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Simulating Poverty in Europe

The Potential Contributions of Employment and Education to Reducing Poverty and Social Exclusion by 2020

Mohamed Ihsan Ajwad
Kenneth Simler
Mehtabul Azam
Basab Dasgupta
Misha Bonch-Osmolovskiy
Irena Topińska

The World Bank
Europe and Central Asia Region
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and Poverty Reduction and Economic Management Sector Unit
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Abstract

This paper sheds light on the impact of improving employment and education conditions on poverty and social exclusion indicators. More specifically, it answers the following question: Will achieving the Europe 2020 national targets on employment and education lead countries to achieve the Europe 2020 poverty and social exclusion target with no other policy interventions? The paper presents a simple partial equilibrium model that is flexible enough to be implemented in a number of different settings and uses widely available household survey data. The simulation model analyzes poverty and social exclusion outcomes in response to changes in education completion rates and employment rates. The model is applied to ten of the European Union's new Member States—Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia—and the model's performance is evaluated through a validation exercise. The Europe 2020 national employment targets are ambitious in many of the new Member States, given historical employment patterns in the countries. Especially in light of the slow and uncertain recovery, labor markets remain weak and employment rates in 2020 could fall short of rates targeted by national policy makers. In this eventuality, the poverty and social exclusion goals may not be reached in many of the new Member States without additional policy measures.

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Simulating Poverty in Europe: The Potential Contributions of Employment and Education to Reducing Poverty and Social Exclusion by 2020[1]

Mohamed Ihsan Ajwad
Kenneth Simler
Mehtabul Azam
Basab Dasgupta
Misha Bonch-Osmolovskiy
Irena Topińska

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1. Introduction

In June 2010, the European Council approved the Europe 2020 strategy, an economic growth and well-being improvement plan for the European Union (EU) in the ensuing decade. The strategy includes five interrelated headline targets to be achieved by the year 2020, encompassing employment, innovation, education, poverty and social inclusion, and climate/energy. An overarching goal of the Europe 2020 strategy is to reduce the number of poor and socially excluded people by 20 million, with national-level targets set by each of the EU Member States. The European Council used three measures of poverty and social exclusion: the at-risk-of-poverty rate, a measure of relative poverty defined as the percent of the population with incomes less than 60 percent of the national median income after social transfers; the index of severe material deprivation, a measure of the percent of people who cannot afford a number of necessities that are considered essential in order to live decent lives in Europe; and low work intensity, which is the percentage of people living in households in which adults worked less than 20 percent of their potential.

This paper sheds light on the impact of improving employment and education conditions on poverty and social exclusion indicators. More specifically, we answer the question: Will achieving the Europe 2020 national targets on employment and education lead countries to achieve the Europe 2020 poverty and social exclusion target with no other policy interventions? To answer this question, we present a simple partial equilibrium model flexible enough to be implemented in a number of different settings using widely available household survey data. The simulation model analyzes poverty and social exclusion outcomes in response to changes in education completion rates and employment rates. We apply the model in ten of the European Union's New Member States (NMS group)—Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia—and evaluate the model's performance through a validation exercise.[2] We expect the proposed method and its application to be of particular value to policy makers, officials at the European Commission, and other stakeholders in the European Union.

The key underlying assumption of this model is that the current structural relationships between poverty and social exclusion outcomes and education and employment indicators remain constant over time. As a result, changes in education and employment rates, such as those that would be expected should countries achieve the Europe 2020 targets, will have a predictable impact on poverty and social exclusion if the beneficiaries are identified. We use a propensity score technique to identify beneficiaries.

This paper complements and builds upon existing analytical studies, four of which are particularly relevant for our analysis and merit highlighting. The first of these studies is a 2009 European Commission report titled "Growth, jobs and social progress in the EU: A contribution to the evaluation of

[2] Bulgaria and Romania joined the European Union in 2007, and the other countries joined in 2004. Two other countries that joined in 2004, Cyprus and Malta, are not included in this study because of the World Bank's more limited engagement in those countries.

the social dimension of the Lisbon Strategy," which focuses on developments in poverty and social exclusion over the past decade. The study also draws lessons about the impacts of employment and government social protection programs on poverty and inequality. The second study is a 2010 volume edited by Anthony B. Atkinson and Eric Marlier titled "Income and living conditions in Europe," which explores concepts such as poverty, income inequality, employment, health and education, housing, and social exclusion. The third is Pascal Wolff's 2010 paper on "Population and Social Conditions," which measures the proportion of EU citizens who are at risk of poverty (after all social transfers). Whereas these three studies focus on past patterns in poverty and social exclusion, a fourth study published in 2010 by Marx et al. and titled "Work as an Antidote to Poverty? An Empirical Analysis for EU Countries," presents prospective scenarios, much like the present paper. Marx et al. simulate the impact that increasing the employment rate to the Europe 2020 target of 75 percent has on the income distribution and relative monetary poverty levels. Their model uses a propensity score technique to simulate higher employment rates among the population most likely to work given specific individual characteristics. Employing a somewhat different methodology and a broader scope than the Marx et al. study, this paper offers insight into several new areas, most notably: (i) the contribution of meeting the Europe 2020 education targets to reducing poverty and social exclusion; (ii) consideration of the indicators for severe material deprivation and low work intensity, which along with relative monetary poverty form the troika of Europe 2020 poverty and social inclusion indicators; (iii) a validation exercise to assess the predictive qualities of the model; and (iv) use of the model to assess the impact of targeting specific disadvantaged groups in the process of trying to meet the Europe 2020 education and employment goals.

If the Europe 2020 national targets for increased employment and education are met, and no other policies are enacted, we find that at-risk-of-poverty rates could decrease by more than 3.7 million people in the ten NMSs.[3] Similarly, if the Europe 2020 national targets for increased employment and education are met, low work intensity rates could decrease by about 3.0 million people by 2020 in the NMSs. More significantly, anchored poverty could fall by almost 9.6 million people in the NMSs when countries achieve their 2020 employment and education targets. When simulating anchored poverty in 2020, we define anchored poverty rates as the percent of people whose disposable income is less than the inflation-adjusted 60 percent of the median income in 2008. Although anchored poverty is not an explicit Europe 2020 target, it is an important indicator of progress in improving poor people's quality of life.

However, we find that the Europe 2020 national employment targets are ambitious in many of the NMSs given historical employment patterns in the countries. Especially in light of the slow and uncertain recovery, labor markets remain weak and employment rates in 2020 could fall short of rates targeted by national policy makers. In this eventuality, the poverty and social exclusion goals may not be reached in many of the NMSs without additional policy measures.

This paper is divided into eight sections. Following this introduction, Section 2 provides background information on poverty and social exclusion indicators in the ten countries in the NMS

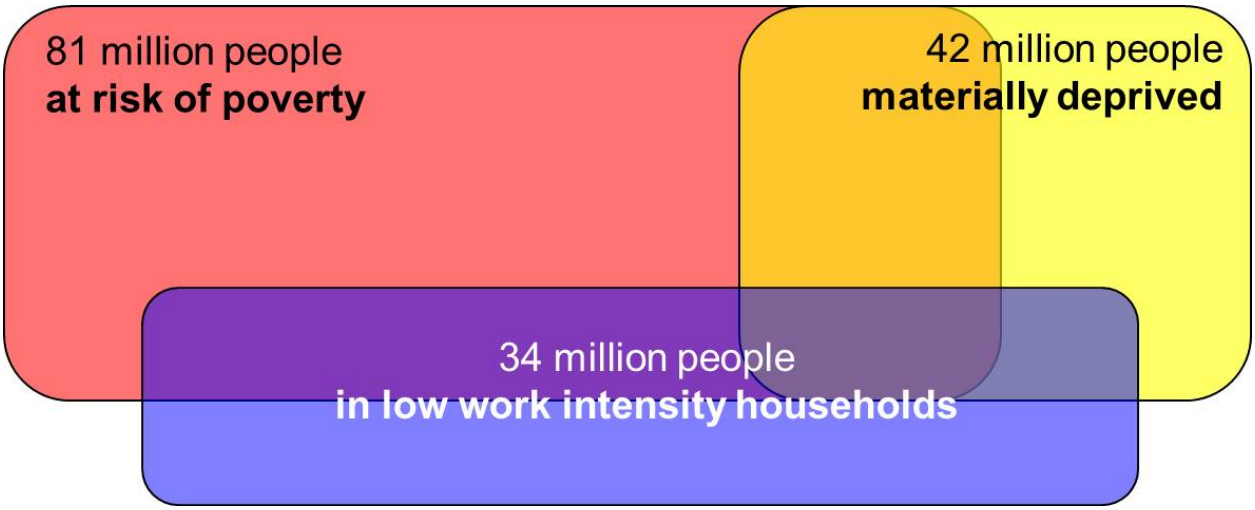
[3] Poverty and social exclusion rates are calculated in 2008.

group, including their evolution since 2005. Section 3 describes the data sources used and defines the key variables of interest. Section 4 outlines the methodology used to simulate indicators of poverty and social exclusion. Section 5 first presents the results from a validation exercise in which data from 2005 are used to simulate the likely outcomes in 2008, and then compares the simulated 2008 values to the actual 2008 values. Section 6 presents the results of the simulation exercise for the ten countries in the study. Section 7 provides an illustration of how the simulation model has been adapted to address policies on pre-schools in Poland. Finally, section 8 offers a set of overall conclusions.

2. Background

In 2008, 116 million people were at risk of poverty or social exclusion in the 27-member European Union (EU-27).[4] According to Atkinson and Marlier (2010), as of that year, 81 million people (nearly 17 percent of the population) were at risk of poverty after social transfers, 42 million were severely materially deprived, and 34 million lived in low work intensity households (Figure 1).[5] Several million people were at risk of poverty and social exclusion by multiple criteria, including 7 million people suffering from all three dimensions of poverty and social exclusion used for the Europe 2020 targets.

Figure 1: As of 2008, 116 million people in Europe were at risk of poverty or social exclusion, and several million people were affected in multiple dimensions



Source: Eurostat and Atkinson and Marlier (2010).

Levels and patterns of poverty and social exclusion indicators vary widely across EU Member States. For example, in 2009, the Czech Republic and Slovakia exhibited the lowest at-risk-of-poverty rates, while Latvia and Romania exhibited the highest at-risk-of-poverty rates among the countries in

[4] Eurostat Press Office, "Income and living conditions in Europe," News Release 190/2010, 13 December 2010. http://epp.eurostat.ec.europa.eu/.
[5] Poverty and social exclusion variables are defined in the Data section.

the NMS group. Similarly, the Czech Republic and Slovenia maintained the lowest severe material deprivation rates, while Bulgaria and Romania maintained the highest severe material deprivation rates. In terms of low work intensity, Estonia, Slovakia, and Slovenia showed the lowest rates, while Hungary and Romania showed the highest, albeit with relatively low variation across countries for this third indicator.

Between 2005 and 2009, poverty and social exclusion indicators improved in most NMSs (Table 1). However, some noteworthy regional and country variances should be mentioned. For example, during that time span, the at-risk-of-poverty rate in the NMS group decreased gradually from 17.3 to 15.1, while remaining virtually unchanged in the EU-27 as a whole. At the country level, significant contrasts in at-risk-of-poverty rates stand out: the Czech Republic, Poland, and Slovakia experienced relatively large decreases in the indicator, while Bulgaria and Latvia experienced large increases. It should also be noted that changes in the at-risk-of-poverty rates are very weakly correlated with economic growth, because they depend entirely on changes in the *shape* of the income distribution, particularly in the lower end of the income distribution, whereas economic growth rates tend to reflect changes in the *location* of the income distribution.[6] Severe material deprivation fell significantly in the NMS group during the 2005–2009 period—from 27 percent to 14 percent—while falling only from 11 to 8 percent in the EU-27. Individually, all NMSs reduced their rate of severe material deprivation except for Slovenia, which in 2005 had the lowest rate of severe material deprivation among them. With regard to the third indicator, the percentage of the population living in low work intensity households decreased by 30 to 50 percent in Poland, Estonia, Slovenia, and the Czech Republic, but Hungary experienced an increase.

Table 1: Trends in poverty and social exclusion indicators, 2005–2009

At-risk-of-poverty rates	**2005**	**2006**	**2007**	**2008**	**2009**
European Union (27 countries)	16.4	16.5	16.7	16.5	16.3
New Member States (10 countries)	17.3	16.7	15.1	15.0	15.1
Bulgaria	14.0	18.4	22	21.4	21.8
Czech Republic	10.4	9.9	9.6	9.0	8.6
Estonia	18.3	18.3	19.4	19.5	19.7
Hungary	13.5	15.9	12.3	12.4	12.4
Latvia	19.2	23.1	21.2	25.6	25.7
Lithuania	20.5	20.0	19.1	20.0	20.6
Poland	20.5	19.1	17.3	16.9	17.1
Romania	Na	na	24.8	23.4	22.4
Slovakia	13.3	11.6	10.5	10.9	11.0
Slovenia	12.2	11.6	11.5	12.3	11.3
Severe material deprivation	**2005**	**2006**	**2007**	**2008**	**2009**
European Union (27 countries)	11.0	10.0	9.1	8.5	8.1
New Member States (10 countries)	27.0	22.3	18.1	15.0	13.9

[6] In six out of the ten new EU Member States, the correlation between economic growth and the change in at-risk-of-poverty between 2005 and 2009 is insignificant at the 10 percent significance level. In Latvia, Lithuania, Poland, and Slovakia, the correlation between economic growth and the change in at-risk-of-poverty is weak at the 10 percent significance level.

Bulgaria	Na	57.7	57.6	41.2	41.9
Czech Republic	11.8	9.6	7.4	6.8	6.1
Estonia	12.4	7.0	5.6	4.9	6.2
Hungary	22.9	20.9	19.4	17.9	20.8
Latvia	38.9	30.6	24.9	19.0	21.9
Lithuania	32.6	25.3	16.6	15.0	15.1
Poland	33.8	27.6	22.3	17.7	15.0
Romania	Na	na	36.5	32.9	32.2
Slovakia	22.1	18.2	13.7	11.8	11.1
Slovenia	5.1	5.1	5.1	6.7	6.1
Low work intensity	**2005**	**2006**	**2007**	**2008**	**2009**
European Union (27 countries)	10.3	10.5	9.6	9.0	9.0
New Member States (10 countries)	Na	na	na	na	Na
Bulgaria	Na	14.7	15.9	8.1	6.9
Czech Republic	8.8	8.9	8.6	7.2	6.0
Estonia	9.4	7.0	6.2	5.3	5.6
Hungary	9.5	13.0	11.3	12.0	11.3
Latvia	8.1	7.0	6.1	5.1	6.7
Lithuania	9.5	8.3	6.4	5.1	6.9
Poland	14.2	12.3	10.0	7.9	6.9
Romania	Na	na	8.4	8.2	7.7
Slovakia	6.6	6.2	6.4	5.2	5.6
Slovenia	8.6	6.9	7.2	6.7	5.6
Anchored poverty (anchored at 2005 at-risk-of-poverty line)	**2005**	**2006**	**2007**	**2008**	**2009**
Bulgaria	Na			na	
Czech Republic	10.4			7.2	
Estonia	18.6			7.8	
Hungary	13.4			8.8	
Latvia	19.8			9.2	
Lithuania	20.7			9.6	
Poland	22.2			5.7	
Romania	Na			na	
Slovakia	13.5			4.9	
Slovenia	Na			na	

Source: World Bank staff calculations using data from the European Union Statistics on Income and Living Conditions (EU-SILC).

3. Data

This paper's primary data source is the European Union Statistics on Income and Living Conditions (EU-SILC) household survey, in particular data from 2005 through 2009. The reference population is all private households and their current members residing in each of the national territories. The survey covers the entire population living in private households and excludes collective households such as boarding houses, residence halls, and hospitals. Although the questionnaires, sample designs, and implementation vary across countries, the EU-SILC is semi-standardized: each EU Member State adheres to common standards overseen by Eurostat, the statistical office of the European Union. Moreover, there is a large set of Eurostat-defined "target variables" that are included in each Member State's EU-

SILC survey, resulting in a high, albeit imperfect, degree of comparability across countries. Each Member State's household survey contains modules for income, labor market activity, demographics, education, health, housing, social programs, access to some durable consumption goods, and subjective welfare. The EU-SILC contains the following sources of individual's income: (i) cash or near-cash personal income; (ii) non-cash employee income and employer's social insurance contribution; and (iii) cash benefits (including unemployment, old age, survivor, sickness, disability, and education-related benefits). The EU-SILC also contains the following sources of household income: income from property rental, housing allowances, regular inter-household transfers, interest, dividends, profit from capital investments in unincorporated businesses, and income received by household members aged less than 16 years.[7] The household income data pertains to the preceding year.

Poverty and social exclusion indicators

The four outcome indicators of poverty and social exclusion considered in this paper are: at-risk-of-poverty rates, severe material deprivation, low work intensity, and anchored poverty. A brief explanation of each indicator follows.

The *at-risk-of-poverty rate* is the percentage of the population with an equivalized disposable income (after all social transfers) of less than 60 percent of the national median equivalized disposable income (after all social transfers). The equivalized disposable income is achieved by dividing total household disposable income by the number of equivalent adults in the household, using the modified OECD scale.[8]

Severely materially deprived households are those that state they cannot afford at least four of the following nine items: (i) mortgage payments, rent, or utility bills; (ii) adequate heating; (iii) unexpected expenses; (iv) meat, fish, or a protein equivalent every second day; (v) a week-long holiday away from home; (vi) a car; (vii) a washing machine; (viii) a color television set; or (ix) a telephone. The indicator thus attempts to capture a household's economic capacity, albeit subjective, to acquire basic material goods and services regardless of whether or not they actually acquire them.[9] Severe material deprivation is, therefore, interpreted as the enforced inability (rather than the choice not to do so) to possess the goods and services and/or engage in activities that are socially perceived as basic necessities in the European context.

Low work intensity is a measure of the share of the population living in households in which adult household members (aged 18–59) worked less than 20 percent of their total potential working time during the past year. The indicator is computed using individual-level information on months of

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[7] Although in most cases net income was available, in the Czech Republic, Hungary, Lithuania, and Slovakia only gross income was available. For these four countries, we converted gross income into net income.

[8] The modified OECD scale gives a weight of 1.0 to the first adult; 0.5 to the second and each subsequent person aged 14 and over; 0.3 to each child aged under 14, and then adds these up to arrive at the equivalized household size.

[9] This takes into consideration that households may have the economic resources to afford certain goods and services but choose not to acquire them, which is distinct from commonly used asset indexes that focus solely on human and physical capital actually held by the household.

employment in regular or part-time work and hours of work per day. Specifically, work intensity is calculated by dividing the number of months that all working-age household members worked during the income reference year by the total number of months that they potentially could have worked during that period. For a worker not working full-time throughout the reference period, the months worked part-time are adjusted by a coefficient that takes into account the total number of hours that he or she worked during that period. Individuals with low work intensity are defined as individuals who belong to households with work intensity below 20 percent.

Anchored poverty refers to households in which the equivalized disposable income is less than a constant value that is set at 60 percent of the national equivalized median income in a particular base year. Although anchored poverty is not one of the indicators included in the Europe 2020 goals, we include it here because it provides valuable complementary information on poverty trends by using a poverty threshold that is fixed (absolute) over time in each EU Member State.

Employment and education indicators

In this paper we use three related employment and education indicators that are also targets of the Europe 2020 Strategy. First, the *employment rate,* which is calculated as the percentage of 20- to 64-year-olds who during the reference week did any work for pay or profit for at least one hour, or were not working but had jobs from which they were temporarily absent. Second, the *early school leaving rate,* which is calculated as the percentage of 18- to 24-year-olds who completed, at most, lower secondary school and did not engage in further education or training. And third, the *tertiary education completion rate,* which is calculated as the percentage of the population aged 30–34 years who successfully completed university or tertiary-level education with an ISCED 1997 (International Standard Classification of Education) education level of 5–6.

Some heterogeneity in the employment rate is seen across the NMSs. In 2008, employment rates in Estonia (76.4 percent), Latvia (74.5), and Lithuania (73.5) were relatively high, while employment rates in Hungary (65.4 percent), Slovenia (65.6 percent), and Poland (65.7) were relatively low (Table 2). Considerable variation in aspirations towards the Europe 2020 goals is also observed. Although an overall 2020 goal of 75 percent has been set for all EU-27 Member States, NMSs with currently high employment rates have set goals that are generally lower than their 2008 employment rates. For example, Estonia has set a national 2020 employment rate target of 76 percent, Latvia of 73 percent, and Lithuania of 72.8 percent. Conversely, Hungary and Slovenia have both set themselves the Europe 2020 target employment rate of 75 percent, which will require them to increase employment rates at a faster pace than either country achieved during the entire 2000–11 period, even during the high growth years of 2000–08.

Table 2: Employment rates among 20- to 64-year-olds in 2008 and national targets for 2020

	Employed as a percentage of people between 20-64 (2008)	National Targets (2020)
Bulgaria	70.5	76
Czech Rep	70.6	75
Estonia	76.4	76
Hungary	65.4	75
Latvia	74.5	73
Lithuania	73.5	73
Poland	65.7	71
Romania	68.5	70
Slovakia	71.9	72
Slovenia	65.6	75

Source: World Bank staff calculations using EU-SILC data.

Significant variation is observed in the *early school leaving rate*. In 2008, Slovakia (2.5 percent), Poland (3.8 percent), and Slovenia (4.1 percent) had relatively low early school leaving rates, while Bulgaria (19.6 percent), Latvia (15.9 percent), and Romania (15.3 percent) had relatively high rates (Table 3). With an indicative European target of 10 percent, countries with high early school leaving rates have generally set themselves ambitious goals. For example, Bulgaria expects to reduce its early school leaving rate from 19.6 percent in 2008 to 11 percent by 2020, and Romania expects to reduce its rate from 15.3 percent to 11.3 percent.

Table 3: Early school leaving rates in 2008 and national targets for 2020

	Early school leavers (percent)	National Targets: Early School Leaving (percent)
Bulgaria	19.6	11
Czech Republic	6.3	6
Estonia	13.8	10
Hungary	12.0	10
Latvia	15.9	13
Lithuania	4.8	6
Poland	3.8	5
Romania	15.3	11
Slovakia	2.5	6
Slovenia	4.1	5

Source: World Bank staff calculations using EU-SILC data.

The *tertiary education completion rate* varies between a high of 45.2 percent in Lithuania and a low of 15.9 percent in the Czech Republic (Table 4). Five NMSs have set targets that fall below the 40 percent region-wide target set for the EU-27 countries, given the challenges this target poses for them. To illustrate, consider that to reach the national targets by 2020, Bulgaria will have to increase its 2011 tertiary education completion rate by 50 percent, the Czech Republic by 30 percent, and Romania by 25

percent. Although these are ambitious increases, it should be noted that many NMSs achieved comparable annual increases in the rates of tertiary education completion between 2000 and 2011.

Table 4: Tertiary education completion rates among 30- to 34-year-olds in 2008 and national targets for 2020 (percent)

	Tertiary education as a percentage of people between the age group30-34	National Target
Bulgaria	23.8	36
Czech Rep	15.9	32
Estonia	34.3	40
Hungary	23.6	30
Latvia	27.7	36
Lithuania	45.2	40
Poland	31.5	45
Romania	16.8	26
Slovakia	24.1	40
Slovenia	27.3	40

Source: World Bank staff calculations using EU-SILC data.

4. Methodology

Simulating at-risk-of-poverty rates and anchored poverty

To simulate the 2020 at-risk-of-poverty and anchored poverty indicators, we first need to simulate the 2020 household income distribution. Household incomes (Y_h) are the sum of labor incomes (Y_L), government and private transfers (Y_T), and other sources of income (Y_O):

$$Y_h = Y_L + Y_T + Y_o \quad (1)$$

In EU countries, labor incomes constitute the majority of a household's income. The transfer income (which is most often pensions) is assumed to remain constant.[10] However, transfers that are tied to employment status, such as unemployment benefits or social assistance benefits, are allowed to vary as needed in the simulations to reflect simulated changes in the employment status of individuals.

A household's labor income is the sum of labor income earned by each working household member ($Y_h = \sum_i y_i \quad \forall\, i \in h$). We assume that the labor income of individual i is determined by individual $i's$ characteristics conditional on the individual's employment status:

$$y_i = \beta x_i \mid Empl = 1 \quad (2)$$

[10] In a separate policy modeling exercise, we explore the impacts on household income distribution of different policy scenarios regarding transfers, such as reducing income transfers by a certain percentage.

where x_i is the matrix of individual characteristics, β is the returns to those characteristics, and *Empl* is an indicator variable taking the value one if the individual is employed and zero otherwise.

To simulate labor incomes in 2020, three pieces of information are needed: (i) the probability of being employed; (ii) the wage-determining characteristics of the population in 2020; and (iii) the returns to those characteristics in 2020. For the probability of employment in 2020, we assume that the national-level Europe 2020 targets for the employment rate are met and, hence, based on propensity scores, we move individuals into employment. We adopt a similar approach for education (an important wage-determining characteristic) by assuming that the national-level Europe 2020 targets for reducing the rate of early school leavers and increasing the tertiary completion rate are met, again using propensity scores to select which individuals will have higher education levels in the simulations. Because age is also an important determinant of wages, in the simulations for 2020 we reweight the data such that the age distribution matches that projected by Eurostat. Item (iii), the labor income returns to characteristics, is the most difficult component to simulate, and we assume that the returns to characteristics remain the same as those estimated in the baseline year.

The structural relationship between an individual's labor income (y_i) and his or her characteristics is estimated by a Mincerian equation:

$$ln\, y_i = \beta x_i + \varepsilon_i \tag{3}$$

where $ln\, y_i$ is the natural logarithm of labor income earned by individual i, and x_i is the matrix of individual characteristics that include age (linear and quadratic), educational attainment (a set of dummy variables for completing different levels), gender, marital status, whether the individual is a migrant, whether the individual has a chronic illness, whether the individual has limited physical mobility, and whether the individual lives in an urbanized area.

Using Equation (3) with the 2008 EU-SILC data, we generate an estimate of the $\hat{\beta}^{2008}$ vector, which is employed later to simulate labor income under the stable structural relationship assumption.

We estimate the probability of employment of a 20- to 64-year-old individual in the baseline year following the Heckman method (1979). Therefore, we estimate the following probit model:

$$Prob(Empl = 1) = \Phi(z'\gamma) \tag{4}$$

where z is a matrix of individual characteristics, i.e. age (linear and quadratic terms), household size, dummy variables for educational level attained, gender, marital status, whether the individual is a migrant, whether the individual has a chronic illness, whether the individual has limited physical mobility, and whether the household lives in an urbanized area.[11] Equation (4) gives us an estimate for $\hat{\gamma}^{2008}$.

The third step involves changing key characteristics, namely the education completion rates and employment rates such that the Europe 2020 national targets are met. By estimating a probit model in

[11] The same set of characteristics is used as explanatory variables in equations (3) and (4).

the baseline year and deriving propensities of educational attainment, we identify individuals who are more likely to attain higher education levels so that the Europe 2020 education targets are met. Because Europe 2020 education targets pertain to secondary school and tertiary school completion, we assume that between 2010 and 2020 only people who are aged 10 to 30 in the base year are affected by increases in educational attainment, meaning that other people are either too young (at least within the time horizon of Europe 2020) or too old to benefit from changes to secondary or tertiary level policies. In the simulations we switch individuals with the highest propensities among those with lower educational attainment into higher levels of educational attainment.

After simulating a new education distribution (the 2020 education distribution) based on achieving the 2020 education targets and the projected age distribution in 2020, we re-estimate the probability of a person in a particular age group being employed using $\hat{\gamma}^{2008}$, i.e., $\widehat{Prob}(Empl = 1) = \Phi(x^{2020\prime}\gamma^{2008})$. The intuition is that, other things equal, the assumed higher educational attainment will increase the simulated probability of employment. We estimate the increase in 20- to 64-year-olds needed to achieve the employment target, and switch unemployed and inactive people into employed status based on the highest propensity of being employed.[12]

Once we have the employment and educational vectors for 2020, we predict the labor income for individuals based on $\hat{\beta}^{2008}$ and x_*^{2020}, where * denotes the hypothetical vector corresponding to the individual characteristics assumed to prevail in 2020:

$$y_{i*}^{2020} = \hat{\beta}^{2008} x_{i*}^{2020} \tag{5}$$

The final step is to estimate the projected household income in 2020:

$$Y_h = \sum_{i \in h} y_{i*}^{2020} + Y_T^{2008} + Y_O^{2008} \tag{6}$$

Once we have the 2020 income distribution, we can estimate the at-risk-of-poverty rate and the poverty rate based on an anchored poverty line.

Simulating severe material deprivation

To simulate the 2020 distribution of severe material deprivation, we assume that the 2020 severe material deprivation distribution will depend on household characteristics in 2020 with the same structural relationship as the current severe material deprivation distribution's dependence on current household characteristics. Specifically, we estimate the current determinants of severe material deprivation, and, using projected estimates of the determinants for 2020 (the *X* matrix) and the estimated coefficients, we simulate the distribution of severe material deprivation in 2020.

The dependent variable is the number of material deprivations experienced by each household, and thus takes integer values from zero to nine, inclusive. The dependent variable is left-censored

[12] We assume that people who are employed in baseline data are also employed in 2020 hypothetical data, and only draw from people in inactive or unemployed status to employment.

because a large proportion of households have none of the nine deprivations, so we employ a Tobit model with the following specification to estimate the determinants of severe material deprivation:

$$\begin{aligned} Severe\ material\ deprivation \\ &= \alpha_0 + \sum \beta_i (demographic\ characteristics) + \delta(disposable\ income) \\ &+ \sum \lambda_i (beneficiaries\ of\ social\ assistance) + \theta(simulated\ work\ intensity) \\ &+ \omega(population\ density\ of\ the\ community\ they\ live\ in) + \epsilon_i \end{aligned}$$

Among demographic characteristics we consider age, marital status, migration status, household size, whether the household is a lone family (a single adult or a single adult with one or more dependent children), employment status, and sectors of employment of the individuals. We include the household's disposable income and a set of covariates to identify the individual-level social assistance beneficiary status, including whether the person receives a pension, unemployment benefits, old age benefits, survivor benefits, sickness benefits, disability benefits, or a student allowance. We also include work intensity work, and finally, the population density of the household's community.

The specification is influenced by past research that has shown that severe material deprivation is not as correlated with household incomes as one might expect. A joint EU-OECD working paper finds that the probability of being severely materially deprived is higher for persons with income below the relative poverty line, young people, those who are unemployed or with weak ties to the labor market, poorly-educated persons, those living alone or as lone parents, disabled persons, immigrants, and welfare recipients (Caminada and Goudswaard, 2010). Tsakloglou and Papadopoulos (2000) report that, in Europe, lone parents have greater odds of lacking basic consumer durables and of having more difficulties in making ends meet.

Simulating low work intensity

The simulated work intensity in 2020 is a direct by-product of the simulated change in the probability of employment given the assumed changes in individual characteristics, that is, $\widehat{Prob}(Empl = 1) = \Phi(x^{2020\prime}\gamma^{2008})$. As noted earlier, the number of persons who are assumed to move into employment in each EU Member State depends on the gap between that country's employment rate in the base year and its national target for 2020. The distribution of the increase in employment is determined by employment propensity scores, which depend on the distribution of individual characteristics and the estimated structural relationship between those characteristics and employment probability.

As with any model, the microsimulation model presented here requires simplifying assumptions. The current model has three main assumptions that may impose limitations on the application of the model or the interpretation of results. First, the approach assumes that the structural relationships in the model parameters remain constant over time. Second, the model is static in the sense that it only provides snapshots of simulated income distributions at different points in time, but it is not able to distinguish between transient and persistent poverty. Third, the microsimulation model is a partial equilibrium model, and therefore does not capture second round effects, such as a possible change in real wage levels associated with large changes in the number of employed people, or large changes in the number of persons with higher educational attainment.

5. Validation

We test the model's performance by conducting a validation exercise. The validation is carried out by using 2005 data to predict 2008 indicators and then comparing the predicted 2008 indicators with actual 2008 indicators. Specifically, we estimate the model parameters limiting ourselves to the EU-SILC data for 2005. We then apply those estimated parameters to the actual data for the independent variables in 2008 to predict the values of poverty and social exclusion indicators in 2008 and, finally, we compare those findings to the actual 2008 findings. This test helps to understand the strengths and limitations of the simulation model. Although this is a less demanding scenario than the simulations for 2020, it is nevertheless informative.

To validate the model's performance at simulating at-risk-of-poverty and anchored poverty rates, we estimate equations (2) though (4) above using EU-SILC 2005 data.[13] For the validation, instead of using national education and employment targets, we use the actual 2008 aggregate data for education attainment and employment rates. This allows us to simulate labor income for each individual in 2008, which we then plug into equation (1) to compute the total household income. Finally, we compute the at-risk-of-poverty and anchored poverty rates and compare those findings to the actual at-risk-of-poverty and anchored poverty rates using the EU-SILC 2008 survey. The simulation model's performance with severe material deprivation and limited work intensity is similarly evaluated by comparing the simulated results using EU-SILC 2005 data with the actual results obtained with EU-SILC 2008 data.

The simulation model predicts 2008 at-risk-of-poverty rates reasonably well using EU-SILC 2005 data for both new and old EU Member States (Table 5). In most cases, the simulated at-risk-of-poverty rate is within 2 percentage points of the actual 2008 at-risk-of-poverty rate. However, in Latvia, Lithuania, and Sweden, the change in at-risk-of-poverty rates between 2005 and 2008 is not well predicted by the simulation model. A Oaxaca-Blinder decomposition confirms the underlying reason for this: the change in at-risk-of-poverty rates between 2005 and 2008 is more strongly related to a change in the structural relationship between individual/household characteristics and outcomes, rather than to changes in individual/household characteristics (see Annex). To take some account of this, we add an adjustment to the constant term in equation (2), such that simulated growth in labor income is consistent with projected GDP per capita growth, which is based on post-crisis forecasts. While this approach does help ensure greater consistency between household incomes and projected macroeconomic aggregates, it is admittedly somewhat ad hoc, and an approach that allowed for the coefficients to change over time would most likely provide a truer representation of the structural relationships.

The 2008 low work intensity rates are predicted reasonably well by the simulation model using EU-SILC 2005 data in both old and new EU Member States. The exception, however, is Hungary, where

[13] Bulgaria and Romania did not conduct EU-SILC surveys in 2005, and are thus excluded from the validation exercise.

the change in low work intensity between 2005 and 2008 is not predicted well by our simulation model, again because the changes in Hungary between 2005 and 2008 are driven more by changes in the model parameters than by changes in the characteristics.

The 2008 severe material deprivation index, on the other hand, is not very well predicted by the simulation model in either old or new EU Member States. Only in the Czech Republic and Estonia are the actual and predicted values within 2 percentage points of each other, while in all other countries the difference is wider. Other studies have also found severe material deprivation difficult to explain using observed variables. One hypothesis for these findings is the considerable subjective element in the questions about whether a household could afford some of the items in the material deprivation measure (for example, the cost of a week's holiday away from home is highly variable).

The simulation model predicts 2008 anchored poverty rates reasonably well in new EU Member States, but not as well in old EU Member States. This pattern is explained by the fact that a change in anchored poverty is more strongly caused by changes in individual and household characteristics in new EU Member States than in old EU Member States. In old EU Member States, the structural relationship between individual and household characteristics and anchored poverty is unstable between 2005 and 2008.

Table 5: Simulated 2008 poverty and social exclusion indicators using 2005 data

Country	Simulated at-risk-of-poverty in 2008 using 2005 data	Actual 2008 at-risk-of-poverty	Simulated low work intensity in 2008 using 2005 data	Actual 2008 low work intensity	Simulated material deprivation in 2008 using 2005 data	Actual 2008 severe material deprivation	Simulated anchored poverty in 2008 using 2005 data	Actual 2008 anchored poverty
Czech Rep*	11.2	9.3	7.0	6.9	4.8	6.2	7.2	3.8
Estonia	19.3	19.5	7.5	5.5	3.6	4.2	7.8	5.2
Hungary*	12.1	12.4	7.8	15.9	10.3	18.2	8.8	9.4
Latvia	18.9	25.8	7.7	5.3	9.1	15.1	9.2	8.9
Lithuania*	16.3	20.1	7.8	6.2	5.5	12.0	9.6	5.1
Poland	14.9	16.9	13.0	10.0	10.3	17.2	5.74	4.3
Slovakia*	9.4	11.6	5.8	5.0	4.9	11.0	4.9	3.0
Greece	17.7	20.4	6.5	7.9	11.9	8.8	9.2	18.5
Ireland	19.5	15.3	12.2	13.4	20.1	5.3	13.2	10.2
Italy	17.5	18.7	9.6	9.7	13.8	8.0	10.1	18.0
Portugal	15.5	18.8	6.1	6.0	4.0	9.0	8.2	17.6
Spain	16.5	19.7	5.7	6.2	8.2	2.8	8.6	14.2
Sweden	18.3	12.2	5.4	4.9	8.9	1.2	5.7	8.5

Note: '*' indicates countries where gross income is used, and for the remaining countries, net Income is used.
Source: World Bank staff calculations using EU-SILC data.

For all countries analyzed in this paper, increases in employment appear to reduce poverty and social exclusion more than increases in education. A Fairlie decomposition analysis (Table 6) shows that employment status is, by far, the dominant factor explaining changes in absolute poverty between 2005 and 2008. This is not surprising given the short time span considered in the simulations, in which improvements in education indicators are not given the time needed to show measurable poverty and social exclusion impacts.

Table 6: Fairlie decomposition: Contribution of education and employment change in explaining change in Absolute poverty between 2005 and 20008 (percent of total change)

	Countries	At most lower secondary	Higher secondary	Tertiary	Employed	Total
NMS	Bulgaria	0.0	−14.3	0.0	114.3	100
	Czech Rep	−20.0	–20.0	40.0	100.0	100
	Estonia	0.0	0.0	−16.7	116.7	100
	Hungary	−42.9	−14.3	57.1	100.0	100
	Latvia	0.0	0.0	−14.3	114.3	100
	Lithuania	0.0	0.0	−14.3	114.3	100
	Poland	−16.7	−33.3	50.0	100.0	100
	Romania	–100.0	−33.3	66.7	166.7	100
	Slovakia	0.0	−25.0	0.0	125.0	100
	Slovenia	−0.03	−0.04	0.03	104.0	100
OMS	Greece	−36.4	−36.4	54.5	45.5	100
	Ireland	−71.4	−57.1	100.0	128.6	100
	Italy	−166.7	−100.0	166.7	200.0	100
	Portugal	0.0	−20.0	0.0	120.0	100
	Spain	−66.7	−100.0	66.7	200.0	100
	Sweden	0.0	0.0	0.0	100.0	100

Source: World Bank staff calculations using EU-SILC data.

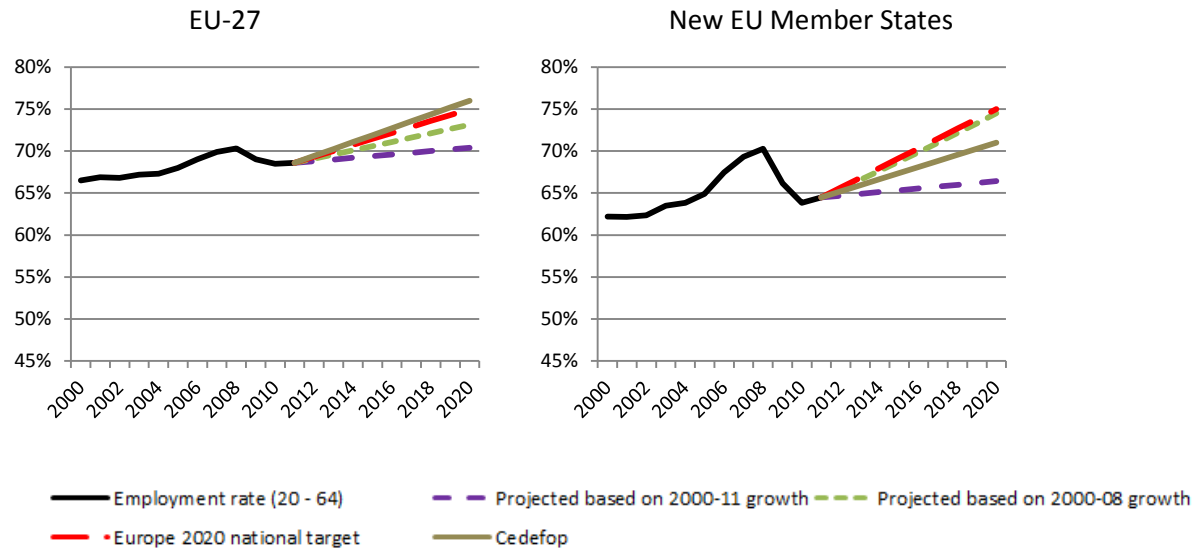
6. Results

This section presents the simulated poverty and social exclusion indicators (at-risk-of-poverty rates, low work intensity rates, and anchored poverty rates) that would result if each country achieved the Europe 2020 national targets in the following areas by 2020: (i) four separate employment outcomes; (ii) early school leaving rates; and (iii) tertiary school completion rates.[14] The three employment outcomes are described below and depicted in Figure 2. First, we assume that Europe 2020 national targets for employment rates are met by 2020. For the NMSs, achieving the national targets represents the best simulated outcome for employment rates. Second, we assume that, up until 2020, current employment rates will remain equal to the growth rate observed during the 2000–11 period. This is the least

[14] As discussed above, the poverty and social exclusion indicators are not as sensitive to the education variables in the short run and therefore, those simulations are not carried out in this paper.

attractive employment outcome for both the NMS group and the EU-27. In the case of the EU-27, if the 2000–11 employment growth rates continue to 2020, employment rates will be only 3 percentage points higher at the end of the period than they were in 2000. Similarly, in the NMS group, 2000–11 employment growth rates will only increase employment rates by 4 percentage points, from 62 percent in 2000 to 66 percent in 2020. Third, we assume that employment rates will grow until 2020 at the same growth rate observed during the 2000–08 period. In most NMSs and many EU-27 countries, 2000–08 marked a period of high economic growth, and hence, often coincided with fast-improving labor market indicators. In the NMS group, employment rates could reach 74 percent in 2020, compared to 62 percent in 2000, if the high growth scenario prevails and employment growth rates return to their 2000–08 pace. We assume that no country achieves a lower employment rate than that achieved in 2008. In instances in which a goal for 2020 that is lower than 2008 is set, we assume that the 2008 value will prevail. Fourth, we assume CEDEFOP's 2020 employment scenario for each NMS.[15] This employment scenario relies on expertise from a number of high-level European research institutions and the methodology is updated in CEDEFOP (2012). For the EU-27, this scenario represents the strongest employment growth scenario.

Figure 2: Employment rate trends, by regional aggregates



Source: World Bank staff calculations using EU-SILC data.

As described earlier, the employment and education targets are achieved by switching the most likely persons from the inactive or unemployed state into the employed state or from the lower educational attainment to the higher educational attainment according to each person's characteristics. We focus on at-risk-of-poverty rates, low work intensity, and anchored poverty because our simulation model is best suited to those indicators. The severe material deprivation indicator is omitted from the

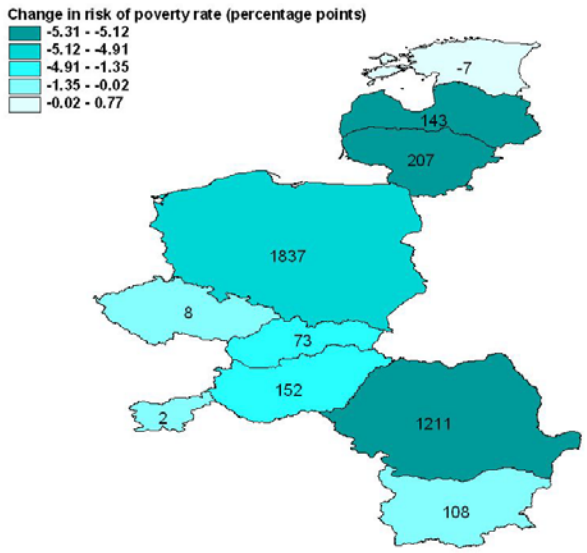
[15] CEDEFOP's employment scenarios for 2020 are available at: http://www.cedefop.europa.eu/EN/about-cedefop/projects/forecasting-skill-demand-and-supply/skills-forecasts/main-results.aspx?CountryID=31&case=ETBS.

following analysis because of the difficulty in specifying a satisfactory model for that indicator, which was confirmed in the validation exercise.

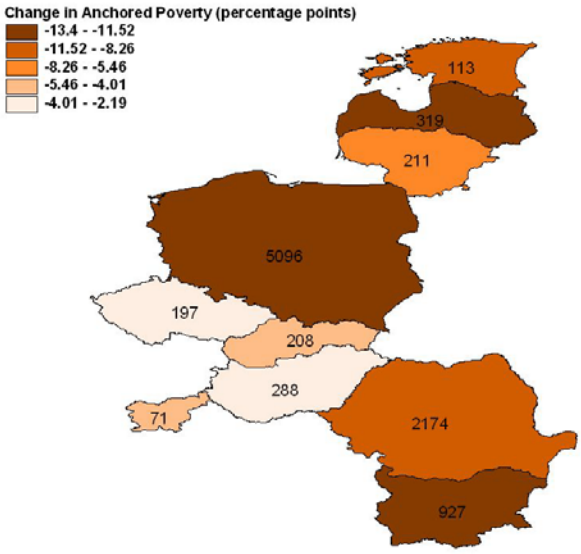
Our simulation model indicates that, by achieving the national targets for employment and education, the NMS group can decrease the number of people at risk of (relative) poverty by more than 3.7 million and low work intensity by about 3.0 million people by 2020.[16] Unsurprisingly, the most heavily populated countries in the NMS group are the biggest contributors to the reduction in poverty and social exclusion. Hungary, Poland, and Romania account for about 85 percent of the at-risk-of-poverty rate reduction and about 79 percent of the low work intensity reduction as a result of achieving 2020 national targets for employment and education. This is seen in Figure 3, which presents the simulated changes for each of three indicators, in both percentage point and absolute numbers of people lifted out of poverty or low work intensity, under the assumption of reaching national education and employment targets. Although Poland, Romania and Hungary contribute the most to the number of persons lifted out of at-risk-of-poverty, the most rapid rates of reduction are found in Latvia, Lithuania, and Romania, which are expected to reduce the proportion of the population at risk of poverty by around five percentage points between 2008 and 2020.

Figure 3: Simulated changes in risk of poverty, low work intensity and anchored poverty assuming national education and employment goals are met (shading shows changed rates in percentage points, numbers for each country are thousands of persons lifted out of poverty or low work intensity)

At Risk of Poverty

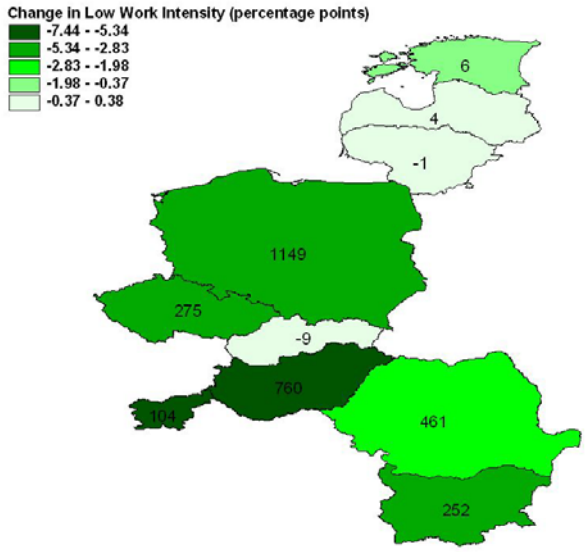


Anchored Poverty



Low Work Intensity

[16] Poverty and social exclusion rates and population estimates are from 2008.



Source: World Bank staff calculations using EU-SILC data.

Results from the simulation model indicate that anchored poverty rates will decrease significantly if countries achieve their national targets for employment and education by 2020, although the anchored poverty rate is not a Europe 2020 indicator. Anchored poverty could decrease by almost 9.7 million people in the NMS group. Poland alone could decrease anchored poverty by about 5.1 million persons and Romania by more than 2 million persons by 2020. Unlike at-risk-of-poverty and low work intensity, all countries are expected to reduce anchored poverty if they achieve their national educational and employment targets for Europe 2020. The simulation results show the fastest expected rate of anchored poverty reduction in Latvia, Poland, and Bulgaria (Table 5).

Under alternate employment scenarios, anchored poverty declines by 9.1 million people and 7.4 million people. If the 2000–11 employment patterns persist through to 2020, then anchored poverty could fall by 8.5 million people. If employment patterns of the crisis period (2008–11) are assumed, then anchored poverty could still fall by as much as 7.4 million people by 2020. If CEDEFOP's employment scenario for 2020 prevails, then the anchored poverty population could fall by 9.1 million people by 2020 relative to the 2008 population.

The at-risk-of-poverty rate is sensitive to the employment scenario considered, and NMSs have set ambitious goals relative to historic trends. The employment goals in the NMSs' National Reform Programs could reduce the number of people at risk of poverty by 3.7 million. As a point of comparison, even if employment growth in the NMSs returned to its rapid pace during the high growth period of 2000–08, the reduction is expected to be slightly less, at 3.5 million people. Should the more modest employment growth patterns seen in each of the NMSs during 2000–11 in the run up to 2020 occur, the number of people at risk of poverty could fall by about 2.4 million relative to the population in 2008. In the most pessimistic scenario, if the crisis period's (2008–11) employment patterns are assumed, but we further assume that employment rates do not decline below rates in 2008, the number of people at risk

of poverty could decline by 1.5 million. Finally, if CEDEFOP's employment scenario for 2020 prevails, then our simulations indicate that at-risk of poverty will decline by about 3.2 million people by 2020 relative to the 2008 population.

In most NMSs, a relatively large spread is observed in at-risk-of-poverty rates depending on the employment scenario considered. A particularly large spread is observed in Bulgaria, Estonia, Latvia, and Slovenia depending on the employment trajectory (Table 7). In Bulgaria, at-risk-of-poverty rates are simulated to be six percentage points lower when employment growth rates achieved during the high growth period (2000–08) are assumed, rather than assuming continuation of the employment growth rates achieved during entire 2000–11 period. The Czech Republic, Hungary, Poland, Romania, and Slovenia are expected to achieve more favorable at-risk-of-poverty rates if they reach the Europe 2020 national targets for employment by 2020 than if they reach the high growth years' employment scenario through to 2020. In the other five NMSs, the simulated at-risk-of-poverty rate is more favorable under the high growth period employment scenario than if the Europe 2020 employment target is reached. Bulgaria, Latvia, and Lithuania are expected to achieve lower at-risk-of-poverty rates under the CEDEFOP's employment scenario for 2020 than if countries achieved the Europe 2020 national employment targets.

In nine of the ten NMSs the at-risk-of-poverty rate is expected to fall if the Europe 2020 national target for employment is achieved, although in Bulgaria the magnitude of the reduction in the at-risk-of-poverty rate is small. In Estonia, at-risk-of-poverty rates are expected to increase marginally by 2020 if national targets for employment are met, mostly because the current employment rate is approximately the same as the 2020 employment target and, therefore, the change in the poverty rate is determined by factors such as demographic changes.

Table 7: Simulated at-risk-of-poverty rates

	2008	2020 [assuming national goals are met]	2020 [assuming 2000-11 growth rate]	2020 [assuming 2000-08 growth rate]	2020 (assuming CEDEFOP's forecast)	2020 [assuming 2008-11 growth rate]
Bulgaria	20.6	20.5	21.1	15.3	19.9	21.3
Czech Rep	9.3	8.9	9.4	9.0	9.1	9.9
Estonia	19.5	20.3	20.8	18.1	20.3	20.9
Hungary	12.4	11.1	13.0	12.7	12.0	13.0
Latvia	25.8	20.7	22.1	18.7	20.6	22.3
Lithuania	20.2	14.9	15.8	14.7	14.9	17.2
Poland	16.9	12.0	13.8	12.9	13.0	15.3
Romania	23.4	18.2	19.0	19.0	18.5	20.1
Slovakia	11.6	9.9	10.3	9.4	10.0	10.9
Slovenia	11.6	10.8	13.4	13.1	11.6	13.4

Source: World Bank staff calculations using EU-SILC data.

Note: We assume no deterioration in employment and education indicators by 2020 relative to their rates in 2008.

Compared to the 2008 population, the low work intensity population in the ten NMSs could fall by as much as 3.0 million people if the Europe 2020 national targets for employment and education are reached or by as little as 277,000 people if the crisis period's (2008–11) employment patterns persist. In other words, and unsurprisingly, employment rates in the run-up to 2020 matter a great deal when low work intensity is considered. If the 2000–11 employment patterns are assumed to persist through to 2020, then 1.4 million people are expected to drop out of the low work intensity category. If the more optimistic employment patterns of the high growth period (2000–08) are assumed, the population living in low work intensity households could be reduced by 2.7 million people. If CEDEFOP's employment scenario for 2020 prevails, then the low work intensity population could fall by 2.2 million people by 2020 relative to the 2008 population.

Low work intensity rates are highly dependent on the employment scenario in most NMSs. In Bulgaria, Hungary, and Slovenia, the spread of low work intensity rates is about 6 percentage points for the different employment scenarios considered here (Table 6). In Bulgaria, low work intensity rates will be considerably lower under the high growth period (2000–08) scenario, while in Hungary low work intensity rates will be considerably lower under the Europe 2020 national target scenario. On the other hand, in Romania the spread of low work intensity rates is fairly small, partly because employment rates remained relatively flat between 2000 and 2011, despite the high growth achieved during the 2000–08 period. In the Czech Republic, Hungary, Romania, and Slovenia, the Europe 2020 national targets are expected to yield the smallest low work intensity rates across the four scenarios considered here. In the remaining NMSs, the smallest low work intensity rates are observed when the 2000–08 employment growth scenario is considered.

In almost all NMSs, low work intensity rates decrease relative to their rates in 2008 as a result of achieving the national employment and education targets. In some countries, the decline is sharp, most notably in Hungary, where low work intensity rates could decrease from 16.2 to 8.8 percent if the Europe 2020 national target for employment and education is achieved by 2020. Slovenia could cut its low work intensity rate from 7.6 to 2.3 percent if it achieved its Europe 2020 national targets for employment and education. Bulgaria and the Czech Republic could also expect relatively large reductions in low work intensity rates if the countries achieved their own employment and education targets. Latvia, Lithuania, and Slovakia, however, show less promising results: Latvia's and Lithuania's low work intensity rates could increase only marginally by 2020 if national targets for employment and education are achieved, and Slovakia's could remain constant. This is not surprising given that all three countries enjoy very high employment rates, and hence, achieving the national targets will not have a significant impact on low work intensity rates. The reduction in the number of persons living in low work intensity households is expected to be greatest in Poland, Slovakia, and Romania. In Bulgaria, the Czech Republic, Latvia, and Lithuania, the percentage of people in the low work intensity category are expected to decrease by more under the CEDEFOP's employment scenario for 2020 than under the Europe 2020 national targets (Table 8).

Table 8: Simulated low work intensity rates

	2008	2020 [assuming national goals are met]	2020 [assuming 2000-11 growth rate]	2020 [assuming 2000-08 growth rate]	2020 (assuming CEDEFOP's forecast)	2020 [assuming 2008-11 growth rate]
Bulgaria	8.1	5.1	6.2	0.6	4.0	7.9
Czech Rep	7.3	4.4	7.0	6.1	3.2	7.0
Estonia	5.7	5.3	5.8	2.4	5.3	5.8
Hungary	16.2	8.8	15.8	14.9	13.0	15.8
Latvia	5.3	5.5	5.5	2.2	5.3	5.5
Lithuania	6.0	6.4	6.5	5.0	6.3	6.5
Poland	10.4	7.3	7.4	6.3	8.1	10.1
Romania	8.7	6.7	8.4	8.4	7.7	8.4
Slovakia	5.4	5.4	5.6	3.2	5.6	5.6
Slovenia	7.6	2.3	8.1	7.5	5.1	8.1

Source: World Bank staff calculations using EU-SILC data.

Note: We assume no deterioration in employment and education indicators by 2020 relative to their rates in 2008.

Anchored poverty rates are somewhat more stable across employment scenarios except in a few instances. The key exceptions are Bulgaria and Slovenia. In Slovenia, anchored poverty rates in 2020 are expected to be considerably lower under the Europe 2020 national target scenario than under any other scenario; while in Bulgaria, anchored poverty rates in 2020 are considerably lower under the 2000–08 employment growth rate scenario than any other employment scenario (Table 9). Achieving the Europe 2020 national targets is expected to lead the Czech Republic, Hungary, Romania, and Slovenia to enjoy the lowest anchored poverty rates across the different employment scenarios. In Bulgaria, the Czech Republic, Latvia, and Lithuania the CEDEFOP's employment scenario for 2020 yields a lower anchored poverty rate than achieving the Europe 2020 employment targets.

In most NMSs, anchored poverty rates can be expected to decrease significantly if countries achieve their national targets for employment and education. Poland can expect a sharp reduction in anchored poverty from 16.9 to 3.5 percent; Bulgaria from 20.6 to 9.0 percent; Latvia from 25.8 to 12.5 percent; and Romania from 23.4 to 13.6 percent. The smallest reductions in the anchored poverty rates are expected in the countries with the lowest anchored poverty rates, namely, the Czech Republic, Slovakia, and Slovenia.

Table 9: Simulated anchored poverty rates (percent)

	2008	2020 [assuming national goals are met]	2020 [assuming 2000-11 growth rate]	2020 [assuming 2000-08 growth rate]	2020 (assuming CEDEFOP's forecast)	2020 [assuming 2008-11 growth rate]
Bulgaria	20.6	9.0	10.1	5.0	8.2	10.6
Czech Rep	9.3	7.1	9.4	9.0	5.9	8.9
Estonia	19.5	11.3	11.7	9.1	11.3	11.6
Hungary	12.4	9.7	13.6	13.3	12.4	13.2
Latvia	25.8	12.5	12.4	9.7	12.3	12.0
Lithuania	20.2	14.8	14.3	12.0	14.7	14.2
Poland	16.9	3.5	3.6	3.1	4.0	5.1
Romania	23.4	13.6	15.3	15.1	14.4	17.9
Slovakia	11.6	7.5	7.2	5.2	7.6	6.8
Slovenia	11.6	7.6	11.6	11.3	9.1	11.3

Source: World Bank staff calculations using EU-SILC data.

Note: We assume no deterioration in employment and education indicators by 2020 relative to their rates in 2008.

Activating specific groups

Labor market activation measures are often targeted at specific groups. In this section, we simulate the impact on poverty and social exclusion that might result from activating lone (single) mothers, inactive family members, and people with disabilities before activating other groups into the labor force in order to achieve the national 2020 employment target. Regardless of the scenario, prioritizing any of the three groups in labor market activation measures reduces the anchored poverty rate, often significantly. The impact on at-risk-of-poverty rates, however, is ambiguous.

Prioritizing single mothers, inactive family members, and people with disabilities in labor force activation measures before other groups are activated, but yet achieving the 2020 national employment rate target, has a particularly large and favorable impact on anchored poverty reduction in Bulgaria, Latvia, Poland, and Romania (Table 10). The impact on at-risk-of-poverty rates is significant and favorable for Latvia, Lithuania, Poland, and Romania. However, in Bulgaria, the Czech Republic, and Estonia the at-risk-of-poverty rates *increase* if single mothers, inactive family members, and people with disabilities are activated before activating other groups in order to achieve the national 2020 employment target.

Table 10: Poverty and social exclusion impacts of prioritizing selected groups for labor force activation measures

	Scenario 1: More single mothers joining the labor force			Scenario2: Increasing family labor force supply			Scenario 3: Increasing disabled people in the labor force		
country	2008 at-risk-of-poverty rate (%)	Simulated at-risk-of-poverty rate for 2020 (%)	Simulated anchored poverty rate for 2020 (%)	2008 at-risk-of-poverty rate (%)	Simulated at-risk-of-poverty rate for 2020 (%)	Simulated anchored poverty rate for 2020 (%)	2008 at-risk-of-poverty rate (%)	Simulated at-risk-of-poverty rate for 2020 (%)	Simulated anchored poverty rate for 2020 (%)
Bulgaria	20.8	21.6	9.7	20.8	21.1	9.5	20.8	21.4	9.7
Czech Rep	9.3	10.6	7.0	9.3	10.6	6.5	9.3	10.5	6.9
Estonia	19.8	20.1	11.5	19.8	21.0	11.7	19.8	20.2	11.2
Hungary	12.4	11.8	9.7	12.4	10.3	7.7	12.4	11.9	9.8
Latvia	25.8	20.7	12.0	25.8	21.2	12.3	25.8	20.7	12.1
Lithuania	20.1	16.1	12.0	20.1	16.3	11.5	20.1	16.0	11.7
Poland	16.9	13.2	4.9	16.9	11.4	3.7	16.9	12.6	4.1
Romania	23.4	19.8	12.1	23.4	18.2	9.2	23.4	20.3	12.1
Slovak Rep	11.6	8.8	4.6	11.6	8.4	4.0	11.6	8.6	4.3

Source: World Bank staff calculations using EU-SILC data.

7. Focus on Poland: Increasing pre-school enrollment to achieve Europe 2020 poverty and social exclusion targets[17]

Poland has recently enacted and is debating potential measures focused on improving childcare (wider access to nurseries and kindergartens, support for baby sitters, new ways of financing childcare institutions, etc.). This is evident through recently adopted legislation as well as through specific targets set in the *National Development Strategy 2020* [*Strategia Rozwoju Kraju 2020*]. These policies set a 2020 pre-school enrollment target of 85 percent of 4-year-olds and assumes an impact on employment rates among youth (15- to 24-year-olds) of 30 percent, and among older workers (55- to 64-year-olds) of 40 percent (*MRR draft of November 2011, Wskaźniki, p.137*). In this section, we present the expected impacts based on applying a variant of our simulation model on poverty and social exclusion that might ensue from increasing employment rates as a result of higher access to pre-school enrollment in Poland. The data employed are the 2010 Polish Household Budget Survey and administrative data from the local data bank.

Access to childcare is treated as an instrument that can be arbitrarily altered so that it reaches the childcare target level in 2020, while keeping all other explanatory variables constant. The estimation model can then be summarized with the following equations:

1. Pr(Childcare = 1) = f(childcare access, H), where H stands for household characteristics

2. Pr(Employed =1) = f(childcare, I, H), where I stands for individual and H household characteristics

[17] This section is adapted from Bonch-Osmolovskiy and Topińska (2012).

3. Mincer equation: Log (Labor income) = f(X), where X stands for individual and household characteristics

After estimating the parameters of these three equations, it is possible to estimate poverty and social exclusion indicators for all households in Poland. For this analysis, we use the 2010 Poland Household Budget Survey (HBS 2010).[18]

The overall poverty impacts of meeting the 2020 target of 85 percent pre-school enrollment of 4-year-olds are not large. The at-risk-of-poverty rate for the entire 2010 population—estimated at 18.2 percent—would decrease by 0.27 percentage points. However, the impacts on specific sub-groups are significant. To illustrate, three scenarios are considered below (see Table 11 and Table 12). First, 20- to 59-year-old women with children observe a 5.1 percentage point increase in employment rates and a 1.3 percentage point decrease in poverty rates when childcare increases from 30 to 85 percent of 4-year-olds. Second, 20- to 59-year-olds with children observe a 3.0 percentage point increase in employment rates and a 0.7 percentage point decrease in poverty rates when childcare increases from 30 to 60 percent in large cities first. Third, 20- to 59-year-olds with children observe a 3.2 percentage point increase in employment rates and a 1.2 percentage point decrease in poverty rates when childcare increases from 30 to 60 percent in rural areas first.

Table 11: Simulated employment rate impacts resulting from changes in childcare enrollment among women (aged 20 to 59) with children (aged 2 to 6)

Target scenarios	Enrollment (%)	Employment (%)	*Percentage point change in employment*	*Employment relative change*
No policy	30.1	55.2	*x*	*X*
85% of 4-year-olds	79	60.4	*5.14*	*1.09*
60% of all children—increase childcare access in large cities first	60	58.3	*3.03*	*1.05*
60% of all children—increase childcare access in rural areas first	60	58.5	*3.25*	*1.06*
100% of all children	100	62.7	*7.42*	*1.13*

Source: Bonch-Osmolovskiy and Topińska (2012).

Table 12: Simulated poverty and social exclusion impacts resulting from changes in childcare enrollment among households with women (aged 20 to 59) with children (aged 2 to 6)

Target scenarios	Income poverty (%)	Low work intensity (%)	*Percentage point change in income poverty*	*Low work intensity abs (pp) change*
No policy change (actual figures)	21.2	6.2	x	X
85% of 4-year-olds	19.9	5.4	*−1.34*	*−0.80*
60% of all children—increase childcare access in large cities first	20.5	5.9	*−0.68*	*−0.28*
60% of all children—increase childcare access in rural areas first	20.0	5.7	*−1.21*	*−0.54*
100% of all children	19.2	5.2	*−2.04*	*−1.01*

[18] The HBS 2010 rather than EU-SILC is used because it provides more recent information on social benefits, including childcare-related variables.

Source: Bonch-Osmolovskiy and Topińska (2012).

8. Conclusions

This study sheds light on the impact of improving employment and education conditions on poverty and social exclusion indicators in ten NMSs. The paper presents a simple partial equilibrium model that is flexible enough to be implemented in a number of different settings using widely available data. The simulation model analyzes poverty and social exclusion outcomes when employment and education indicators are altered. The model incorporates the key structural relationships between education, employment probability, labor earnings conditional on employment, individual and household income, and measures of risk of poverty and social exclusion. The model structure is straightforward, and is designed to take advantage of the widely available EU-SILC data, ensuring that it can be useful to a large number of analysts in any country with EU-SILC data.

The microsimulation model has some limitations, namely the assumption that structural parameters are stable over time and its partial equilibrium approach. The former limitation may be particularly important because pre-financial crisis (2008–2010) data are used to simulate post-crisis structural relationships. A validation exercise shows that the microsimulation model performed well at predicting at-risk-of-poverty, anchored poverty, and low work intensity outcomes over the 2005–2008 period. However, performance at predicting severe material deprivation was poor, echoing results of other researchers.

The paper takes as a starting point the assumption that Europe 2020 national targets for increased employment and education will be met, demonstrating how the different pillars of the Europe 2020 strategy may reinforce one another. We find that at-risk-of-poverty incidence could decrease by more than 3.7 million people and low work intensity by about 3.0 million people by 2020 if NMSs achieved their national targets for employment and education.[19] More significantly, anchored poverty could fall by about 9.6 million people in the NMSs when countries achieve their 2020 employment and education targets. Although anchored poverty is not an explicit Europe 2020 target, it is an important indicator of progress in improving poor people's quality of life.

The microsimulation model presented in this paper permits alternative assumptions, such as falling short of—or surpassing—the 2020 education and employment targets. It also lends itself to a range of policy simulations, such as the impact of changes in social transfer levels, targeting of increases in education or employment to particular population sub-groups, and other policies, some of which will be explored in future work. As a result, we believe that it provides an important and practical analytical tool for countries to help simulate quantitative outcomes to policy reforms.

[19] Poverty and social exclusion rates are calculated in 2008 and populations are from 2010.

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Annex

Oaxaca-Blinder decomposition (2005–2008) of the latent characteristics and returns to characteristics

	Total difference in log(wage,2008) and log(wage,2005)	Latent characteristic effect	Returns to characteristics effect
Czech Republic	0.1810	0.0118	0.1690
Estonia	0.3550	0.0006	0.3540
Spain	0.0265	0.0045	0.0220
Greece	−0.0074	0.0387	−0.0461
Hungary	0.0229	0.0448	−0.0218
Ireland	0.0097	0.0318	−0.0221
Italy	−0.0327	0.0178	−0.0506
Lithuania	0.3700	0.0291	0.3410
Latvia	0.2110	0.0193	0.1920
Poland	0.3460	−0.0802	0.4260
Sweden	0.1090	0.0509	0.0586
Slovakia	0.2320	−0.0253	0.2580

Source: World Bank staff calculations using EU-SILC data.