Chersons'ka, Kirovohradska, Mykolajivs'ka, Poltavs'ka, Rivnens'ka and Vinnyc'ka oblasts, because they have the biggest share of workers employed in one of these sectors. For further information on the employment effects of trade liberalization in Ukraine see Christev et al. (2008).

[28]Seven of them are located in the Western and two of them in the Eastern part.

offset by a reduced CPI[29] and the increase in the return on capital and unskilled labor. Despite an increase in labor remuneration in S2 and S3, there are two households in S2 and one household in S3, which would be worse off in terms of absolute income effects.[30] All of them would experience a rise in the CPI.

	benchmark	S1	S2	S3
Gini index	0.27466[a]	-0.0692%	-0.0036%	0.0328%

Table 2: Changes in income inequality in Ukraine

[a]The Gini index for Ukraine calculated by the World Bank is 0.2956, i.e. it is slightly higher than the one derived from the survey data.

Ukraine's unilateral tariff elimination slightly reduces income inequality in Ukraine under S1 and S2, but the resulting changes are very small (table 2). This is mainly due to two reasons. First, given the already low level of protection after Ukraine's accession to the WTO, further tariff reduction has only a very moderate effect on factor returns and prices. Second, as the endogenous part of household's total income (labor and capital income) accounts on average for 38%, changes in this type of income result only to a limited extent also in changes in total income. However, the direction of the results for overall income inequality in Ukraine are reasonable given the changes in the factor returns resulting from the CGE model simulation. Because of an increase in the wage rate for unskilled and a decrease in the wage rate for skilled labor, S1 leads to the highest reduction in total income inequality in Ukraine. As there are gains for both types of labor but a loss in return on capital in S2, there is only a marginal, but still positive effect on overall income inequality. Instead, the provision of foreign aid by the EU would lead to a slight increase in income inequality in Ukraine because of its postive impact on returns to all factors of production with the biggest rise occuring in the wage rate for skilled labor.

To get back to the initial question of whether Ukraine exists of two heterogenous parts which might be differently affected by the tariff elimination, we should first have a closer look at the relevant characteristics of the two parts. A t-test[31] shows that they differ with respect to the average share of labor income in total household income. The same holds for the share of capital income. Compared to the Western part, the Eastern part also exhibits a higher share of skilled workers.[32] Concerning the structure of households' expenditures, the average shares in the Western and the Eastern part of Ukraine are statistically significantly different from

[29]The CPI in S1 is reduced for all households in the sample.

[30]All of them are located in the Eastern part.

[31]The difference is statistically significant ($\alpha \leq 5\%$).

[32]The difference is statistically significant ($\alpha \leq 1\%$).

each other for all but three goods and services (refined petroleum, renting and other activities).[33]

	benchmark	S1	S2	S3
	Ukraine	Ukraine	Ukraine	Ukraine
Theil index	0.13673	-0.1463%	-0.0439%	0.0220%
	within-parts	within-parts	within-parts	within-parts
Theil index	0.13641	-0.1466%	-0.0440%	0.0220%
	between-parts	between-parts	between-parts	between-parts
Theil index	0.00032	0.000%	0.0000%	0.0000%

Table 3: Decomposition of income inequality in Ukraine

However, looking at the effects on income inequality in Ukraine measured by the Theil index gives some interesting insights as it allows for a decomposition across groups. Most interestingly, 99% of total income inequality in Ukraine is explained by the within-parts inequality. Accordingly, only 1% is due to the between-parts inequality. As table 3 shows, trade liberalization affects total income inequality in Ukraine only via its effect on within parts inequality. Thus, in the next step the Western (table 4) and the Eastern (table 5) part are analyzed separately. The results are complemented by table 6, which reports the changes in income inequality for each region and some information on the key characteristics.

[33]The difference is statistically significant ($\alpha \leq 5\%$).

	benchmark	S1	S2	S3
	Western part	Western part	Western part	Western part
Theil index	0.13883	-0.1585%	-0.0432%	0.0144%
	within-regions	within-regions	within-regions	within-regions
Theil index	0.12654	-0.1264%	-0.0316%	0.0237%
	between-regions	between-regions	between-regions	between-regions
Theil index	0.01229	-0.4882%	-0.1627%	0.0000%

Table 4: Decomposition of income inequality in the Western part

	benchmark	S1	S2	S3
	Eastern part	Eastern part	Eastern part	Eastern part
Theil index	0.13358	-0.1422%	-0.0524%	0.0150%
	within-regions	within-regions	within-regions	within-regions
Theil index	0.13125	-0.1448%	-0.0533%	0.0076%
	between-regions	between-regions	between-regions	between-regions
Theil index	0.00233	-0.4292%	0.0000%	0.4292%

Table 5: Decomposition of income inequality in the Eastern part

oblast	Theil index benchmark	Theil index S1	Theil index S2	Theil index S3	labor[a] income	capital[b] income	skill[c] level	urbanization[d]
Rivnens'ka	0.08691	-0.0805%	-0.0115%	**0.0345%**	40%	0%[e]	38%	60%
Poltavs'ka	0.09032	-0.1218%	**0.0111%**	**0.0775%**	40%	0.15%	51%	60%
Sums'ka	0.09387	-0.0639%	**0.0107%**	**0.0639%**	34%	0.00%	46%	67%
Volyns'ka	0.09560	-0.0628%	**0.0209%**	**0.0623%**	32%	0.02%	37%	54%
Čerkas'ka	0.10204	-0.0980%	0.0000%	**0.0588%**	33%	0.01%	51%	59%
Ternopil's'ka	0.10455	-0.0670%	-0.0383%	-0.0096%	27%	0.02%	33%	46%
L'vivs'ka	0.10658	-0.1314%	0.0000%	**0.0657%**	41%	0.01%	45%	64%
Zaporiz'ka[f]	0.10750	-0.1302%	0.0000%	**0.0651%**	37%	0%	45%	74%
Ivano-Frankivs'ka	0.11265	-0.1598%	-0.0533%	0.0000%	37%	0%	40%	51%
Vinnyc'ka	0.11421	-0.1051%	-0.0613%	-0.0175%	30%	0.07%	47%	52%
Černihivs'ka	0.11734	-0.1449%	-0.0682%	-0.0170%	30%	0%	45%	62%
Donec'ka	0.11911	-0.1007%	**0.0504%**	**0.1259%**	44%	0.02%	62%	90%
Luhans'ka	0.12077	-0.1490%	-0.1159%	-0.0745%	40%	0.00%	44%	82%
Chmel'nyc'ka	0.12209	-0.1147%	**0.0246%**	**0.0983%**	29%	0.08%	42%	57%
Sevastopol' City	0.12373	-0.0566%	**0.0162%**	**0.0566%**	50%	0%	61%	88%
Charkivs'ka	0.12449	-0.1125%	**0.0161%**	**0.0803%**	40%	0.02%	54%	78%
Odes'ka	0.12596	-0.1429%	0.0000%	**0.0715%**	34%	0.02%	49%	59%
Kirovohradska	0.12601	-0.1428%	-0.0714%	-0.0397%	32%	0.02%	54%	66%
Kyivs'ka	0.12949	-0.1931%	-0.0232%	**0.0695%**	39%	0%	42%	60%
A. R. o. Crimea	0.12950	-0.0772%	**0.0077%**	**0.0772%**	36%	0.00%	48%	65%
Zakarpats'ka	0.13351	-0.1049%	-0.0599%	-0.0300%	47%	0%	34%	45%
Mykolajivs'ka	0.13723	-0.1166%	-0.0291%	**0.0219%**	34%	0.01%	46%	63%
Černivec'ka	0.14462	-0.0899%	-0.0207%	**0.0207%**	35%	0.16%	46%	53%
Chersons'ka	0.14575	-0.1304%	-0.0686%	-0.0206%	31%	0%	52%	61%
Dnipropetrovs'ka	0.16742	-0.2210%	-0.1971%	-0.1493%	43%	0.01%	48%	87%
Žytomyrs'ka	0.18344	-0.0382%	-0.0109%	**0.0109%**	28%	0.00%	38%	59%
Kyiv City	0.20805	-0.1202%	-0.0336%	**0.0192%**	55%	0.03%	65%	100%

Table 6: Regional income inequality effects and characteristics

[a]Labor income indicates the share of labor income in total household income.

[b]Capital income indicates the share of capital income in total household income.

[c]The skill level is measured by the share of skilled workers in the labor force.

[d]Urbanization is measured by the share of households living in urban areas.

[e]0% indicates that there was no single entry greater than zero12

[f]The regions in italics are located in the Eastern part.

In contrast to the results in table 3, trade liberalization affects income inequality in the Western and the Eastern part mainly via its impact on the between-regions income inequality, even though the biggest share of income inequality in both parts of Ukraine is due to within-regions inequality.

The effects on the regional level confirm the previous results. Overall income inequality decreases in S1 as the Theil index diminishes for all regions. In S2, the impact on total income inequality is still positive even though some regions experience an increase in the Theil index. The rise of the Theil index in the majority of regions in S3 also reflects the negative income inequality effect for the country as a whole. Summarizing the results so far would lead to the conclusion that in terms of identifying between-groups (here: parts) effects of Ukraine's trade liberalization, the geographical location (Western vs. Eastern part) of households seems not to be the appropriate grouping criterion.

A more relevant criterion might be the area where the household is located. For the purpose of comparison this criterion is used to divide the Ukrainian households into two groups (rural vs. urban area) and to analyze the effects of Ukraine's tariff elimination on within- and between-groups income inequality. The results are reported in table 7. Within-groups income inequality again constitutes the biggest share (97%) of overall income inequality. Though, in contrast to the results concerning the Western and the Eastern part, Ukraine's tariff elimination would not only act on the within-groups but also on the between-groups income inequality in S1 and S3.

	benchmark	S1	S2	S3
	Ukraine	Ukraine	Ukraine	Ukraine
Theil index	0.13673	-0.1463%	-0.0439%	0.0220%
	within-groups	within-groups	within-groups	within-groups
Theil index	0.13253	-0.1283%	-0.0453%	0.0075%
	between-groups	between-groups	between-groups	between-groups
Theil index	0.00420	-0.7143%	0.0000%	0.2380%

Table 7: Decomposition of income inequality in Ukraine

5 Conclusion

The simulation of trade liberalization in a CGE-microsimulation model for Ukraine shows that the distributional effects of a unilateral tariff elimination are rather small. However, the results are reasonable given the small changes coming from the simulations in the CGE model and the structure of households' income. With regard to the within- and between-groups effects we conclude that trade liberalization affects overall income inequality in Ukraine via its impact on the within-parts income inequality rather than via the between-parts inequality. In this respect, the answer to the initial question whether there are "two Ukraines" must be "no" as it turns out that the more relevant grouping criterion to analyze between-groups income inequality effects is a rural/urban rather than a West/East division of households. Concerning the assessment of the different scenarios in terms of their income inequality effects, the scenario with reduced government expenditures would be prefered as it leads to a decrease in the Theil index in all regions and does also reduce income inequality between urban and rural households.

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Appendix

	(1)	(2)	(3)
variables	logarithm of labor income	selection[a]	mills
rural location	-0.272***	-0.684***	
	(0.0581)	(0.0508)	
work experience	0.0167***	0.0125	
	(0.00515)	(0.00827)	
work experience^2	-0.000688***	8.56e-06	
	(0.000121)	(0.000214)	
Zakarpatska Oblast	0.0384	0.720***	
	(0.0838)	(0.140)	
West Ukraine	0.0697	-0.226***	
	(0.0448)	(0.0652)	
South Ukraine	-0.0530	-0.182**	
	(0.0582)	(0.0881)	
A. R. o. Crimea	0.0879	0.148	
	(0.0721)	(0.120)	
East Ukraine	0.156***	0.186***	
	(0.0405)	(0.0683)	
married		0.498***	
		(0.0616)	
number of household members		0.0583**	
		(0.0289)	
chronic disease		-0.0979	
		(0.0628)	
lambda			-0.612***
			(0.151)
constant	9.410***	0.274**	
	(0.0892)	(0.111)	
observations	3,262	3,262	3,262

Default category: Center/North Ukraine

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Labor income estimation for unskilled men, Heckman selection model

[a]The coefficients of the selection equation cannot be interpreted directly. As selection into the labor market is out of the focus of this paper, the marginal effects for the selection equation are not reported here, but are available upon request.

variables	(1) logarithm of labor income	(2) selection[a]	(3) mills
rural location	-0.358***	-0.604***	
	(0.0810)	(0.0665)	
work experience	0.0154**	0.0406***	
	(0.00762)	(0.0101)	
work experience^2	-0.000456***	-0.000357	
	(0.000129)	(0.000273)	
Zakarpatska Oblast	0.125*	-0.181	
	(0.0722)	(0.128)	
West Ukraine	-0.0684*	0.0830	
	(0.0383)	(0.0869)	
South Ukraine	-0.0372	0.102	
	(0.0531)	(0.123)	
A. R. o. Crimea	0.148**	0.0300	
	(0.0653)	(0.152)	
East Ukraine	0.0863**	0.193**	
	(0.0396)	(0.0864)	
married		0.125*	
		(0.0671)	
number of household members		-0.0237	
		(0.0369)	
chronic disease		-0.121*	
		(0.0721)	
lambda			0.0171
			(0.305)
constant	8.793***	0.469***	
	(0.173)	(0.136)	
observations	2,208	2,208	2,208

Default category: Center/North Ukraine

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Labor income estimation for unskilled women, Heckman selection model

[a]The coefficients of the selection equation cannot be interpreted directly. As selection into the labor market is out of the focus of this paper, the marginal effects for the selection equation are not reported here, but are available upon request.

	(1)	(2)	(3)
variables	logarithm of labor income	selection[a]	mills
rural location	-0.252***	-0.631***	
	(0.0614)	(0.0869)	
work experience	0.0157***	0.00216	
	(0.00475)	(0.0130)	
work experience^2	-0.000597***	0.000157	
	(0.000112)	(0.000323)	
Zakarpatska Oblast	-0.0898	0.912***	
	(0.106)	(0.352)	
West Ukraine	-0.107**	-0.0459	
	(0.0437)	(0.106)	
South Ukraine	-0.124**	0.127	
	(0.0575)	(0.145)	
A. R. o. Crimea	0.0598	-0.178	
	(0.0696)	(0.157)	
East Ukraine	0.0455	0.0861	
	(0.0383)	(0.0978)	
married		0.419***	
		(0.102)	
number of household members		-0.0189	
		(0.0481)	
chronic disease		-0.306***	
		(0.0901)	
lambda			-0.637***
			(0.230)
constant	9.613***	1.025***	
	(0.0759)	(0.170)	
observations	2,046	2,046	2,046

Default category: Center/North Ukraine

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Labor income estimation for skilled men, Heckman selection model

[a]The coefficients of the selection equation cannot be interpreted directly. As selection into the labor market is out of the focus of this paper, the marginal effects for the selection equation are not reported here, but are available upon request.

variables	(1) logarithm of labor income	(2) selection[a]	(3) mills
rural location	-0.383***	-0.535***	
	(0.0789)	(0.0796)	
work experience	0.0315***	0.0339***	
	(0.00637)	(0.0117)	
work experience^2	-0.000729***	-0.000355	
	(0.000121)	(0.000319)	
Zakarpatska Oblast	-0.0321	-0.305*	
	(0.0873)	(0.168)	
West Ukraine	-0.150***	0.0176	
	(0.0369)	(0.104)	
South Ukraine	-0.0163	-0.000652	
	(0.0446)	(0.126)	
A. R. o. Crimea	0.0228	0.537**	
	(0.0718)	(0.234)	
East Ukraine	-0.0117	0.114	
	(0.0318)	(0.0894)	
married		0.0986	
		(0.0756)	
number of household members		0.0459	
		(0.0484)	
chronic disease		0.0259	
		(0.0812))	
lambda			0.641
			(0.502)
constant	8.840***	0.938***	
	(0.134)	(0.155)	
observations	2,902	2,902	2,902

Default category: Center/North Ukraine

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Labor income estimation for skilled women, Heckman selection model

[a]The coefficients of the selection equation cannot be interpreted directly. As selection into the labor market is out of the focus of this paper, the marginal effects for the selection equation are not reported here, but are available upon request.

variables	marginal effects employed
man	-0.497***
	(0.0595)
income differential	4.76e-05***
	(6.00e-06)
rural location	-0.923***
	(0.0586)
logarithm of age	0.566***
	(0.100)
number of household members	-0.0994***
	(0.0315)
Zakarpatska Oblast	0.128
	(0.130)
West Ukraine	-0.129*
	(0.0726)
South Ukraine	-0.0516
	(0.0994)
A. R. o. Crimea	0.0589
	(0.132)
East Ukraine	0.192**
	(0.0756)
skilled	0.777***
	(0.0619)
constant	-0.480
	(0.407)
observations	10,418

Reference group: unemployed

Default category: Center/North Ukraine

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Labor market choice, binomial logit model