



Working Paper Series

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ECINEQ WP 2015 - 355

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Abstract

We analyse the effect of globalisation on the incidence of in-work poverty in advanced European countries. We firstly develop an analytical framework that provides bases for the empirical work. Using the EU-SILC database between 2005 and 2010 supplemented by macro-data, we apply both a fixed effect model at the country level and a multilevel model at the individual level. In line with the analytical predictions, trade with emerging countries has a positive and significant effect on in-work poverty whereas the effect of trade with developed countries is non-significant. The impact of social protection indicators is non-significant as well, which suggest that the efficiency effect and the compensation effect could balance each other. Hence, globalization has a positive effect on in-work poverty, which is essentially based on trade with emerging countries.

Keywords: Working poor, globalisation, Europe.

JEL Classification: F66, H26, I32, J31, J32.

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1. Introduction

This paper analyses the impact of globalization on in-work poverty in advanced European countries.

Since the early eighties, in-work poverty has increased in most advanced countries, first in the US and the UK, and subsequently in continental European countries. This development of in-work poverty has been concomitant with the rise in income inequality. This connection is not surprising because, if inequality comes with lower gains at the bottom of income distribution, then the probability to become working poor increases with inequality.

Over the same period, the world economy has experienced a sizeable globalization process. Globalization is multidimensional. It firstly relates to trade openness, with an increase in international trade that has been particularly vigorous in emerging countries ('the South'). The share of the South in international trade has substantially increased, principally for trade of manufacturing. Another trait is the acceleration of the multinationalisation of firms, which can be measured by the huge increases in FDI (Foreign Direct Investments) and offshoring. The considerable increase in capital mobility, both physical and financial, represents another key element of globalization. Finally, globalization has made the countries become increasingly interdependent in their policies and institutions. This is particularly the case amongst advanced countries ('the North') because the almost perfect capital mobility between them generates tax and social competition.

An abundant literature has analysed the impact of globalization on poverty in developing countries (reviews by Winters, 2004, and Winters et al., 2004). The impact of globalization upon inequality in advanced economies has also given rise to a large number of works, both theoretical and empirical (reviews by Chusseau et al., 2008, and Chusseau and Hellier, 2012). In contrast, the analysis of the globalization-poverty relationship in advanced countries is far less developed, and the analysis of the influence of globalization upon the working poor in these countries is even scarcer.

Our study is based on the fact that the mechanisms that increase inequality by lowering the pay at the bottom of the income ladder are likely to increase in-work poverty. We shall therefore utilise the literature on the globalization-inequality nexus so as to determine the impact of globalization on in-work poverty.

Over the last thirty years, advanced economies have experienced a general increase in income inequality. Initiated in the US from the late 1970s, growing inequality has subsequently spread to all developed economies. In Europe, this now concerns all countries.

Three main explanations have been given for the surge in inequality, namely, globalization (particularly North-South trade), technological change and institutional changes. If in the US technological change seems to have been the main driver, the impact of globalization, particularly offshoring to emerging countries of unskilled-intensive stages of production, has played a key role in a number of European countries. In addition, globalization has come (i) with a significant decrease in the statutory corporate tax rates and top marginal income tax rates, and (ii) with a regression in the Welfare state in a number of advanced economies. This can increase in-work poverty by erasing redistribution and social transfers.

From the aforementioned stylised fact, one can reasonably suspect that globalization has had a non-negligible impact upon in-work poverty. There is thus room for the analysis of the relationship between the two phenomena. However, to our knowledge, few empirical investigations have been implemented on the subject (Cormier & Craypo, 2000, is an exception). This paper attempts to fill this gap.

Globalization may influence in-work poverty through its impacts on the poverty line, the income and the reservation wage. In addition, globalization may act through its several dimensions, i.e., North-South trade and offshoring, North-North trade, capital mobility and financial liberalization, and their consequences in terms of taxation and redistribution.

We firstly provide an analytical framework that binds in-work poverty to globalization. From this basis, we subsequently estimate the impact of the several dimensions of globalization upon the incidence of in-work poverty.

We use six rounds of the *European Statistics on Income and Living Conditions* (EU-SILC) to estimate the effect of globalization on the working poor in 16 advanced European countries from 2005 to 2010. Two definitions of the poverty line are utilised, i.e., at 60% of the median income and at 50% of the average income. Globalization is divided in several dimensions: imports of manufacturing from emerging countries (North-South trade and offshoring), trade with advanced countries (North-North trade) and globalization-driven changes in social protection.

We implement a twofold empirical strategy. Based on aggregate data by country, we firstly analyse the determinants of the share of working poor in the working population by using a two-way fixed effect estimator. The second strategy follows a multilevel modelling which analyses the individual probability to be working poor by considering both individual characteristics and countries' macro-contexts, in which the different dimensions of globalisation.

We find evidence of the specific effect of globalization on in-work poverty. In line with the analytical predictions, imports of manufacturing from emerging countries have a positive and significant effect on in-work poverty whereas the effect of trade with developed countries is non-significant. Moreover and as expected, the impact of globalization is clearly larger when considering the poverty line based on the average income than that based on the median income. Finally, the impact of social protection indicators is ambiguous, which suggest that the efficiency effect and the compensation effect could balance each other.

The paper is organised as follows. Section 2 provides an overview of the literature related to the subject. Section 3 presents the analytical framework that binds in-work poverty to globalization. The empirical strategy, the variables and the data are exposed in Section 4. The results are presented in Section 5. We discuss these findings and conclude in Section 6.

2. Literature

Our work is based on the fact that, if income inequality is positively related to globalization, and in-work poverty to inequality, then globalization should impact in-work poverty. The sense of the relation is not inevitably positive because (i) globalization could act on in-work poverty through other channels than inequality, and (ii) the mechanisms that bind inequality to globalization are diverse and sometimes conflicting, and the overall impact thus depends on their respective weight.

The following review firstly focuses on the mechanisms by which globalization is inequality-enhancing because the same mechanisms typically increase in-work poverty. We subsequently examine the literature on the working poor's characteristics.

2.1. Globalization, inequality and the working poor

Since the late eighties, an abundant theoretical and empirical literature has analysed the impact of globalization on inequality within advanced economies¹.

Four strands of analysis that explain how globalization increases inequality within advanced economies may be identified. The first lies on the traditional comparative advantage approach to trade. The second analyses the impact of globalization within 'new' international economics theories, particularly Melitz's approach. The third shows how globalization fosters skill-biased technical change. The last studies globalization-driven changes in institutions.²

¹ Reviews in: Chusseau & Dumont (2012), Chusseau and Hellier (2012), and Chusseau et al. (2008).

² We do not present the literature on globalization and job polarization. Gleicher & Stevans (2005) analyse in-work poverty with job polarization, but do not introduce globalization.

2.1.1. Comparative advantage, trade and inequality

A simple way to generate wage inequality is to assume trade openness into a North-South Heckscher-Ohlin-Samuelson (henceforth NS-HOS) model with a skill-abundant North and an unskilled-abundant South. In each country, openness raises the price of the relatively abundant factor and lowers the price of the relatively scarce factor. In the North, the wage of the unskilled decreases and the skill premium and inequality increase. However, if the NS-HOS model generates inequality in advanced countries, most of its predictions are at odds with observed facts, due to constraining and over-simplified hypotheses. A number of theoretical works have thus extended the model by adding more accurate assumptions. In particular, the HOS framework has been extended by assuming imperfections on the labour market³, differences in talent across workers (Haskel et al., 2012), etc. Hellier (2012a) shows that the extension of the NS-HOS approach by relaxing its most simplifying assumptions provides a rather reliable picture of the globalization-inequality-unemployment nexus. In addition, following Feenstra & Hanson (1996), several models have shown that offshoring to the South the unskilled-intensive stages of production typically increases inequality.⁴

The first stand of empirical works implemented in the early 1990s came to the conclusion that trade had had a small or negligible impact on inequality, particularly for the US (Borjas et al, 1992; Katz & Murphy, 1992; Krugman & Lawrence, 1993; Lawrence & Slaughter, 1993). Challenged by Wood (1994), this first diagnosis has subsequently been revisited. A new set of empirical works has particularly studied the impact of offshoring to emerging countries, leading to the conclusion that this type of trade has significantly influenced the demand for skill and inequality in a number of advanced countries (Crino, 2009 for a survey). This diagnosis has been confirmed by works on the impact of FDI outflows from the North to the South. Krugman, who was formerly a fervent defender of the weak impact of globalization on inequality, explains this renewal of the North-South trade explanation by the huge increase in the size of the South since the early estimates were implemented (Krugman, 2008).

2.1.2. Heterogeneous firms, trade and Inequality

Another strand of literature is based on Melitz (2003) model that combines a Dixit-Stiglitz monopolistic competition approach with firms' heterogeneity in terms of productivity. In this model openness results in a distinction between domestic-oriented firms and exporting firms,

³ Minimum wage (Davis, 1998), a fair wage hypothesis (Agell & Lundborg, 1995; Albert & Merckl, 2001; Kreckemeier & Nelson, 2006), matching combined with comparative advantage and increasing returns to scale (Helpman & Itskhoki, 2010)

⁴ Models where offshoring increases inequality can be found in Gao (2002) and Glazer & Ranjan (2003). In contrast, offshoring reduces inequality in Arndt (1997), Venables (1999) and Jones & Kierzkowski (2001).

the latter displaying higher profits. By inserting labour market imperfections (fair wage, search and matching frictions)⁵ into the model, several works found that openness fosters inequality.

From an empirical point of view, Melitz model provides a theoretical explanation for the previously noted fact that exporting firms were typically more profitable and offered better pay than purely domestic firms (Bernard & Jensen, 1995 and 1997). Most empirical works confirm that, when firms are heterogeneous, trade raises profit and wage differences (Bernard et al., 2007; Frias & Kaplan, 2009) and wage inequality (Egger et al., 2013).

2.1.3. Globalization-driven skill biased technological change

Several theoretical works have shown that globalization may increase inequality by encouraging skill biased technological change (SBTC), i.e., by fostering skill intensive technologies and driving R&D in this direction. SBTC typically results in lower relative demand for unskilled workers, and a derived increase in the skill premium and inequality. Initiated by Wood (1994), this idea has subsequently been soundly justified and modelled by Thoenig & Verdier (2003). The main explanation is that, when property rights on patents are poorly enforced in the South, northern firms are encouraged to boost technologies in which the South suffers a disadvantage, i.e., skill-intensive ones⁶.

Finally, a number of empirical works have confirmed that globalization can encourage SBTC (Morrison Paul & Siegel, 2001, for the impact of trade on computerization in the US; Bloom et al., 2011, for the impact of imports from China on technical change in EU countries).

2.1.4. Globalization, tax competition and social protection

On top of its interplay with labour market institutions, globalization can impact on inequality by modifying redistribution and social protection. This firstly occurs in the cases of tax and social competition, which essentially relates to North-North globalization.

Since the seminal article of Zodrow & Mierzkowski (1986)⁷, it is commonly admitted that international capital mobility (one of the striking characteristics of globalization) generates corporate tax competition (CTC) that leads to a ‘race to the bottom’ and lower social welfare. This can increase the number of working poor when the cut in corporate levies induces cuts in social transfers.

⁵ Amiti & Davis, 2011, and Egger & Kreickemeier, 2012, for the first; Helpman et al., 2010, for the second.

⁶ Other approaches in which globalization fosters SBTC can be found in Acemoglu (1998, 2003).

⁷ Extended by Wildasin (1988), Bucovetsky & Wilson (1991), Wilson (1999) and Kanbur & Keen (1991).

CTC has been tested and estimated in several ways, leading to mixed diagnoses. The works that attempt to verify the existence of strategic interactions (Zodrow, 2010, for a review) or to estimate the impact of corporate taxation upon FDI inflows (reviews by De Mooij & Ederveen, 2008, and Devereux & Maffini, 2007) have clearly confirmed CTC. In contrast, estimating the impact of higher capital mobility or growing globalization on corporate taxation leads to mixed evidence. CTC is confirmed when corporate taxation is measured by statutory tax rates (Benassy-Quéré et al., 2007; Cassette & Paty, 2008; Devereux et al., 2008; Devereux & Fuest, 2012), but it is denied when corporate taxation is measured either by the corporate taxes on GDP ratio, or by the effective corporate tax rate, i.e. the ratio of corporate levies on corporations' profits.⁸

Higher mobility of the most skilled and richest workers can identically lead to an income tax competition which reduces both the top marginal income tax rate (the rate applied to the highest tax bracket) and the amount of levies available for redistribution. The decline in the top marginal income tax is observable in all advanced economies (Förster et al., 2014). As modelled by Lehmann et al. (2014), mobility at the top of income and wealth distribution incites governments to lessen the top marginal income tax rate as well as wealth and inheritance taxation. This generates a 'race to the bottom' as regards tax progressiveness.

Finally, globalization can modify social expenditure and the welfare state in two opposite ways. First, cost competition between advanced countries can create a race to the bottom as regards employment and social protection, i.e., social competition. This is referred to as the *efficiency effect*. Second, since social risks linked to global competition have risen, governments are incited to increase social expenditure to insure workers against these new risks. This is the so-called *compensation effect*.

The literature on social competition is recent and essentially empirical. As in the case of tax competition, there are several ways to test social competition. The first consists in assessing the impact of social and employment protection upon multinational firms' FDI. Görg (2002), Javorcik & Spatareanu (2005), and Dewit et al. (2009) find that higher labour standards have a negative impact on FDI inflows, a result however challenged by Kucera (2002) and Rodrik (1996). Olney (2010) shows that employment protection has had a significant negative impact on American multinational firms' FDIs. A second way to assess social competition is to test the strategic interactions between the countries' social policies. If social protection in one country is positively related to that in other countries, this is an

⁸ Slemrod (2004), Mendoza & Tesar (2005), Dreher (2006), Devereux et al. (2008) Devereux & Fuest (2012).

indication of a race to the bottom. Positive interactions were found by Olney (2010) and Davies & Vadlamannati (2013).

A third type of empirical works consists in estimating the impact of globalization on public social expenditure (as a percentage of GDP) so as to diagnose which of the efficiency effect and compensation effect has prevailed. The results are rather mixed. The number of works finding a negative impact is broadly equal to the number of those diagnosing a positive impact (Gemmels et al., 2008), and several works find no significant relationship.

From the reviewed literature, it appears that:

1. North-South globalization essentially impacts on inequality through trade and offshoring based on the South comparative advantage in unskilled labour, and to a lesser extent through trade-driven SBTC. These three channels jeopardise the wage position of less skilled workers.

2. North-North trade can reduce inequality by increasing efficiency and increase redistribution, but it can also increase inequality through Melitz-type mechanisms.

3. Factor mobility creates tax and social competition that reduces redistribution and social norms, raising thereby inequality and in-work poverty (the efficiency effect).

4. Globalization can in contrast expand the social net when the government decides to compensate the new social risks due to globalization (the compensation effect).

2.2. The working poor: major characteristics

The notion of working poverty appeared in the United States at the time of the Great Depression and it was renewed in the sixties (Harrington, 1962). In-work poverty has become a major concern and its analysis has been considerably developed since the early eighties with the growth in poverty observed in the US and the UK. In the last thirty years, growing in-work poverty has been diagnosed in a majority of advanced countries. In the European Union, the working poor have become a key concern since the nineties (Kalugina, 2012). Though, the researches in this field have remained almost exclusively empirical and centred on the main determinants and characteristics of in-work poverty.

In most countries, the working poor are defined as persons who work⁹ and belong to a poor household, i.e., a household below the poverty line.

The working poor characteristics have been divided between professional, personal, family and more rarely institutional/country specific characteristics (Kalugina, 2012, for a review). The impact of these characteristics on the incidence of working poverty may differ across countries. However, it is possible to portray the main traits of the working poor. They are

⁹ According to the definition, these can be limited to employed workers only or can include the unemployed.

generally young and low-skilled men¹⁰, with insecure professional positions such as temporary contracts and part-time jobs (OECD, 2009; Lohmann, 2006, 2008 and 2009; Guillén et al., 2009; Peña-Casas, 2009).

The probability to be working poor is higher for single parents and for families with one unemployed parent, and this probability increases with the number of children. Belonging to an ethnic minority, particularly immigrants, increases the risk of in-work poverty. Being low-paid is a key characteristic in the US, but not in Europe. Finally, in-work poverty is correlated to general poverty and inequality (Guillén et al., 2009). Most of the characteristics of the working poor are typically close to those of the poor in general.

Several comparative studies on Europe have attempted to account for countries' institutional contexts (Allègre, 2008; Andreß & Lohmann ed., 2008; Fraser et al., 2011; Peña-Casas & Latta, 2004). This context reflects welfare state benefits and labour market institutions (trade unions, wage bargaining, social transfers and unemployment benefits) and the studies are often based on a typology of welfare systems. The results are rather mixed. If most studies diagnose that the Southern European system ('familialist') comes with more working poor, the other systems (social democrat in Nordic countries, conservative in continental Europe and liberal in Anglo-Saxon countries) show rather weak differences. In particular, the social democrat and liberal systems which are the most opposite have rather similar results in terms of in-work poverty (Peña-Casas & Latta, 2004; Lohmann & Marx, 2008). Finally, working-poverty rates substantially diverge across Continental European countries.

Few works have analysed the impact of globalization on the working poor. The results of Cormier & Craypo (2000) suggest that globalization and industrial restructuring could foster in-work poverty. Hellier (2012b) provides a simple explanation for this. If North-South openness reduces the real wage of the less skilled, a proportion of these workers may fall under the poverty line. The number of working poor can however be simultaneously lessened when the same reduction makes certain workers fall in exclusion and leave the labour market.

3. Analytical framework

As already noted, there are no well-established theoretical bases that bind globalization to the working poor. We do have a large literature on the impact of globalization on inequality, but higher inequality does not *ipso facto* mean more working poor. This section provides an

¹⁰ Allègre, 2008, Eurofound, 2010, Elodie et al., 2006, Gießelmann & Lohmann, 2008, Peña-Casas, 2009 for Europe; BLS, 2011; Gleicher & Stevans, 2005, for the US.

analytical framework to analyse the influence of globalization on the working poor. The analysis is based upon the impact of globalization on (i) the pre-tax and redistribution incomes, (ii) taxes, social transfers and unemployment benefits, and (iii) the poverty line. The working poor are individuals whose potential wage is above their reservation wage and who are under the poverty line. We show that this corresponds to personal attributes and abilities which are located between two limits. The upper limit is related to the poverty line and the lower limit to the reservation wage. We then analyse the way globalization acts upon these two limits by modifying labour and capital incomes and institutions (redistribution and unemployment benefits). These variables are those that will be used in the subsequent empirical work.

3.1. In-work poverty: key determinants

We define the condition for an individual to be working poor and we examine the different factors affecting this condition.

3.1.1. The condition to be working poor

Consider individual i whose wage is determined by her/his efficient labour (productivity). If efficiency differs across individuals, this results in different wages across workers. Let w_i be individual i 's labour income, identified to wage for the sake of simplicity.

Let $r_{P,i}$ be the private capital income and rents (henceforth *private rents*) received by individual i , $r_{G,i}$ the net public transfers (unemployment benefits not included) s/he receives from the government, and $b_{U,i}$ the benefits s/he receives when being unemployed.

Let finally \underline{w}_i be individual i 's reservation wage (its determination is exposed hereafter).

The personal income of individual i when s/he works is thus $I_i = w_i + r_{P,i} + r_{G,i}$.

We denote \underline{I} the personal income corresponding to the poverty line.

Suppose that there is no involuntary unemployment. Individual i works if $w_i > \underline{w}_i$ and s/he is poor if $w_i + r_{P,i} + r_{G,i} < \underline{I}$. By combining the preceding two conditions, we determine the condition for an individual to be working poor:

$$\underline{w}_i < w_i < \underline{I} - r_{P,i} - r_{G,i} \quad (1)$$

When there is no involuntary unemployment, all the individuals verifying (1) are working and this condition is necessary and sufficient to be working poor. When there is involuntary

unemployment, some individuals verifying (1) may be unemployed and condition (1) is necessary, but not sufficient, to be working poor.

In any case, shifts in the different factors defining relation (1) modify the probability to be working poor. To analyse the occurrence of in-work poverty, we can thus study the factors that modify the components of both inequalities $w_i < w_i$ and $w_i < \underline{I} - r_{P,i} - r_{G,i}$.

3.1.2. The poverty line \underline{I}

In our approach, the poverty line is determined in terms of income.¹¹ In this respect, two definitions can be considered.

The first and most usual is based on a certain percentage of the *median* income. In most cases, the threshold of 60% of the median income is selected to determine the poverty line. This is what we do here. However, this threshold suffers a weakness, namely, when the median income decreases at the same rate as bottom incomes, then the impoverishment of the latter is erased by the lowering of the median income-related poverty line.

Another way to measure the poverty line is to define a *deprivation* threshold in terms of income. This covers two types of deprivation: 1) a deprivation in terms of minimal consumption value, and thus a minimum income; 2) a deprivation in terms of relative income, which depicts the feeling of individuals who get poorer in relation to others and consider themselves as poor. A convenient way to combine both types of deprivation is to define the poverty line as a percentage of the *average* income. Actually, the normal ‘basic’ consumption typically changes with time and it increases with the society purchasing power. In addition, the average income can be seen as a norm for the poor and a growing gap between the poor’s income and the average income is a good measure of relative income deprivation. As a consequence, and since the average income is typically higher than the median income, we shall define the second poverty line at 50% of the average income.

In short, we shall consider two poverty lines. The first is defined by 60% of the median income threshold, and the second by 50% of the average income threshold. Formally, the average income related poverty line is:

$$\underline{I}^A = 0.5 \times I^A = 0.5 \left(w^A + r_P^A + r_G^A \right) \quad (2)$$

where superscript A indicates an average value.

¹¹ Another type of definition consists in defining a basic basket of goods necessary to have a ‘normal’ life. Then, a household is poor if more than a given number of these goods are missing. Our second definition permits to consider the income linked to a minimum basket of goods.

In the case of the median income based poverty line, we have $\underline{I}^M = 0.6 \times I^M$ where superscript M signifies ‘median’.

Finally, we make the usual assumption that the median income is lower than the average income ($I_M < I_A$) and we also suppose that both the labour income w and the private rents r_p are higher on average than for the median income: $w^M < w^A$ and $r_p^M < r_p^A$.

3.1.3. Labour income w_i

Labour income depends on several dimensions. Firstly, and particularly when considering the competition from emerging countries (the South), it is important to make a distinction between skilled and unskilled workers. On top of that, we cannot just divide the population into two homogenous groups because we need heterogeneity across unskilled workers so as to distinguish poor from non-poor unskilled workers.

A simple way to model such a situation is to assume that a worker is defined by two characteristics, i.e., her/his cognitive skill h_i (henceforth *skill*) and her/his non-cognitive personal attributes λ_i (henceforth *personal attributes*). The former depicts the individual’s education level and experience and the latter gathers the personal attributes that impact upon her/his productivity such as health, strength, non-cognitive skills (self-confidence, appearance etc). Personal attributes are distributed inside the interval $[\underline{\lambda}, \bar{\lambda}]$.

To be a skilled worker, an individual must at least possess the cognitive skill level \underline{h} .

An unskilled worker is paid $w_L \lambda_i$ and a skilled worker $w_H \eta_i$, with $\eta_i = h_i \lambda_i$, w_L and w_H being the wage per efficient unit of unskilled and skilled workers respectively. We assume $w_H \underline{h} > w_L$ so that anyone with a skill higher than \underline{h} prefers to be a skilled worker. Then individual i endowed with skill h_i and personal attributes λ_i receives the following wage w_i when working:

$$w_i = \begin{cases} w_L \lambda_i & \text{if } h_i < \underline{h} \\ w_H \eta_i & \text{if } h_i > \underline{h} \end{cases} \quad (3)$$

Note that the wages of unskilled and skilled workers typically overlap because the personal attributes may offset the skill-related difference in wage.

We finally suppose that the reservation wage is effective for at least certain individuals.

Without loss of generality, we can write $\lambda_L^A = 1$, with λ_L^A the average personal attribute of unskilled workers.

From the above assumptions, it is clear that the average wage is:

$$w^A = q_L w_L + q_H w_H \eta_H^A \quad (4)$$

with η_H^A the average η of skilled workers, q_L and q_H the proportions of unskilled and skilled workers in the working population.

3.1.4. Private rents $r_{P,i}$

For the sake of simplicity, private rents $r_{P,i}$ are defined as incomes from capital. Assuming that capital assets holdings differ across individuals, we can write:

$$r_{P,i} = r_P \times k_i \quad (5)$$

where k_i are the assets possessed by individual i and r_P the return rate of assets.

We make the additional two assumptions that (i) the poor and the individuals who are under the poverty line as well as at its upper vicinity have no capital and thus no private rents, which is a rather reasonable hypothesis, and (ii) the assets owned by the median income earner are lower than the average asset holding (which is always the case given the distribution of wealth amongst individuals in all countries).

3.1.5. Public transfers and unemployment benefits

We assume a redistribution scheme such that the individual's net transfer is proportional to the difference between the average income and her/his income before redistribution $w_i + r_{P,i}$:

$$r_{G,i} = r_G (I^A - w_i - r_{P,i}) \quad (6)$$

where superscript A indicates an average value, $I^A = w^A + r_P^A$ is the average income and $0 \leq r_G < 1$ is the income tax that measures the redistribution intensity (this scheme is similar to an income tax at rate r_G utilised to give everyone the same lump sum transfer).

Straightforwardly, the average net public transfer is nil.

Individual i 's after-redistribution income $I_i = w_i + r_{P,i} + r_{G,i}$ is:

$$I_i = (1 - r_G)(w_i + r_P k_i) + r_G I^A \quad (7)$$

We finally suppose that non-working individuals receive unemployment benefits. These simply consist of a certain proportion $b_U < 1$ of what the individual would earn if s/he had a job. We further assume that unemployment benefits are funded by a social contribution paid by the sole skilled workers. This assumption permits to ignore the impact of the funding of

unemployment benefits upon the workers close to the poverty line, given that skilled workers are typically not poor. We thus write:

$$b_{U,i} = b_U \times w_i, \quad 0 \leq b_u < 1 \quad (8)$$

3.1.6. The reservation wage

The individual's income when working is defined by equation (7).

Assume that individuals receive unemployment benefits when they do not work. Her/his non-working income $I_i^U = b_{U,i} + r_{G,i} + r_{P,i}$ is thus:

$$I_i^U = (1 - r_G)(b_U w_i + r_P k_i) + r_G I^A$$

We suppose that, on top of I_i^U , the non-working individuals' effective incomes must be augmented by a certain extra-revenue $\delta_i = \delta \times \lambda_i^\beta$, $0 < \beta < 1$, that depicts the goods and services the individual can self-produce when being out of the labour market. The exponent β , $0 < \beta < 1$, indicates that the marginal productivity of (efficient) labour is decreasing in the self-production function. The effective non-working income I_i^E can be written:

$$I_i^E = (1 - r_G)(b_U w_i + r_P k_i) + r_G I^A + \delta \lambda_i^\beta$$

Finally, the reservation wage is the wage \underline{w}_i that equalises the income when working I_i with the effective non-working income I_i^E :¹²

$$\underline{w}_i = \frac{\delta \lambda_i^\beta}{(1 - r_G)(1 - b_U)} \quad (9)$$

It can be easily checked that \underline{w}_i increases with both r_G and b_U .

3.2. The impacts of income shifts upon in-work poverty

We suppose that all working poor are unskilled workers. This is consistent with the evidence that unskilled workers account for the large majority of the working poor. In addition, even if a limited number of highly educated individuals can fall in working poverty, it is very unlikely that, then, they have a skilled professional position. In fact, they typically occupy unskilled positions even if they are skilled.¹³

¹² $(1 - r_G)(b_U \underline{w}_i + r_P k_i) + r_G I^A + \delta \lambda_i^\beta = (1 - r_G)(\underline{w}_i + r_P k_i) + r_G I^A \Rightarrow \underline{w}_i = \delta \lambda_i^\beta / (1 - r_G)(1 - b_U)$.

¹³ Because of skill obsolescence due to technological change, shrinkage in aptitudes due to affective disorder etc.

Proposition 1. *The condition for individual i to be working poor is:*

$$\underline{\lambda} < \lambda_i < \tilde{\lambda} \tag{10}$$

with:

$$\underline{\lambda} = \left(\frac{\delta}{w_L(1-r_G)(1-b_U)} \right)^{1/(1-\beta)} \quad \text{and} \quad \tilde{\lambda} = \frac{\underline{I} - r_G I^A}{(1-r_G)w_L}$$

Proof: Appendix A.

For given values (i) of the unskilled labour unit wage w_L , the redistribution rate r_G and the unemployment compensation rate b_U , (ii) of the average income I^A and (iii) of the poverty line \underline{I} , condition (10) determines a *set of working poor* which is the interval $[\underline{\lambda}, \tilde{\lambda}]$ defined in terms of personal attributes.

The set of working poor can move by its two sides, $\tilde{\lambda}$ and $\underline{\lambda}$. An increase in $\tilde{\lambda}$ corresponds to the passage of certain non-poor workers below the poverty line, i.e., an increase the number of working poor by the top. A decrease in $\underline{\lambda}$ signifies that the potential wage of certain non-working individuals moves above their reservation wage, which make them join the set of working poor and increase the number of working poor by the bottom.

In what follows, we thus analyse the impact of changes in the different components of income (wages, rents, social transfers and unemployment benefits) upon each limit of the set of working poor ($\tilde{\lambda}$ and $\underline{\lambda}$) and thus on the incidence of working poverty.

3.2.1. Impacts of income shifts upon the lower limit of the set of working poor $\underline{\lambda}$

Proposition 2. *The lower limit of the set of working poor $\underline{\lambda}$:*

- 1) *increases with the redistribution rate r_G and the unemployment compensation rate b_U ;*
- 2) *decreases with the unskilled labour unit wage w_L .*

Proof: Appendix B.

A rise (reduction) in $\underline{\lambda}$ lessens (augments) the number of working poor. Hence, increases (decreases) in r_G and b_U raise (lessen) the number of working poor whereas an increase (decrease) in w_L lessens (raises) it. This is because the rise in r_G decreases the return to working and augments its opportunity cost, the increase in b_U augments the opportunity cost of working, and the rise in w_L augments the return to working.

3.2.2. Impacts of income shifts upon the upper limit of the set of working poor $\tilde{\lambda}$

We make a distinction between the two definitions of the poverty line, i.e., the average income based poverty line and the median income based poverty line.

Proposition 3. *When the poverty line is defined at 50% of the average income, the upper limit of the set of working poor $\tilde{\lambda}$:*

- 1) *decreases with the unskilled labour unit wage w_L and the redistribution rate r_G .*
- 2) *increases with the skilled labour unit wage w_H and return to capital r_P .*
- 3) *does not change when w_L , w_H and r_P increase at the same rate.*

Proof. Appendix C.

As an increase (decrease) in $\tilde{\lambda}$ augments (lessens) the number of working poor, increases in w_L and r_G lower the number of working poor whereas increases in w_H and r_P raise it when the poverty line is defined at 50% of the average income.

In the case of the median income based poverty line \underline{I}^M , it is typically impossible to make precise predictions of the impacts of shifts in the components of personal income upon the upper limit $\tilde{\lambda}$. This is because:

1) The impacts of shifts in w_L and w_H obviously depend on whether the median income earner is a skilled or an unskilled worker. Actually, the incomes of both types of worker overlap because unskilled workers with high aptitudes can earn more than low-aptitude skilled workers, and the median income earner can be inside this set of overlapping.

2) Changes in the income components (w_L, w_H, r_P and r_G) can shift the ranking of individuals on the income ladder, and thereby the median income earner and her/his characteristics λ^M , h^M and k^M .

3) The upper limit of the set of working poor $\tilde{\lambda}$ depends on how the incomes at the vicinity of the poverty line $\underline{I}^M = 0.6 \times I^M$ behave in relation to this poverty line. When the median income worker changes with incomes shifts, the incomes close to the poverty line that decrease more than the pre-shift median income can albeit decrease less than the post-shift median income, or the other way round. It is thus impossible to determine whether incomes shifts increase or decrease the number of working poor at the upper limit of their set.

Appendix D presents an analysis of the possible impacts of shifts in income determinants upon $\tilde{\lambda}$ when the poverty line is \underline{I}^M . The effects of changes in w_L , w_H and r_p are ambiguous. The only clear result is that an increase in r_G moves the upper limit downwards, lowering thereby the number of working poor (a decrease having the opposite effects).

3.3. Impacts of globalization on in-work poverty

Based on the literature reviewed in Section 2, we firstly highlight the main changes in incomes related to different components of globalization. We subsequently combine these changes with the results determined in the preceding Section 3.2 so as to yield our main predictions in terms of impacts of globalization upon in-work poverty.

3.3.1. Globalization-driven income shifts

In advanced economies, the literature reviewed in Section 2 shows that North-South trade (NST) (i) lowers the wages of unskilled workers, (ii) increases the wage of skilled workers and the return to capital in advanced economies and (iii) raises the skill premium by fostering skilled biased technical change.

North-North trade (NNT) firstly increases efficiency by specializing each economy in its most productive sectors. This could be seen as increasing the three types of private incomes, i.e., w_L , w_H and r_p , without any bias in favour of one of them. This general increase can however boost redistribution. When Melitz approach is combined with imperfections on the labour market, trade can also foster inequality at the expense of unskilled workers.

Capital mobility generates tax and social competition (TSC), which lower both redistribution r_G and the unemployment benefits b_U . This ‘efficiency effect’ typically increases the number of working poor.

Finally, globalization-enhanced rise in social risks encourage governments to increase redistribution and unemployment benefits, i.e., the ‘compensation effect’. This can generate a positive relationship between social benefits and the incidence of in-work poverty because the increase in the latter causes the increase in the former.

3.3.2. Impacts on the working poor

We now go by the impacts of globalization-enhanced income shifts on the limits of the set of working poor, λ and $\tilde{\lambda}$, so as to predict their effects on in-work poverty.

When considering the average income based poverty line \underline{I}^A , North-South trade (NST) increases both the lower limit $\underline{\lambda}$ and the upper limit $\tilde{\lambda}$. The first move reduces the incidence of working poverty, but this results from the only decrease in w_L which lessens the incentive to work. In contrast, the upward move in $\tilde{\lambda}$ is generated by the changes in three determinants, w_L , w_H and r_p , that reinforce each other. We can thus expect an increase in the number of working poor because the second move is supported by the three shifts in w_L , w_H and r_p whereas the first is only based upon the decrease in w_L . Hence, NST typically increases the incidence of being working poor when the poverty line is \underline{I}^A .

When the poverty line is based on the median income (\underline{I}^M), the impact of NST is ambiguous. The impact upon $\tilde{\lambda}$ depends on the type of the median worker (skilled or unskilled) and on whether the income shifts change the worker with the median income.

The effect of North-North trade (NNT) is similar when considering both definitions of the poverty line. In both cases, the impact is rather ambiguous. The move in $\underline{\lambda}$ is ambiguous, the increases in w_L , w_H and r_p have no impact when they operate at the same rate, and the Melitz model with labour market imperfections tends to increase in-work poverty.

Tax and social competition generates an ‘efficiency effect’ that clearly augments the number of working poor. The decrease in r_G raises in-work poverty by both sides, namely, by lowering the reservation wages and making low paid workers become poor. On the other hand, the decrease in b_U further depress the reservation wage.

Finally, the ‘compensation effect’ has the opposite impact by inciting governments to increase public transfers and unemployment subsidies so as to insure households for the more risky environment generated by globalization.

Table 1: Impacts of globalization upon in-work poverty according to the poverty line

Dimensions of globalization	Impact on in-work poverty
North-South Trade and Offshoring Decrease in w_L ; Increase in w_H and r_p	\underline{I}^A line: <i>Increase</i> ; \underline{I}^M line: <i>Ambiguous</i>
North-North Trade Unclear move in w_L ; rise in w_H and r_p	\underline{I}^A line: <i>Ambiguous</i> ; \underline{I}^M line: <i>Ambiguous</i>
Tax & Social Competition (efficiency effect) Lower r_G and b_U	\underline{I}^A and \underline{I}^M lines: <i>Increase</i> .
Compensation effect Higher r_G and b_U	\underline{I}^A and \underline{I}^M lines: <i>Decrease</i> .

In short, 1) North-South trade increases the incidence of working poverty when the poverty line is defined in terms of average income whereas its effect is rather ambiguous in the case of a median income based poverty line, 2) the effect of North-North trade is ambiguous, and 3) tax and social competition augments, and the compensation effect lessens, the number of working poor. Table 1 summarises these predictions.

4. Empirical strategy and data

We investigate the effects of globalisation on the incidence of in-work poverty in advanced European countries. We successively present (i) the empirical strategy and (ii) the variables and databases utilised in the estimates.

4.1. Empirical strategy

We implement a twofold empirical strategy. The first strategy is based on aggregate data by country and analyses the determinants of the share of working poor in the working population by applying a two-way fixed effects estimator. The second strategy is based on a multilevel analysis. The multilevel analysis is an appropriate econometric technique when investigating the relationship between individual characteristics and institutional contexts. The individual probability of being working poor is analysed by putting together individual and macroeconomic contextual variables.

In both the macro and the multilevel analysis, three successive estimates are implemented. In a first step (model I), the impact of trade is represented by total trade (exports + imports in percent of GDP) without distinction between North-North and North-South trade. In a second step (model II), we introduce the countries' trade with the South only. We finally estimate the impact of both trades with the South and with the North (model III). In the three specifications we correct the countries' relative size following the method of Leibrecht et al. (2011).

4.1.1. Macroeconomic estimates

The empirical strategy is based on the macro analysis of the percentage of working poor. The fixed effects approach provides a valuable panel data estimation technique which allows controlling for country unobservable heterogeneity. The following empirical model is estimated:

$$WP_{it} = \beta G_{it} + \gamma C_{it} + \alpha_i + v_t + \varepsilon_{it}$$

where subscript i denotes the country index (16 countries) and t the year (from 2005 to 2010).

The dependent variable WP_{it} is the percentage of working poor in country i and year t . The G_{it} s are the globalisation indicators and C_{it} the vector of control variables (see Section 4.2). α_i and v_t capture the country and time fixed effects, and ε_{it} is the remainder error term. The estimated coefficients β can be interpreted as the marginal effect of an increase in the globalisation indicator(s) on the percentage of working poor.

We use Schaffer's *xtivreg2* Stata command with the standard errors robust with respect to serial correlation and heteroscedasticity (Leibrecht *et al.*, 2011; Schaffer, 2010).

4.1.2. Multilevel estimates

Based on aggregate data at the country level, the above-defined model provides estimations of the impacts of the macro-determinants of in-work poverty incidence in European countries. However, it cannot analyse individuals' behaviours because the probability of being working poor is to a large extent influenced by individual and family characteristics (Section 2.2).

The multilevel modelling permits to consider both individual/family and countries' institutional contexts, using a statistical model that properly includes both types of dependencies (Hox, 2002). If the institutional framework matters, individual responses within one particular country are usually not independent observations (Greenan *et al.* 2013). Multilevel models explicitly take such correlations into account and combine individual and contextual factors by providing correct inferences, i.e., statistically efficient estimates of regression coefficients, correct standard errors, confidence intervals and significance tests (Hox, 2002).

The respondents to the EU-SILC survey are individuals for each of the 16 EU countries. Thus, the dataset is hierarchical, with a level 1 (the individual, indexed by i) nested in a level 2 (the country, indexed by j). In our case, the country is the level where the contextual effects are assessed.

The estimated empirical model is as follows. Suppose that underlying the binary response y_{ij} there is a continuous latent variable y_{ij}^* that is related to the observed y_{ij} such that:

$$y_{ij} = \begin{cases} 1 & \text{if } y_{ij}^* \geq 0 \\ 0 & \text{if } y_{ij}^* < 0 \end{cases}$$

We can define the two-level random intercept model:

$$y_{ij}^* = \beta_0 + \beta_1 x_{ij} + \beta_2 z_j + u_j + \varepsilon_{ij}$$

This model includes individual-level variables (noted x_{ij}) and country-level variables (noted z_j). u_j is the random effect at the country level and is assumed to be normally

distributed with the expected value 0 and the variance σ_u^2 . The errors ε_{ij} are distributed as logistic with mean zero and variance $\sigma_\varepsilon^2 = \pi^2/3$ and are independent of u_j .

4.2. Database and variables

We utilise 6 rounds (2005-2010) of the *European Statistics on Income and Living Conditions* (EU-SILC). EU-SILC is the reference database for income and social exclusion in the European Union. It provides information on income and on the socio-demographic and labour characteristics for individuals and households. Initiated in 2003 for 7 European countries, it covers 29 countries in 2010. As we focus on the impact of globalization on working poverty in advanced European economies, we limit our analysis to 16 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden and the UK.

We use the European definition of ‘in-work poverty risk’: “*Individuals who are classified as ‘employed’ and who are at risk of poverty*” (European Commission, 2009). Individuals are classified as employed according to the most frequent activity status (MFAS).¹⁴ On this basis, the usual macro-indicator of in-work poverty selected in most empirical works (Ponthieux, 2010) is *the percentage of individuals at risk of poverty in the working-age employed population*. However, the analytical approach exposed in Section 3 shows that being working poor can derive from the choice of moving out of unemployment. To account for this in the macro-estimates, we rather consider *the percentage of individuals at risk of poverty in the active population*, which includes both the employed and unemployed workers.

We use two definitions of the risk of poverty threshold: 1) at 60% of the country median income as in European studies and 2) at 50% of the country average income¹⁵.

At the individual level we consider gender, age (three categories), education (three categories), country of birth (foreign versus native), family composition (five categories), employment status (self-employed vs employee and part-time vs full-time work), sector of the workplace (12 categories) and occupations (9 categories).

4.2.1. Trade indicators

A first key dimension of globalization is openness to trade. In line with the approach developed in Section 3, we make a distinction between North-North and North-South trade. In this purpose, we use the following three indicators (see Appendix E, Table A2):

- 1) The *total openness to trade*, i.e., the sum of total imports and exports as a share of GDP.

¹⁴ The MFAS is the status individuals declare to have occupied for more than half of the calendar year.

¹⁵ Appendix E reports the incidence of in-work poverty for each definition, which does not differ much.

2) The *imports of manufactured products from the South*¹⁶ in percent of GDP to measure trade with emerging countries (North-South trade). This indicator accounts for both the imports of final goods and the impact of offshoring by focusing on manufacturing, which permits to erase trade of raw materials and energy (their impact on activity is introduced through the variable ‘real GDP growth’).

3) The *sum of imports and exports with the developed countries as a share of GDP* to capture the impact of the North-North¹⁷ trade.

We correct the “country size bias”, i.e., the fact the small countries trade more without being necessarily more open. In this purpose, we follow Leibrecht et al. (2011): we estimate the three trade ratios as functions of the country’s relative size (GDP of the country on the average GDP of the sample) and we use the residuals of this regression as proxies of the three ratios measuring the country’s openness to trade.

4.2.2. Institutional variables

Institutional variables have a twofold status. They are firstly partially driven by globalization which acts upon institutions through the efficiency and compensation effects. In addition, changes in institutions can derive from political and social choices.

In the model exposed in Section 3, we focus on the impact of globalization linked to tax and social competition (the efficiency effect) which tend to reduce the social net and increase thereby the number of working poor. However, when governments adapt their social policy to protect households from the new risks linked to globalization, this ‘compensation effect’ can increase the social transfers and lessen thereby in-work poverty.

So as to encompass these different impacts, we select two indicators of social transfers and labour market institutions.

We firstly consider the total public social expenditure as a percentage of GDP, by subtracting from this total unemployment benefits and old age and retirement benefits (calculated from Eurostat database, see Appendix E). An increase in this indicator makes certain working poor escape from poverty by increasing the social transfers.

Secondly, so as to synthetize the different factors that incite individuals to move from no-activity to working poverty, we utilise the *participation gain*, i.e., the net gain from moving

¹⁶ The ‘South’ comprises emerging countries (Turkey, South African Union, Ecuador, Mexico, Brazil, Argentina, Chile, Colombia, Tunisia, Egypt, Indonesia, India, Malaysia, Philippines, Thailand, Brunei, Bangladesh, Sri Lanka, Russia, China, Indochina) and Central and East European Countries (Albania, Bulgaria, Czech Republic, Slovakia, Hungary, Poland, Romania): .

¹⁷ The North includes the US, Canada, France, Belgium, Luxembourg, Germany, Italy, The Netherlands, the UK, Ireland, Denmark, Finland, Norway, Sweden, Island, Austria, Switzerland, Spain, Greece, Portugal, Israel, Japan, Australia, New Zealand, South Korea, Singapore, and Taiwan.

from unemployment to work. This indicator depicts the impact of redistribution and unemployment benefits upon the incentive to go to work. However, unlike the simplifying modelling made in our theoretical approach, the redistribution framework is not the same for everyone in most countries. Consequently, we calculate the participation gain for workers whose wage is close to 33% of the average wage, which permits to focus on the unemployed who are under the poverty line if they decide to go back to working. The participation gain is calculated from the OECD '*participation tax rates for a transition into full-time work for persons receiving unemployment benefits at the initial level*' (i.e., who have recently fallen in unemployment). The participation tax rate provides the percentage of the earnings they would get from working which is already covered by unemployment benefits and social transfers to the household.¹⁸ The participation gain is the ratio $\frac{1 - \text{participation tax rate}}{\text{participation tax rate}}$. As a higher participation gain prompts poor individuals to go to work and become working poor, we expect a positive coefficient on this variable.

4.2.3. Other control variables

In line with the large empirical literature on the determinants of in-work poverty, we add the following control variables (definitions: Table A2, Appendix E):

1. The *growth rate of real GDP* to capture the influence of economic activity.
2. The *share of persons with low educational attainment* which account for the fact that low education significantly increases the probability of being the working poor. This indicator is defined as the percentage of 25-64-aged people with an International Standard Classification of Education (ISCED) level of 2 or less (pre-primary, primary and lower secondary).
3. *R&D expenditure as a percentage of GDP*. This indicator aims at revealing the possible negative impact of skill biased technical change upon the wage of less skilled workers.

5. Results

We successively expose the results of the macro estimates and the multi-level estimates.

5.1. Results of the macro-estimates

Tables 2 and 3 depict the results of the macro-estimations for the two poverty lines. The three models (model I = total trade; model II = North-South trade only; model III = North-South and North-North trades) are reported.

¹⁸ For more details on OECD participation tax rates see: www.oecd.org/els/social/workincentives

Table 2. Macro-estimations with the poverty line at 60% of the median income

	Model I	Model II	Model III
<i>Total trade</i>	<u>0.024</u>	-	-
<i>North-South trade</i>	-	<u>0.366**</u>	<u>0.381**</u>
<i>Country's relative size</i>	0.026***	0.031***	0.031***
<i>North-North trade</i>	-	-	<u>-0.016</u>
<i>Low educational attainment</i>	0.029	0.045	0.05
<i>Participation Gain (33%)</i>	-0.004	0.0017	0.003
<i>Social expenditures, % of GDP</i>	0.002	0.029	0.03
<i>R&D expenditures</i>	0.09	-0.211	-0.242
<i>Real GDP growth</i>	-0.029	-0.038	-0.034
R^2	0.1182	0.1771	0.1788
<i>Nb of observations</i>	96	96	96

Table 3. Macro-estimations with the poverty line at 50% of the average income

	Model I	Model II	Model III
<i>Total trade</i>	<u>0.062**</u>	-	-
<i>North-South trade</i>	-	<u>0.439***</u>	<u>0.448***</u>
<i>Country's relative size</i>	0.033***	0.041***	0.041***
<i>North-North trade</i>	-	-	<u>-0.01</u>
<i>Low educational attainment</i>	0.009	0.036	0.039
<i>Participation Gain (33%)</i>	0.0005	0.010	0.011
<i>Social expenditures as a % of GDP</i>	-0.023	0.033	0.03
<i>R&D expenditures</i>	-0.747	-1.013	-0.032
<i>Real GDP growth</i>	-0.066**	-0.064**	-0.061*
R^2	0.1734	0.1909	0.1914
<i>Nb of observations</i>	96	96	96

* significant at 10% , ** significant at 5% , ***significant at 1% .

The major result of the macro-estimates is that the coefficient of North-South trade is always significant and positive, whereas North-North trade displays a negative and non-significant coefficient. This is in line with our analytical results. Total trade has a positive impact which is only significant in the estimate using the average income poverty line.

In addition, the estimates using a poverty line at 50% of the average income perform better than those using the 60% of the median income poverty line: all significant coefficients are larger in absolute value and the R^2 is higher. This could reflect the fact that the variation in income of workers close to the poverty line is similar to that of the median income in a number of countries.

In the case of the average income-based poverty line, the GDP growth is significant and negative. An improvement of economic activity (higher growth) reduces the proportion of working poor. For both definitions of the poverty line, none of the institutional variables (participation gain and social expenditure) have a significant impact.

5.2. Results of the multi-level estimates

The results of the multi-level estimates are presented in Tables 4 and 5 for the poverty line at 60% of the median income and at 50% of the average income respectively.

The bottom line of Tables 4 and 5 indicates the variance of the country level residual errors σ_u^2 . This variance decreases from model I to model III in both specifications, suggesting that the residual variation attributable to countries' unobserved characteristics diminishes when North-South trade and North-North trade are added¹⁹.

5.2.1. Individual level heterogeneity

At the individual level, our results are in line with the empirical literature on working poverty (see Section 2.2). As in most empirical works (surveyed by Kalugina, 2012), our estimates reveal the following results for both definitions of the poverty line:

1. The probability to be working poor is higher for men than for women, which confirms the so-called 'gender paradox'.²⁰
2. Young workers are more vulnerable to working poverty and the working poor are mostly concentrated among low educated workers.
3. Workers born abroad are more frequently exposed to working poverty.
4. The likelihood of becoming working poor is higher for single parents than for any other family structures.
5. Insecure professional positions (as part-time versus full-time work) as well as self-employment matter and they increase significantly the probability of being working-poor.

The most vulnerable occupations for both poverty lines are craft workers and elementary occupations, and the probability of being working poor is the highest for workers in agriculture and hotels and restaurants.

5.2.2. Country level heterogeneity (except globalization)

We present here the results for the country-level (macro) variables, except for those related to globalization and institutions which are examined and discussed in the next section. On top of globalization and institution indicators, three country-level variables are considered: educational attainment, R&D expenditure and GDP growth.

¹⁹ We have also calculated the variance partition coefficient (VPC): $\frac{\sigma_u^2}{\sigma_u^2 + \sigma_e^2}$, with $\sigma_e^2 = 3.29$ for a logit model. The VPC is interpreted as the proportion of the total residual variance in the propensity to be working poor that comes from differences between countries. For the median income specification, the VPC moves from 0.073 in model I down to 0.05 in model III, and from 0.093 to 0.04 in the average income specification. This suggests an improvement in the explanatory impact of the model at the country level: the unexplained heterogeneity between countries diminishes when inserting the distinction between North-South and North-North trade.

²⁰ It is a paradox because this probability is higher for women when considering poverty in general.

Table 4. Probability of being working poor (60% of median income poverty line): multilevel model

Variable	Model I	Model II	Model III
Intercept	-3.913***	-3.846***	-3.839***
Individual level (number of observations = 649535)			
Woman	-0.338***	-0.339***	-0.339***
Low education	0.835***	0.835***	0.835***
Medium education	0.316***	0.315***	0.315***
Tertiary education		<i>Reference</i>	
Age Group <24	0.474***	0.475***	0.475***
Age Group 25-44	-0.016	-0.016	-0.016
Age Group 45+		<i>Reference</i>	
Foreign	0.744***	0.746***	0.746***
<i>Single</i>		<i>Reference</i>	
Household of more than one adult, no child	-1.135***	-1.135***	-1.135***
Single parent household	0.904***	0.905***	0.905***
Household of two adults and at least one child	-0.274***	-0.273***	-0.273***
Household of more than two adults and at least one child	-0.629***	-0.629***	-0.629***
Self-employed versus Employee	1.276***	1.276***	1.276***
Part-time versus Full-time work	0.696***	0.696***	0.696***
<i>Financial Intermediation</i>		<i>Reference</i>	
Agriculture and fishing	1.215***	1.215***	1.215***
Mining, Manufacturing and Energy Supply	0.331***	0.331***	0.331***
Construction	0.704***	0.704***	0.704***
Wholesale and retail trade	0.761***	0.761***	0.761***
Hotels and Restaurants	0.932***	0.932***	0.932***
Transport and Communication	0.426***	0.425***	0.425***
Real Estate, Renting and Business Activities	0.635***	0.635***	0.635***
Public administration	0.106**	0.106**	0.107**
Education	0.591***	0.590***	0.590***
Health and Social Work	0.513***	0.512***	0.512***
Other Services	0.819***	0.819***	0.820***
<i>Clerks</i>		<i>Reference</i>	
Legislators, Seniors officials & Managers	0.044*	0.043	0.043
Professionals	-0.536***	-0.536***	-0.537***
Technical & Associate Professionals	-0.164***	-0.164***	-0.165***
Services workers	0.410***	0.410***	0.410***
Skilled agricultural & Fishery workers	0.479***	0.479***	0.479***
Craft and related trades workers	0.529***	0.529***	0.529***
Plant & Machine operators	0.440***	0.440***	0.440***
Elementary occupations	0.803***	0.803***	0.803***
Country level (number of countries = 16)			
Total trade	0.011***	-	-
North-South trade	-	0.060***	0.064***
Country's relative size	0.0008	0.002**	0.002**
North-North trade	-	-	-0.004
Low educational attainment	0.003	0.010***	0.012***
Participation Gain (33%)	-0.0004	0.0003	0.0004
Social expenditures as a % of GDP	0.006	0.013	0.013
R&D expenditures	0.095**	0.091*	0.088*
Real GDP growth	-0.006**	-0.005**	-0.004
Variance of the country level residual errors	0.260	0.211	0.187
Log likelihood	-142563.83	-142567.49	-142567.1

Table 5. Probability of being working poor (50% of average income poverty line): multilevel model

Variable	I	II	III
Intercept	-3.957***	-3.864***	-3.856***
Individual level (number of observations = 649535)			
Woman	-0.333***	-0.333***	-0.333***
Low education	0.832***	0.831***	0.830***
Medium education	0.316***	0.315***	0.315***
Tertiary education		Reference	
Age Group <24	0.496***	0.497***	0.497***
Age Group 25-44	-0.023**	-0.023**	-0.023**
Age Group 45+		Reference	
Foreign	0.719***	0.721***	0.721***
Single		Reference	
Household of more than one adult, no child	-1.150***	-1.149***	-1.149***
Single parent household	0.871***	0.872***	0.872***
Household of two adults and at least one child	-0.304***	-0.303***	-0.303***
Household of more than two adults and at least one child	-0.656***	-0.656***	-0.655***
Self-employed versus Employee	1.304***	1.304***	1.303***
Part-time versus Full-time work	0.708***	0.708***	0.707***
<i>Financial intermediation</i>		Reference	
Agriculture and fishing	1.210***	1.210***	1.210***
Mining, Manufacturing and Energy Supply	0.320***	0.321***	0.321***
Construction	0.685***	0.685***	0.685***
Wholesale and retail trade	0.755***	0.755***	0.755***
Hotels and Restaurants	0.915***	0.915***	0.914***
Transport and Communication	0.423***	0.422***	0.421***
Real Estate, Renting and Business Activities	0.634***	0.634***	0.634***
Public administration	0.096*	0.096*	0.096*
Education	0.599***	0.598***	0.598***
Health and Social Work	0.519***	0.518***	0.518***
Other Services	0.811***	0.812***	0.812***
<i>Clerks</i>		Reference	
Legislators, Seniors officials & Managers	0.045	0.044	0.044
Professionals	-0.524***	-0.524***	-0.525***
Technical & Associate Professionals	-0.175***	-0.175***	-0.176***
Services workers	0.407***	0.407***	0.407***
Skilled agricultural & Fishery workers	0.470***	0.470***	0.470***
Crafts and related trades workers	0.519***	0.519***	0.519***
Plant & Machine operators	0.419***	0.419***	0.419***
Elementary occupations	0.780***	0.800***	0.800***
Country level (number of countries = 16)			
Total trade	0.016***	-	-
North-South trade	-	0.078***	0.083***
Country's relative size	0.002**	0.003***	0.002***
North-North trade	-	-	-0.005
Low educational attainment	-0.002	0.009***	0.011**
Participation Gain (33%)	-0.0005	0.0005	0.0005
Social expenditures as a % of GDP	0.014	0.024**	0.023**
R&D expenditures	-0.058	-0.053	-0.054
Real GDP growth	-0.010***	-0.009***	-0.007**
Variance of the country level residual errors	0.337	0.182	0.138
Log likelihood	-136517.35	-136526.28	-136525.57

* significant at 10% level, ** significant at 5% , ***significant at 1%.

Low educational attainment is positively and significantly correlated with the probability of being working poor in models II and III for both definitions of the poverty line. The probability of being working poor is higher in those countries where the percentage of low educated is high. We have already underlined that having a low education increases the probability of being working poor at the individual level. The positive coefficient at the macro level suggests the existence of an educational macro-impact: being working poor is more likely for an individual when, on top of its low skill, he lives in a country where low skilled workers are numerous.

As regards R&D expenditure, the results depend on the selected definition of the poverty line. The coefficient is positive and significant in the models where the poverty line is based on the median income, while it is not significant (and negative) in the models with average income-based poverty line.

Finally, the coefficient of ‘real GDP growth’ is negative and significant in all specifications, except in model III for the median income poverty line. This suggests that, quite logically, economic growth favours better quality jobs and decreases the probability of being working poor.

5.2.3. Globalization and institutions

Two types of country-level variables are related to globalization, i.e., trade variables and institutional variables that are impacted by the efficiency and the compensation effects. Obviously, institutional and welfare contexts are also related to political choices which can be independent from globalization.

Trade variables

As regards trade variables, the multi-level estimates clearly confirm the results of the macro-estimates.

First, North-South trade and offshoring has a positive and significant effect on the incidence of in-work poverty, and this is observable in all specifications. In contrast, the coefficient of North-North trade is always non-significant and its sign is negative for both definitions of the poverty line.

Both results are in line with the predictions exposed in Section 3.3. They show that trade with, and offshoring to, emerging countries has had a major impact on in-work poverty, and that this impact is robust to the different specifications of the empirical model. This should be related to the decrease in low skilled workers’ wages and to skill obsolescence due to industrial restructuring and relocation to the South of unskilled intensive industries, which are

major consequences of openness to the South in advanced countries. It must finally be noted that the significant and positive coefficient of North-South trade is clearly higher in the case of the average income based poverty line than in the case of the median income based.

In the opposite direction, North-North trade appears as having a non-significant and negative impact on the incidence of in-work poverty. This is once again in accordance with the analytical approach that predicts an ambiguous impact of trade with advanced countries.

Finally, total trade has a positive and significant impact in both multilevel estimates, with naturally a coefficient substantially lower than for North-South trade. This shows that the impact of North-South trade is large enough to make total trade increase the incidence of in work poverty.

Institutions

The results concerning institutions are mixed. First, the impact of the participation gain is always non-significant and its sign changes according to the specification. Concerning social expenditure as a percent of GDP, its impact is always positive but only significant in models II and III with an average income-based poverty line.

The result on the participation gain can depict the heterogeneity of European countries concerning the impacts of the efficiency and compensation effects. It can also result from the fact that, in certain countries, a recession-related large unemployment incite the government to reduce unemployment benefits while the recession prevent the poor to find a job, even if they are incited to work. It can finally reflect differences in political and social choices.

As regards social expenditure, its positive and mostly non-significant impact on in work poverty could reveal the fact that, in a number of countries (e.g., Germany), benefits are conditional to the acceptance of jobs proposed by the employment agency. It can also be connected to the results of the empirical literature that show an ambiguous impact of globalization upon social expenditure and the welfare state.

Finally, these results are in line with certain multi-level analyses that show a rather mixed impact of institutional variables with most of the coefficients being non-significant at the 5% level (Lohmann, 2008 and 2009).

6. Discussion and Conclusion

We have assessed the impact of globalization on working poverty in advanced European countries over the period 2005-2010. This impact has been analysed by considering (i) the levels of trade, disentangling North-South from North-North trade, and (ii) the globalization-

driven changes in institutions. We have selected two definitions of the poverty line, one at 60% of the median income, the other at 50% of the average income. Finally, the estimates were implemented at both the macro level and the multilevel (micro-estimates to which macro determinants are added).

As expected, the results are both more significant and of higher intensity when poverty is defined as a percentage of the average income than when defined in terms of the median income. This shows that, when lowering the income of low-skilled workers, globalization lessens the median income as well because this income corresponds to a rather low skill in a number of European countries. We also find that the estimates using a multilevel approach perform better than the macro-level estimates. In the latter, few variables are significant, particularly when considering the median income based poverty line.

At the individual level, all our results confirm the findings put forward in the empirical literature on the working poor. Hence, all our control variables perform as expected. The impact of education must however be highlighted because it appears to act both at the individual and at the macro level (in the multilevel estimates). The former level reproduces the well documented fact that a low education attainment increases the risk of an individual to become working poor. The macro-level impact shows that this individual risk is reinforced when the country is itself characterised by a high percentage of low skilled workers. These results are consistent with the analytical mechanisms through which low skill operates. First, low skill means low pay, which directly increases the risk to be working poor. Second, a large supply of unskilled labour (at the macro level) decreases the price of this factor, which reinforces the risk to become working poor.

Our essential finding is that trade with emerging countries has had a positive and significant impact on in-work poverty. This is true in all our specifications, i.e., in both the macro and multilevel estimates, with both definitions of the poverty line, and in the three models. This can be seen as consistent with the usual analytical diagnosis that competition from emerging countries tends to hurt unskilled workers by lowering their wages compared to that of other workers. This also shows that trade competition from the South must have hurt the income of the bottom tail of the unskilled more than that of the median worker. It can be reminded that a key conclusion of the literature on the globalization-inequality relationship is that the impact of globalization was rather weak until the mid-nineties, whereas it can be seen as major since then (Chusseau et al., 2008). Our results regarding the working poor complement this last diagnosis since the estimates are implemented over the period 2005-10.

In contrast with North-South trade, the impact of trade with other advanced countries is always non-significant and its sign is negative in all specifications. This is once again in line with what was expected from the analytical mechanisms put forward in Section 3 showing that the impact of North-North trade is ambiguous.

Total trade (without discriminating between North-South and North-North trade) has a significant positive impact on in-work poverty, except in the macro-estimate with the poverty line at 60% of the median income. This impact is however low compared to that of North-South trade. This shows that, despite the still dominant share of advanced economies in European countries' trade, the weight of the South is now large enough to make total trade increase the number of poor workers.

Finally the impacts of institutions are mixed and rarely significant. In the perspective of the globalization-institution nexus, this finding is in line with the literature that cannot diagnose which of the efficiency effect and the compensation effect is prevalent (synthesis in Gemmels et al., 2008). As regards institutions themselves, certain characteristics of the measures taken by public authorities can also explain this ambiguous impact. As emphasized by the compensation hypothesis, a number of measures were decided so as to reduce the effects of a growing risk of poverty. This should typically reduce the number of working poor (i) by moving a number of households out of poverty and (ii) by maintaining a number of poor households out of the labour market because of a low (or even negative) participation gain. To avoid the latter unexpected effect, the governments have then added strict conditions to benefit from public aids, among which an obligation not to reject jobs proposed to them. These conditions now increase the number of working poor by inciting poor individuals to participate in the labour market.

In summary, globalization appears to have a significant positive effect on the incidence of in-work poverty, but this impact essentially –or even solely– results from the strong impact of trade with emerging countries. The impacts of the considered other channels (North-North trade, globalization-driven changes in institutions) are typically non-significant.

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Appendix A. The limits of the set of working poor.

As individual i being working poor is unskilled, her/his labour income is $w_i = w_L \lambda_i$. Given that individuals below and close to the poverty line receive no rents, the condition (1) becomes: $w_i / w_L < \lambda_i < (I - r_{G,i}) / w_L$. By inserting (6) and (9) into this condition, we obtain the following

condition to be working poor: $\lambda_i = \left(\frac{\delta}{w_L(1-r_G)(1-b_U)} \right)^{1/(1-\beta)} < \lambda_i < \frac{I - r_G I^A}{(1-r_G)w_L} = \tilde{\lambda}$, λ and $\tilde{\lambda}$

being the roots of equations $\lambda_i = \frac{\delta \lambda_i^\beta}{w_L(1-r_G)(1-b_U)}$ and $\lambda_i = \frac{I - r_G(I^A - w_L \lambda_i)}{w_L}$ respectively.

Appendix B. Impacts of income shifts upon $\lambda = \left(\frac{\delta}{w_L(1-r_G)(1-b_U)} \right)^{1/(1-\beta)}$

$$\frac{\partial \lambda}{\partial w_L} = -\frac{1}{1-\beta} \left(\frac{\delta}{w_L(1-r_G)(1-b_U)} \right)^{\beta/(1-\beta)} \frac{\delta}{(1-r_G)(1-b_U)} w_L^{-2} < 0$$

$$\frac{\partial \lambda}{\partial r_G} = \frac{1}{1-\beta} \left(\frac{\delta}{w_L(1-r_G)(1-b_U)} \right)^{\beta/(1-\beta)} \frac{\delta}{w_L(1-b_U)} (1-r_G)^{-2} > 0$$

$$\frac{\partial \lambda}{\partial b_U} = \frac{1}{1-\beta} \left(\frac{\delta}{w_L(1-r_G)(1-b_U)} \right)^{\beta/(1-\beta)} \frac{\delta}{w_L(1-r_G)} (1-b_U)^{-2} > 0$$

Appendix C. Changes in $\tilde{\lambda}$: the case of the average income based poverty line

The average income-based poverty line is (remember that $r_G^A = 0$):

$$I^A = 0.5 \times I^A = 0.5(q_L w_L + q_H w_H \eta_H^A + r_P k^A)$$

Because of Eq. (5), $\tilde{\lambda} = \frac{I^A - r_G I^A}{(1-r_G)w_L}$, which yields by inserting I^A into this equation:

$$\tilde{\lambda} = \frac{(0.5 - r_G)(q_L w_L + q_H w_H \eta_H^A + r_P k^A)}{(1-r_G)w_L}$$

The condition for $\tilde{\lambda}$ to exist $r_G < 0.5$. Let us suppose that this condition is fulfilled, which is a rather realistic assumption.

$$\frac{\partial \tilde{\lambda}}{\partial w_L} = -\frac{(0.5 - r_G)(q_H w_H \eta_H^A + r_P k^A)}{(1-r_G)w_L^2} < 0 ; \quad \frac{\partial \tilde{\lambda}}{\partial w_H} = \frac{(0.5 - r_G)q_H \eta_H^A}{(1-r_G)w_L} > 0$$

$$\frac{\partial \tilde{\lambda}}{\partial r_G} = -\frac{0.5}{(1-r_G)^2} \frac{q_L w_L + q_H w_H \eta_H^A + r_P k^A}{w_L} < 0 ; \quad \frac{\partial \tilde{\lambda}}{\partial r_P} = \frac{(0.5 - r_G)k^A}{(1-r_G)w_L} > 0$$

Finally, and increase in w_L , w_H and r_P at the same rate maintains $\tilde{\lambda}$ unchanged.

Appendix D. Changes in $\tilde{\lambda}$: the case of the median income based poverty line

The median income-based poverty line is $\underline{I}^M = \beta_M I^M$, $\beta_M = 0.6$.

Hence, $\underline{I}^M = 0.6(w^M + r_P^M + r_G^M)$, where superscript M depicts the median income worker.

We firstly determine the impacts of income shifts upon $\tilde{\lambda}$ when these shift do not change the median income worker. We subsequently discuss the cases in which this median worker changes.

a) When the median income is an unskilled worker

As the median income is an unskilled worker, $I^M = (1 - r_G)(w_L \lambda^M + r_P k^M) + r_G I^A$ and:

$$\underline{I}^M = 0.6((1 - r_G)(w_L \lambda^M + r_P k^M) + r_G I^A), \quad \text{with: } I^A = q_L w_L + q_H w_H \eta_H^A + r_P k^A$$

Because of Eq. (5), $\tilde{\lambda} = \frac{\underline{I}^M - r_G I^A}{(1 - r_G) w_L}$, which yields by inserting \underline{I}^M into this equation:

$$\tilde{\lambda} = \frac{0.6(1 - r_G)(w_L \lambda^M + r_P k^M) - 0.4 r_G I^A}{(1 - r_G) w_L}. \quad \text{By inserting } I^A:$$

$$\tilde{\lambda} = \frac{0.6(1 - r_G)(w_L \lambda^M + r_P k^M) - 0.4 r_G (q_L w_L + q_H w_H \eta_H^A + r_P k^A)}{(1 - r_G) w_L}$$

The condition for $\tilde{\lambda}$ to exist is:

$$3(1 - r_G)(w_L \lambda^M + r_P k^M) > 2r_G(q_L w_L + q_H w_H \eta_H^A + r_P k^A)$$

$$\Leftrightarrow r_G < \frac{3(w_L \lambda^M + r_P k^M)}{3(w_L \lambda^M + r_P k^M) + 2(q_L w_L + q_H w_H \eta_H^A + r_P k^A)}$$

Logically, there is a level of redistribution above which there in-work poverty vanishes.

$$1) \frac{\partial \tilde{\lambda}}{\partial w_L} = \frac{0.4 r_G (q_H w_H \eta_H^A + r_P k^A) - 0.6(1 - r_G) r_P k^M}{(1 - r_G) w_L^2} < 0 \Leftrightarrow r_G < \frac{3k^M}{3k^M + 2k^A + 2r_P^{-1} q_H w_H \eta_H^A} \quad \underline{\text{ambiguous}}$$

$$2) \frac{\partial \tilde{\lambda}}{\partial w_H} = -\frac{0.4 r_G q_H \eta_H^A}{(1 - r_G) w_L} < 0$$

$$3) \frac{\partial \tilde{\lambda}}{\partial r_P} = \frac{0.6(1 - r_G) k^M - 0.4 r_G k^A}{(1 - r_G) w_L}; \quad \frac{\partial \tilde{\lambda}}{\partial r_P} > 0 \Leftrightarrow r_G < \frac{3k^M}{3k^M + 2k^A} \quad \underline{\text{ambiguous}}$$

$$4) \frac{\partial \tilde{\lambda}}{\partial r_G} = -0.4 \frac{q_L w_L + q_H w_H \eta_H^A + r_P k^A}{(1 - r_G)^2 w_L} < 0$$

Proposition A1. When (i) the poverty line is \underline{I}^M , (ii) the median income earner is unskilled, and (iii) this median worker does not change with the shifts in income determinants, then:

1) The impact of w_L is ambiguous: a decrease in w_L entails a rise in $\tilde{\lambda}$ for

$$r_G < \frac{3k^M}{3k^M + 2k^A + 2r_p^{-1}q_H w_H \eta_H^A}, \text{ i.e., very low levels of the redistribution rate.}$$

Otherwise a decrease in w_L moves $\tilde{\lambda}$ downwards.

2) $\tilde{\lambda}$ and the number of working poor increase with w_H .

3) The impact of r_p is ambiguous: $\tilde{\lambda}$ increases (decreases) with r_p for

$$r_G < (>) \frac{3k^M}{3k^M + 2k^A}.$$

4) $\tilde{\lambda}$ and the number of working poor decrease with r_G

b) When the median income is a skilled worker

As the median income is a skilled worker, $I^M = (1 - r_G)(w_H \eta^M + r_p k^M) + r_G I^A$, and:

$$\underline{I}^M = 0.6 \left((1 - r_G)(w_H \eta^M + r_p k^M) + r_G I^A \right), \quad \text{with: } I^A = q_L w_L + q_H w_H \eta_H^A + r_p k^A$$

Because of Eq. (5), $\tilde{\lambda} = \frac{I^M - r_G I^A}{(1 - r_G)w_L}$, which yields by inserting \underline{I}^M into this equation:

$$\tilde{\lambda} = \frac{0.6(1 - r_G)(w_H \eta^M + r_p k^M) - 0.4r_G(q_L w_L + q_H w_H \eta_H^A + r_p k^A)}{(1 - r_G)w_L}$$

The condition for $\tilde{\lambda}$ to exist is $3(1 - r_G)(w_H \eta^M + r_p k^M) > 2r_G(q_L w_L + q_H w_H \eta_H^A + r_p k^A)$, i.e.:

$$r_G < \frac{3(w_H \eta^M + r_p k^M)}{3(w_H \eta^M + r_p k^M) + 2(q_L w_L + q_H w_H \eta_H^A + r_p k^A)}$$

Logically, there is a level of redistribution above which in-work poverty vanishes.

$$1) \frac{\partial \tilde{\lambda}}{\partial w_L} = \frac{0.4r_G(q_H w_H \eta_H^A + r_p k^A) - 0.6(1 - r_G)(w_H \eta^M + r_p k^M)}{(1 - r_G)w_L^2} < 0 \text{ because of (1).}$$

A decrease in w_L entails an increase in $\tilde{\lambda}$, and hence more working poor.

$$2) \frac{\partial \tilde{\lambda}}{\partial w_H} = \frac{0.6(1 - r_G)\eta^M - 0.4r_G q_H \eta_H^A}{(1 - r_G)w_L} > 0 \Leftrightarrow 3(1 - r_G)\eta^M > 2r_G q_H \eta_H^A \Leftrightarrow r_G < \frac{3\eta^M}{2q_H \eta_H^A + 3\eta^M}$$

$$3) \frac{\partial \tilde{\lambda}}{\partial r_p} = \frac{0.6(1 - r_G)k^M - 0.4r_G k^A}{(1 - r_G)w_L} \Rightarrow \left\{ \frac{\partial \tilde{\lambda}}{\partial r_p} > 0 \Leftrightarrow r_G < \frac{3k^M}{2k^A + 3k^M} \right\}$$

$$4) \frac{\partial \tilde{\lambda}}{\partial r_G} = -\frac{0.4I^A}{(1 - r_G)^2 w_L} < 0$$

Proposition A2. When (i) the poverty line is \underline{I}^M , (ii) the median income earner is skilled, and (iii) this median worker does not change with the shifts in income determinants, then:

- 1) $\tilde{\lambda}$ and the number of working poor decrease with w_L .
- 2) The impact of w_H is ambiguous: $\tilde{\lambda}$ and the number of working poor increase (decrease) with w_H for $r_G < (>) 3\eta^M \bar{a} / (2q_H \eta_H^A + 3\eta^M)$.
- 3) The impact of r_p is ambiguous: $\tilde{\lambda}$ and the number of working poor increase (decrease) with r_p for $r_G < (>) 3k^M / (2k^A + 3k^M)$.
- 4) $\tilde{\lambda}$ and the number of working poor decrease with r_G

By combining propositions A1 and A2, we find that the impacts of w_L , w_H and r_p are ambiguous (this finding is reinforced if the income shift comes with a change in the median income earner). The only effect that is clear is that an increase (decrease) in r_G moves down (up) the upper limit $\tilde{\lambda}$ and thereby the number of working poor. This result is still valid when the income shift comes with a change in the median income earner.

APPENDIX E.

Table A1. In-work poverty rate in European countries

1 = 60% of the household's median disposable income. 2 = 50% of the household's average disposable income

	AT		BE		DE		DK		ES		FI		FR		GR	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
2005	6,7	5,6	3,9	3,0	4,4	4,6	4,8	4,3	10,4	8,7	3,8	4,1	6,1	5,6	12,7	11,0
2006	6,4	5,4	4,0	3,2	5,5	6,7	4,5	4,4	9,8	7,6	4,4	4,3	6,0	5,1	13,7	12,0
2007	6,1	5,3	4,2	2,9	7,3	6,8	4,2	4,3	10,6	8,3	4,8	5,3	6,4	5,6	14,2	12,4
2008	6,4	5,9	4,7	3,7	7,1	6,9	5,0	6,0	10,6	8,6	5,1	5,6	6,8	7,5	14,2	12,9
2009	6,0	5,1	4,5	3,4	6,8	6,2	5,9	5,5	11,4	9,1	3,7	3,8	6,6	8,0	13,7	12,3
2010	5,0	4,7	4,5	3,4	7,1	6,5	6,4	6,1	12,6	10,9	3,7	3,8	6,2	7,0	13,9	11,2

	IE		IT		LU		NL		NO		PT		SE		UK	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
2005	5,9	5,3	8,9	8,6	9,8	7,0	5,9	5,6	4,6	5,2	11,5	12,8	5,3	4,6	8,0	9,3
2006	6,1	5,9	9,7	9,2	10,3	7,9	4,4	4,9	5,4	5,9	10,4	12,1	7,4	6,0	7,6	7,6
2007	5,7	5,2	9,9	9,7	9,3	7,7	4,5	5,3	6,6	5,5	9,3	10,5	6,6	5,4	7,8	7,8
2008	6,3	5,5	9,0	8,5	9,4	7,8	4,7	5,6	5,4	4,7	11,3	12,8	6,8	5,6	8,0	8,5
2009	4,9	4,7	10,2	10,6	10,1	8,1	5,0	5,8	5,7	5,0	10,3	10,8	7,0	5,8	6,3	6,6
2010	7,5	7,5	9,5	9,5	10,6	8,5	5,2	5,6	5,2	4,7	9,6	9,4	6,6	5,5	6,7	6,9

Table A2. Definition of variables and data sources

Variable	Source	Definition
Trade	Eurostat	Average of the total imports and exports of the goods and services divided by GDP.
North-South trade	Chelem	Sum of imports of manufacturing from emerging countries (including BRICs and Central & Eastern European countries) as a percent of GDP.
North-North trade	Chelem	The sum of total imports and total exports with developed countries as a percent of GDP.

<i>Low educational attainment</i>	Eurostat	The indicator is defined as the percentage of people aged 25 to 64 with an education level ISCED (International Standard Classification of Education) of 2 or less. ISCED levels 0-2: pre-primary, primary and lower secondary education.
<i>Social expenditures</i>	Eurostat	(Total of social protection benefits – Unemployment benefits– Old age benefits) in percent of GDP.
<i>Participation gain (33%)</i>	OECD	This indicator is constructed from the ‘participation tax rates for a transition into full-time work for persons receiving unemployment benefits at the initial level’ (i.e., who have recently fallen in unemployment) for workers whose wage is close to 33% of the average wage.
<i>R&D expenditures</i>	Eurostat	R&D expenditure as a percent of GDP R&D expenditure includes all expenditures for R&D performed within the business enterprise sector (BERD) on the national territory during a given period, regardless of the source of funds.
<i>Real GDP growth</i>	Eurostat	Real GDP growth rate. Percent change on previous year.

Table A3. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
<i>Trade</i>	49.89	27.95	22.2	142.6
<i>Trade “North-South”</i>	4.05	1.83	1.12	8.86
<i>Trade “North-North”</i>	26.57	14.87	7.87	76.61
<i>Low education attainment</i>	31.22	14.43	11.8	73.5
<i>Participation gain (33%)</i>	32.18	39.008	-19.27	165.96
<i>Social expenditures</i>	14.74	1.93	11.2	18.3
<i>R&D expenditures</i>	2.04	0.82	0.59	3.94
<i>Real GDP growth</i>	1.16	3.13	-8.5	6.6