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Differential Welfare State Impacts for Frontier Working-Age Families

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The central argument in this paper is that dissimilarities in welfare state objectives and taxation systems are of the major obstacles in promoting freedom of movement for work. By questioning to what extent mobile earners are covered by the objectives of the national social policies, the current study illustrates that their needs are only partially covered by the welfare states in which they work and reside. This paper focuses on the case of frontier workers in Luxembourg in Belgium as an illustrative example of mobile earners commuting in relatively similar settings. To answer to the research question, the application of two welfare state objectives of insurance and equity on the cases of frontier workers are examined. Mixed results are found. First, while countries follow analogous welfare regimes and pursue similar welfare objectives, their ensuing outputs differ significantly. Second, differences in unemployment conditions and benefits favor high discrepancies in residents' incomes. Third, mobility creates high vertical and horizontal inequity among resident of Belgium and Luxembourg.

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1. Introduction

In the late 1950s western European countries faced two major changes: freedom of movement (the Treaty of Rome, 1957) and the expansion of welfare programs. At the European Union (EU) level, free movement of labor began to be achieved through bi-lateral tax agreements and coordination of national social security systems.

While language, education, diplomas, and cultural differences are indicated as obstacles to mobility, existing evidence suggests that uncertainties in taxation and social security-related issues influence individuals' decisions to move.[2] For instance, opinion polls[3] on frontier workers[4] in the EU clearly indicate that welfare systems and taxation differences affect workers' welfare. Despite this, limited empirical proof exists of the extent to which current coordination and taxation policies affect the welfare of mobile workers[5].

Benefits and taxes vary greatly across the European Union, owing to incongruent welfare and taxation systems. Coping simultaneously with two or more welfare state systems is a prerequisite for free labor mobility in the EU. Each country's existing social security schemes are divergent, in line with their pressing population needs. This complicates coordination efforts.

Social security coordination promotes freedom of movement of workers; nevertheless, to what extent their entitlements and needs are covered by social security systems considering the multitude of national and supra-national policy complexities. The research question addressed in this paper is to what extent are the mobile earners covered by the objectives of national welfare states in which they reside and work? The null hypothesis is that current welfare systems cover through their national social policies, and cope with mobile earners' needs in various life-cycle stages. Moreover, that in system with similar welfare structures, mobile earners are less likely to suffer income loss. The alternative hypothesis is that regardless if welfare structures have similar objectives and aims, the differences in benefits conditions and taxation are in place and present an important barrier in work mobility and do not consider fully the place and role of mobile earners in national social policies.

Ebert and Lambert (2004) argue that future research should seek to extend the analysis to combined tax and benefit systems. In accepting this challenge this research proposes a holistic approach to investigate the simultaneous effects of taxes and benefits. Despite the relevance of tax regulations for cross-border work, and the strong ties of tax regulations to social security

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[2]   Greve and Rydbjerg (2003).
[3]   Nerb G. et al., (2009).
[4]   A frontier worker is defined as someone who "is engaged in a remunerative activity of a Member State in which he or she does not reside", "who normally returns daily, or at least once a week in the residence country (The European Parliament & Commission, (1997, 2009). In terms of Taxation Agreements, a frontier workers is defined as a non-resident.
[5]   This generic term is attributed here to any type of migrant that pay taxes and social insurance contributions, thus commutes to another country for work.

contributions and benefits[6]. These differences are of concern to frontier workers, who are subjects of two simultaneous tax and social security systems. By investigating the dual roles of tax and benefit system, this paper provides a quantification of policy impacts on the welfare of mobile earners, namely frontier workers and, by extension, migrants.

Analysis of these countries is carried out using the tax-benefit micro-simulation methodology. A tax-benefit system refers to the national fiscal and social policy legislative rules that generally reflect the objectives of a particular welfare state. The micro-simulation method allows us to generate models of two taxation regimes and two social security systems based on existing policies by combining rules from the EC Regulation 883/2004 and state-level fiscal regimes. Considering the complexities in interaction between policies and population, we simplify the complexity on population by using hypothetical data. These data represent various income groups of four cases: 1) residents of Luxembourg (called 'residents'), 2) residents of Luxembourg commuting to Belgium for work ('frontier workers'), 3) residents of Belgium, and 4) residents of Belgium commuting Luxembourg to for work.

Country case selection aims to investigate two cases that have similar welfare state objectives. Luxembourg and Belgium are classified as belonging to the Conservator-Corporatist welfare regime. Luxembourg is the country with one the highest number of cross-border workers and Belgium is the country with the highest rate of cross-border workers (Bonin H. et al., 2008).

The increasing interaction between migrants and welfare schemes is one of the most strongly debated topics in European social policy research, however most literature on worker mobility derives from the legal field and focuses largely on case studies of the impact of national and supranational legislation on mobility, work-place discrimination, and similar issues.[7] Other streams of literature study the role of citizenship in accessing welfare benefits or compare and contrast different migration regimes[8] or social protection systems.[9] Other authors explore regional policy disparities (across over 70 cross-border European regions) and discuss the role of free labor mobility on unemployment, taxation, and other economic risks.[10]

In the upcoming sections we focus on the importance of the welfare state objectives for social security coordination. We then make use of the national tax-benefit rules on hypothetical cases to demonstrate how coordination provisions of unemployment benefits and fiscal agreements affect income taxation in practice. The underlying complexities across different social and fiscal systems are minimized by using two similar welfare states—states that, despite their similarities, culminate in different outcomes, which are illustrated in the results section. The results prove that lack of synergy between current policy instruments can affect the welfare of individuals, even in cases where individuals are embedded in systems with fewer differences in organization.

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[6] Pennings F., Weerepas M., (2006).
[7] Mei van A.P., (2003), Pennings F., (2010).
[8] Sainsbury D., (2006), Dougan M., (2009), Greve B., (2010)
[9] Johnson P. (1999s), Kvist J. and Saari J., (2007), Champion, C., Bonoli, G., (2011), Schmitt C and Starke P., (2011).
[10] Perkmann M., (2003, 2007), Heinz F.F. et al. (2006), Pierrard O. (2008), Corvers F. and Hensen M. (2003), Matha T. and Hall P. (2008), Wintr L., (2009), Hartmann – Hirsch, C. (2010), Hartmann – Hirsch, C. and Ametepe, S. F. (2011).

2. Policy instruments of benefits and taxes of frontier workers in the EU

The aim of this section is to illustrate the operational dimension of taxation rules and coordination of social security schemes at the EU level to describe how the social security coordination functions, referring especially for frontier workers. The decisive role of the EC Regulation 883/2004 in coping with multiple national social security schemes, its challenges is demonstrated.

In European, the 'coordination' term has various meanings. It could refer to soft law, aiming at policy learning and sharing experience from national social policies (e.g. national poverty strategies, social inclusion policies, etc.), such as the "Open Method of Coordination" (OMC), and the OECD Strategy "Making Work Pay". Nonetheless, it could also refer to legally binding rules that Member States have to implement, such as the EC Regulations of free movement of labour. This paper refers solely to the latter mentioned type of coordination.

Free movement of workers is regulated by a set of legal instruments, that are generally captured under the "social security coordination" (SSC) concept. The EC Regulation 883/2004 is one of the fundamental documents in this area and is founded through the cooperation of national social security administrations. As such, it has the power to overrule national laws. Table 1 presents a schematic description of how the SSC principles operate among the EU Member States, for various groups of individuals, who move across the EU.

Table 1 indicates the following phases. When a person decides to move to another country, the first question concerns individual's place insurance: is it the country of residence or of employment. It is possible that the individual is subject to contributions in country a, and subject to tax in country b, or partially in both. Afterwards, it is decided if the individual pays social premiums in the same country where they are insured, or in another country. If no EC Regulations would exist, then national law would be applied, which – according to the territoriality principle - support the consumption of benefits within the territorial state where they are received by the residents (Mei van A.P., 2003; Pennings F., 2010), and excludes outsiders, who reside in other country than their residence country. However, the EC Regulation 883/2004 is in place to ensure that a single state rule is applied at a time.

Table 1. Rules Determining the Applicable Legislation of the Regulation 883/2004

What is the Competent State – Where is someone insured?				
Competent State Pays, but can also levy premiums or contributions?				
National Law		Reg.883/2004		
Problem: Double Insurance or No Insurance at all ⇒		Solution: Single State Rule -Art.11(1)		
Residence based systems	Employment based systems	Which State? ⇓		
		Workers	Inactive	Pensioners (health care)
		Lex Loci Laboris	Lex Loci Domicilii	Lex Loci Pensionado

Source: Mei van A.P., (2011), "Coordination of Social Security & Unemployment benefits", Social Security Law course, University of Maastricht.

Subsequently, depending on the employment status, a certain state law is applied. As the diagram indicates, active workers are subject of the country of work legislation, since this is the place where they pay contributions and taxes. Frontier workers pay contributions in the country of work, but some of the benefits (as unemployment) according to the legislation of the country of residence, (art. 65). Pennings F., and Weerepas M., (2006) affirm that as a result of applying different countries regulations, mobile earners can be worse off than if they had kept working in the state of origin only.

In this paper we argue that the major difficulty in coordinating national social security systems consists in coping with the differences in national social policies and taxation regimes of the Member States. Furthermore, these differences originate from various welfare state objectives that European countries have, which makes it difficult to communicate then across in practice.

Let us assume that a worker commutes in two types of settings: between countries with similar welfare state objectives and characteristics (e.g. Ireland-United Kingdom, Sweden-Denmark, Belgium – Luxembourg, Germany-France), and dissimilar (e.g. Spain-France, Slovenia-Italy, Denmark-Estonia). In the first case, one might expect fewer impediments in work mobility because the countries of residence and of work have similar welfare structures and objectives. Nonetheless, even if countries share similar welfare regimes accrued benefit entitlements and amounts could vary widely. Take the example of child benefits in a highly commuted region of

Denmark with Sweden, Øresund. In Denmark, the basic annual allowance is allocated for children 0-2 (16,998 kroner), 3-6 (13,448 kroner) and 10,580 kroner for each child aged 7 to 17. While in Sweden, a monthly benefit is given per child (1,050 kronor) with supplements for families with two or more children. Both countries are clustered as Scandinavian welfare states that are based on strong universalistic principles, yet differences between the systems are still significant. Even if systems do not differ significantly, social security coordination instruments needs to account for such vulnerabilities.

One of the major challenges is that SSC aims to facilitate labour mobility but at the same time the current set-up of social security coordination does not intend to address the differences in great detail between the systems. The variety of benefits amounts and conditions create challenges to frontier workers. Yet one of the fundamental principles of SSC that is moving for work from one Member State to another should not disadvantage the earners.

Apart from social security coordination, we refer to income taxation, which is not regulated at the EU level. Hence the bi-lateral fiscal agreements remain a core policy instrument in frontier work taxation management. In this paper we consider both the national taxation rules in each country and the general rules from the latest bi-lateral tax treaties (2002) on income taxation of frontier workers.

In conclusion, the Regulation 883/2004 is the core legally binding mechanism that indicates to the Member States how frontier workers need to be treated in terms of their benefits' accessibility and contributions. Fiscal agreements on the other hand, indicate how frontier workers are taxed in two countries' setting. Both policy instruments are unrelated and are applied at different levels: supra-national and bi-lateral.

3. The role of the welfare state objectives in work mobility, cases of Luxembourg and Belgium.

This section examines the meaning and role of the objectives of the welfare state, The welfare state refers to state measures of key welfare services provision (Barr N. A., 2004). Welfare states vary in terms of their objectives and structures. We seek to test how certain welfare objectives reflect upon the welfare of those residents who, due to their employment, are offered some benefits in another state. Two welfare state core objectives are selected: insurance and inequality. Unemployment insurance has been chosen as a case study due to particular coordination provisions for frontier workers. Nonetheless, other policy instruments (e.g. health insurance) could equally have been chosen. Supporting living standards by ensuring against unexpected fall in income is one of the key strategic objectives of a welfare state.

Equity refers to the distribution of resources in a manner that would achieve the most equal distribution of welfare in a society (Dworking R., 1980). We assume that individuals who commute across borders have similar skills and capacities but are more advantaged compared to their neighbours – given attractive labor markets across the border.

We assume that, the more similar welfare states are in their structures and objectives, the less inequity arises due to mobility. To observe such complexities, two countries with comparable

settings are selected. Belgium and Luxembourg are classified as Conservative-corporatist welfare regimes although some authors place Luxembourg in a mix between Scandinavian and Continental (Hartmann – Hirsch C. and Ametepe S.F., 2011). Since we carry out benefit calculations similar to Ferrera M. (1996), we consider both countries to belong to the same regime.

Benelux countries were the first cluster of European countries to remove barriers at the border and allow free circulation of persons and services in Europe (1944). They were the first European countries to share a common currency and later on, a high fluctuation of job migration,[11] long cross-border cooperation and respect for mutual agreements. Luxembourg and Belgium have in particular, signed a series of social security and fiscal agreements.[12] The latter consists of articles (17) on: supply at birth, invalidity, sickness and maternity-leave benefits. Presently, Regulation 883/2004 has supremacy over these social security agreements. As such, unemployment benefit provisions with regards to the Belgian and Luxembourgish frontier workers stem on this supranational legislation (Regulation 883/2004).

For the analysis, we consider national taxation regimes as the main reference to build up our model. Luxembourg taxes individuals jointly while Belgium relies on individual taxes. In Luxembourg married couples are jointly taxed while in Belgium, couples are taxed as individuals – i.e., both spouses' incomes are added and then taxed as single individuals (e.g. $T(Y_1 + Y_2)$). Thus, when considering the case of Luxembourgish residents, both spouses' income was added up, placed on tax bands and taxed accordingly. Similar considerations were made in cases where either of the spouses worked in Luxembourg and the other in Belgium, but both lived in Belgium (i.e., Luxembourg income + Belgian income, taxed on Luxembourgish tax rates).

4. Methodology

Micro-simulation is a means of modeling real life events by simulating characteristics and actions of the individual units that make up the system where the events occur (Atkinson A.B. et al., 1999). A tax-benefit system allows simulating of a wide array of contexts, majorly dealing with households' income and its recalculation under various scenarios (Immervol & O'Donoghue, 2002). There is an extensive literature in the field of comparative tax-benefit analysis (Rake J., Falkingham R. and Evans M., 1999, Evans M. and Lewis W., 1999, Immervoll and O'Donoghue C., 2002, O'Donoghue C., 2010). This analysis is based on hypothetical cases to facilitate operationalization of national legislation rules and allow for a wide array of life situations. We compute tax-benefits rules at household level and assume equal sharing of resources. Each case represents different income groups and working hours.

To gain a deeper understanding about the redistributive mechanism of the welfare state, it is necessary to separate social transfers and taxation in components (Ferrara and Nelson, 1995). Social benefits included in this analysis are: social assistance, child benefits and unemployment

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[11]   Nerb et al., (2009)

[12]   Convention on social security for frontier workers in 1959; Convention on Allocation of childbirth benefits under the legislation of family allowances, 1963; Improved Convention in 1964; Last Convention on social security for frontier workers between Belgium and Luxembourg in 1995; The last convention is an improved of the previous one, from 1963; this due that in this period the Regulation 1408/71 was launched.

benefits. Both social assistance schemes include housing benefits, scoring higher benefit amounts for Luxembourg than for Belgium and also taking into account higher living and housing costs in Luxembourg.

In the year to which the simulation is applied (2010), Luxembourg had 17 tax bands and Belgium 5. These ranged from 8 – 38% tax rate in former and 25 to 50% in latter. Luxembourg has a joint taxation system based on the splitting method. Couples' taxable income is first halved and tax liabilities are then calculated as for single persons. However, the actual tax paid by couples is double this amount (in line with tax class 2). Both countries offer tax credits for children. Tax deductions are offered to low income spouses in Belgium and mobility deductions in Luxembourg.

The following methodology was used to analyze the welfare objectives. We first analyzed the insurance component of both States' welfare objectives. We relied on two parameters: unemployment benefit level and net replacement ratios. In Luxembourg, unemployed individuals are paid for the first six months, 80% of the national average wage. In Belgium however, this rate goes down to about 65%. While allocation periods and eligibility criteria for both unemployment benefit-schemes differ, we apply an average length to reduce the differences (short term unemployment: 0-6, long term: 7-12). Average production wage is used to compare the standard of living in each country.

Secondly, we focused on the vertical inequity dimension. Here, we calculate a tax-benefit redistribution indicator to show the differences in income of both residents and frontier workers. For a better understanding of the policy effect on income, we first calculate the concentration curves of the pre-tax and post-tax income:

$$g^{pre}(p) = \int_0^y x dF(x) / \int_0^\infty x dF(x) \qquad (1)$$

$$g^{post}(p) = \int_0^y x - t(x) \, dF(x) / \int_0^\infty x - t(x) \, dF(x) \qquad (2)$$

Similar income cases are compared and calculated to show the distances between the concentration curves. Since we are using hypothetical data that does not allow for a clear representation of the distributional incomes, the above continuous case is turned into a formula in which the integral sign is replaced by a sum sign (see Cichon M. et al., 2004). Reynolds-Smolensky Index is used to calculate income variations. To determine the number of cases to which the perfect equality line corresponds, the sum of taxes and benefits is cumulated until it becomes zero. Market income is divided in half and consider such half to fall above or below the average. Assuming an equal proportion of income in different income cases, we determine how far to the right, the concentration curve bends. The Belgian instead of Luxembourgish market income was selected as a reference line to ensure the comparability of Belgian non-frontier worker-cases, who usually score the lowest. Table 2 summarizes the calculations.

Thirdly, we consider horizontal inequity by the use of equivalence scales. Considering that our hypothetical data set does not enable us to examine needs depending on age or other detailed characteristic of the household members, the equivalized income of the overall household is solely based on the presence or absence of an additional adult or child in the family.

5. Study Results

5.1. Frontier work in Luxembourg and Belgium: Unemployment Benefits

Hitherto we have explored the importance of social security coordination and its relevance to the welfare state objectives. In this section, we aim to evaluate the impact of the Regulation 883/2004 as the main coordination mechanism used in this paper for the case of unemployment. Insurance component is one of the major welfare state objectives (Barr N, 2004) and is strongly characteristic to Luxembourg, Belgium and other continental countries (Arts&Gelissen, 2003).

Before embarking on the analysis, it becomes clear from the benefit levels (Fig. 2, 3) that Luxembourg (compared to Belgium) offers higher benefits and attracts commuters (Hartman H., 2009, 2010). As such we can assume that having a Luxembourgish unemployment benefit boosts Belgian frontier workers' income (see Fig.1).

Figure 1. Unemployment benefit for Belgian frontier workers (theoretical scenario)

The use of replacement rates is a widely applied indicator to show the level of benefits in different countries – i.e., 'what percentage of earnings is replaced by the benefits' (Whitefold P., 1995). Replacement rates are generally considered as a consistent measure of relative levels of benefits comparable across countries. We show net replacement rates of earnings after taxation for different income groups. We calculate net rather than gross replacement rates as they offer a more precise income data at the disposal of commuters and non-commuters.

Applying the provisions of coordination Regulation 883/2004 (art. 65) however, unemployed frontier workers are entitled to unemployment benefits solely in the country of residence, as calculated based on the Belgian national legislation. In our case, former Belgian frontier workers are eligible to Belgian unemployment benefits. Hence, a Belgian frontier worker in Luxembourg contributes a 2,5% premium rate and benefits from 60% of the previous average earnings rather than 80% as his/her colleagues in Luxembourg. Luxembourgish frontier workers in Belgium on

the other hand, contributes 0,87% of their income and are eligible to 80% of their previous earnings. Pennings F. (2010) argues that "this rule is quite problematic, since it deprives an unemployed person of benefits for which s/he has paid contributions". Our analysis proves the same. Figure 2 refers to two scenarios: previous work in Belgium (a), (c) and having worked in Luxembourg (b),(d).

**Figure 2. Unemployment benefit and net replacement rates, Belgium**

(2a) Resident	(2b) Frontier worker [13]
(2c) Resident	(2d) Frontier worker
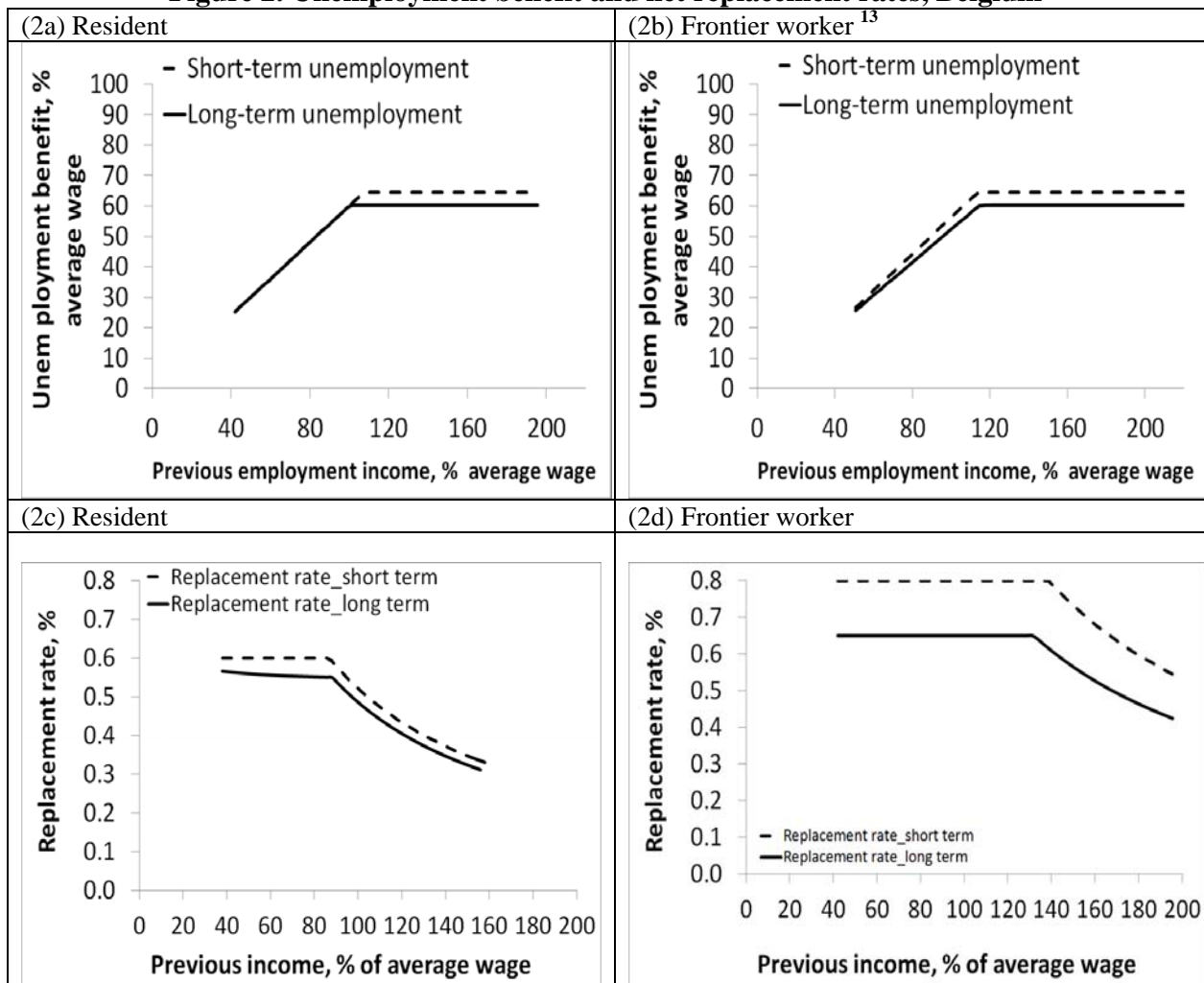
The Short-term line indicates the amount of benefit that an unemployed individual between 0-6 months would normally receive. The Long-term line indicates the amount received by job seekers for more than 6 months and up to one year. To avoid benefit dependency, the long term benefit is usually less and decreases with time – as shown in the graphs. Consequently, scenarios (c) and (d) indicate replacement rates for unemployment benefits among our comparison groups.

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[13]A Belgian resident working in Luxembourg.

Fig. 1 has a higher unemployment benefit level than Fig. 2 (b). This indicates that a former Belgian frontier worker loses more income when the Regulation rules are applied. At the same time, the Regulation is provided to ensure that the best scenario is attained. When an unemployment authority is not financially responsible for the job seeker to find a job, it becomes more complicated to give benefits to particular individuals. For this reason, a former frontier worker is financed and based in the country of residence solely. Similarly, we observe a fall in income of Luxembourgish frontier workers (see Fig. 3b and 3c).

Figure 3. Unemployment benefit and net replacement rates, Luxembourg
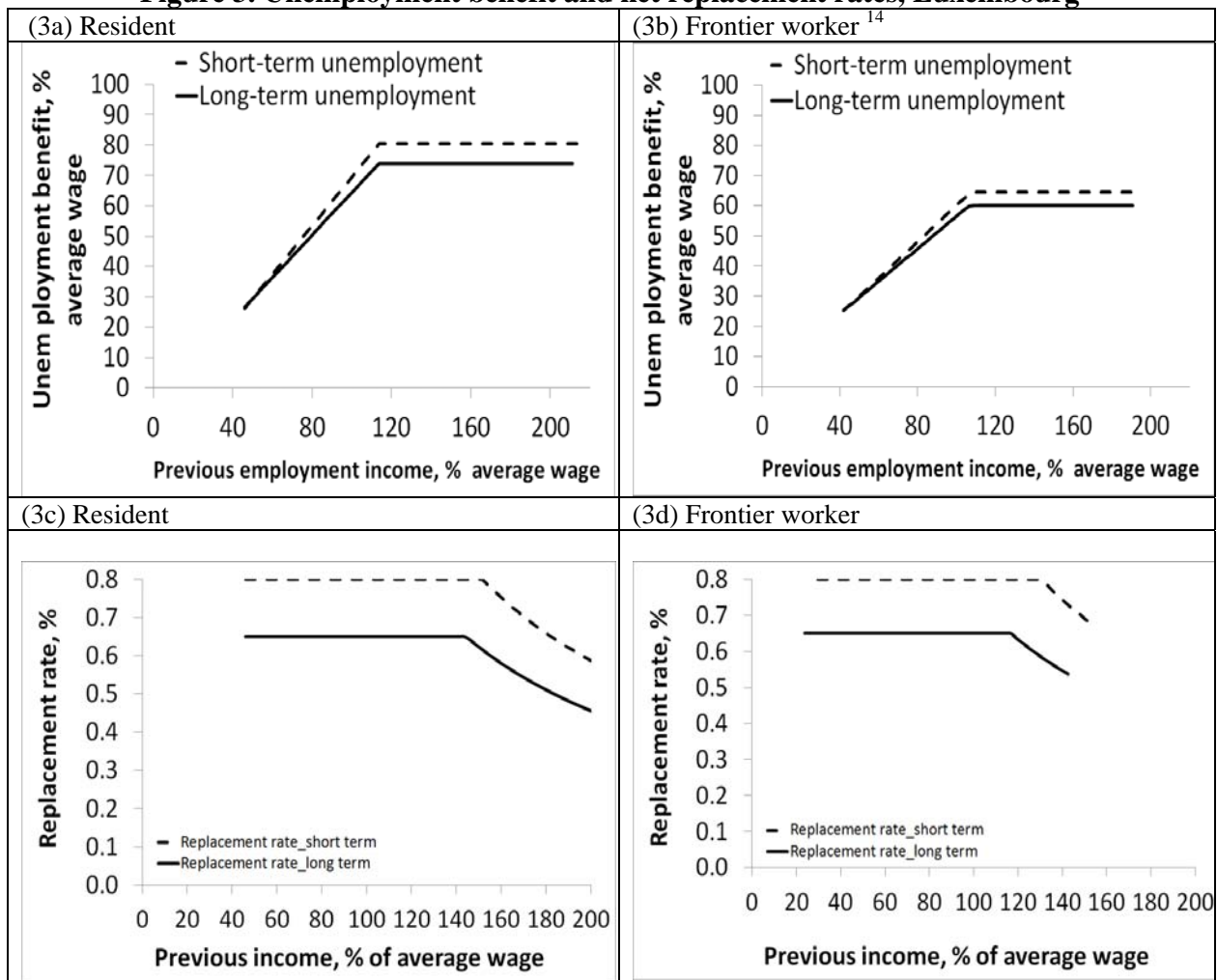
The unemployment benefit level for Luxembourgish residents (Fig. 3, a) increases as the previous income increases. This reflects higher unemployment benefits as expected for those groups with higher previous earnings. For low income groups, replacement rates increase up to a certain point and then decrease as previous earnings increase. This is due to benefit-ceiling. The latter prevents receipt of higher benefits in cases where individuals earn high incomes in previous jobs.

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[14]   A Luxembourgish resident working in Belgium

Luxembourgish frontier workers naturally have lower benefit levels than the residents given their previous lower earnings in Belgium. Whereas the Luxembourgish legislation provides for an 80% (of previous earnings) initial benefit, Luxembourgish frontier workers are disadvantaged. This is unlike Belgian frontier workers who are not as disadvantaged - mainly due to their high previous earnings (Fig. 2, b). Moreover, they incur similar replacement rates as the Belgian residents for lower and higher income groups.

Generally, the results show that unemployment insurance affects both residents and frontier workers divergently. Regulation's provision on unemployment does not have a symmetric impact on the welfare of former frontier workers. In particular, the insurance component of comparable welfare states' objectives does not apply equally to both residents and frontier workers. This causes income discrepancies in case of unemployment.

5.1 Vertical Inequity and Labour Mobility.

This paper evaluates how welfare state objectives are achieved in a mobile setting. In section 5.1, we focused on the insurance component. Sections 5.2 and 5.3 focus on fair income redistribution through tax policies. We explore the effects of labour mobility on vertical inequity in the current section and horizontal inequity in section 5.3.

One of the core principles in vertical inequity is the increase in taxation as income increases, in other words "unequals are treated equally" (Dworking, R., 1981). If the taxation is higher or lower than proportional to the raise in income of frontier workers we will assume a case of vertical inequity. The analysis refers to comparison between and among groups of resident and frontier workers. We examine whether frontier workers have higher disposable income than the residents. We use this to indicate whether or not mobility creates vertical inequity.

Table 2 consists of four indicators that vary depending on the family type. The first two indicators show the distance between the market and disposable income curves from the reference line (Belgian market income). The market income gap changes depending on the number of earners in the household. Disposable income on the other hand, varies depending on the family context and tax/deductions. The area between the reference line - market - disposable income is the 'Redistribution indicator' (division of disposable and market income). The negative sign stands for very small differences in income before & after taxes.

The 'Ratio indicator' suggests how much further or closer the income of compared groups is. When the coefficient is higher than 1, the residents have lower income than frontier workers and the vice versa. It clearly shows a pattern of income discrepancies between incomes of frontier workers and residents - within and across countries.

Table 1. Redistribution indicators

Family Types	Area_market income		Area_disposable income		Redistribution		Ratio
Single[15]	R	FW	R	FW	R	FW	R/ FW
L	0,354	0,354	0,048	-0,001	-0,306	-0,355	0,86
B	0,354	0,354	0,015	0,090	-0,339	-0,264	1,28
	Area_market income		Area_disposable income		Redistribution		Ratio
2 E	R	FW	R	FW	R	FW	R/ FW
L	0,352	0,352	0,043	-0,055	-0,308	-0,406	0,76
B	0,352	0,352	0,167	0,245	0,185	0,107	1,74
	Area_market income		Area_disposable income		Redistribution		Ratio
2 E 1 CH	R	FW	R	FW	R	FW	R/ FW
L	0,352	0,352	0,035	-0,057	-0,317	-0,409	0,78
B	0,352	0,352	0,095	0,176	-0,257	-0,176	1,46
	Area_market income		Area_disposable income		Redistribution		Ratio
1E0E1CH	R	FW	R	FW	R	FW	R/ FW
L	0,354	0,354	0,032	-0,002	-0,322	-0,356	0,62
B	0,354	0,354	0,173	0,098	-0,181	-0,256	1,27
	Area_market income		Area_disposable income		Redistribution		Ratio
1E0E0CH	R	FW	R	FW	R	FW	R/ FW
L	0,354	0,354	0,231	0,142	-0,123	-0,212	0,808
B	0,354	0,354	0,173	0,083	-0,181	-0,271	0,980
	Area_market income		Area_disposable income		Redistribution		Ratio
1E1E1CH	R	FW	R	FW	R	FW	R/ FW
L	0,352	0,352	0,119	0,184	-0,233	-0,168	0,84
B	0,352	0,352	0,018	0,033	-0,334	-0,319	1,15
	Area_market income		Area_disposable income		Redistribution		Ratio
1E1E0CH	R	FW	R	FW	R	FW	R/ FW
L	0,352	0,352	0,035	0,013	-0,317	-0,339	0,84
B	0,352	0,352	0,035	0,013	0,257	-0,166	1,20

Source: authors' calculations

Belgian coefficients are higher than Luxembourgish, indicating higher income of Belgian frontier workers in Luxembourg than Belgian residents. The coefficients for Luxembourg oppositely indicate that the Luxembourgish residents have higher income than Luxembourgish frontier workers in Belgium. Taxation instruments in Luxembourg can easily explain these discrepancies.

Luxembourg offers a variety of tax deductions among which mobility deduction plays an important role. A frontier worker in Luxembourg obtains a tax deduction of up to 3.000 E per

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[15] The acronyms for family types are: Single earner, 2E – 2 Earner couples, 2 E 1 CH – 2 Earners 1 Child, 1E0E1CH – 1st spouse is an earner, 2nd spouse is a social assistance receipient, not earning, 1 child. 1E0E0CH – 1 Earner couples without children. 1E1E1CH – Two earner mixed couple with 1 child, where 1 spouse work in a different country than that of residence, 1E1E0CH - Two earner mixed couple without a child, where 1 spouse work in a different country than that of residence.

year for their commuting expenses (2010). Moreover, a frontier worker is entitled to generous child benefits and child tax credit, which together consists of an almost double less amount than Belgian child benefits and credit.

Mobility creates vertical inequity among Belgian and Luxembourgish earners. Fig. 4(a) shows that the line closest to the market income is that of a Belgian frontier couple compared to the rest of the three groups. This indicates that Luxembourgish tax deductions on mobility and other taxation instruments boost frontier workers' income. At the same time, the least favoured by taxation instruments are Luxembourgish frontier workers in Belgium (last line at the bottom), showing the highest gap between market and disposable income. Moreover, if compared to Luxembourgish market income, the difference would increase.

Figure 4. Figure 4: Market vs. disposable incomes, Two earner couples

(4a) no child[16]
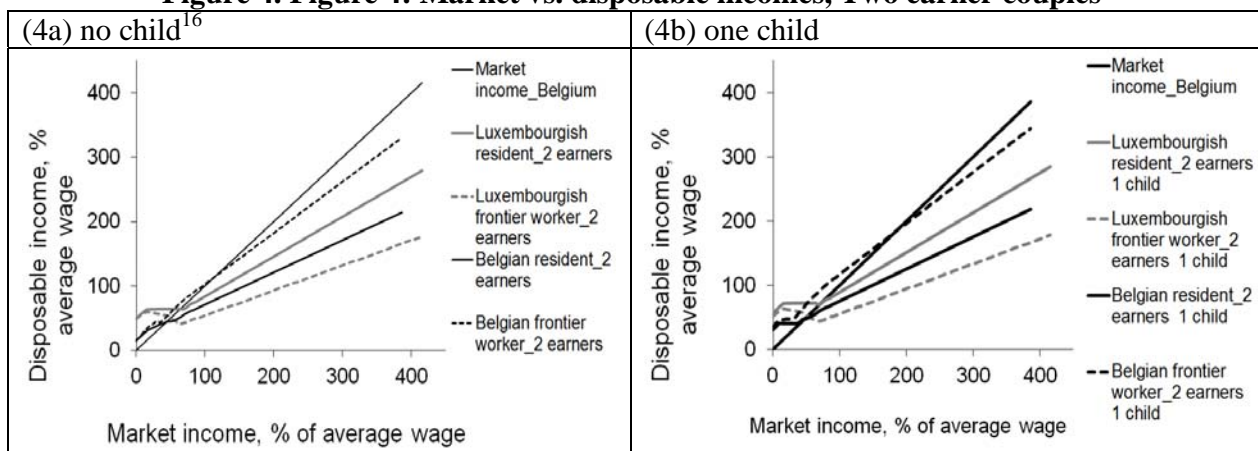
(4b) one child

A Belgian frontier couple with one child Fig. 4 (b) earns almost as much as the Belgian residents without being taxed. Single cross-border earners show similar pattern. Mobility deductions can create large differences in income and so does the child tax credit and benefit. Figs. 4(c) and 4(d) imply that child related tax instruments can play an important role in boosting income.

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[16] The acronyms of income slopes are: Market income_Belgium – Belgian gross market income, lu_resident/be_resident – Luxembourgish/Belgian resident, lu_cbw– Luxembourgish resident working in Belgium, be_cbw – Belgian resident working in Luxembourg.

Figure 5. Two earners, mixed couples

(4c) no child[17]	(4d) with one child
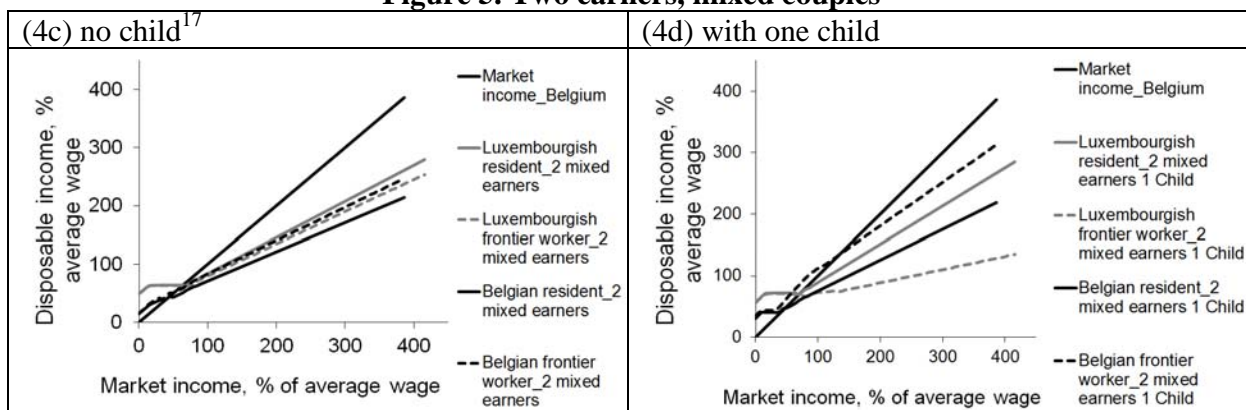
A mixed couple[18] means that spouses have access to social assistance for two earners with/without child in the country of residence, are eligible to two tax deductions and credits, and have the highest child benefits (Regulation 883/2004). Surprisingly, mixed childless couples are the least unequal - with lowest differences between their incomes (see Fig. 4c). This implies that, when a family operates in two systems at the same time, Belgian frontier workers earn less than what they would earn otherwise. Nonetheless, welfare for single earner couples decreases as they commute to neighboring countries (see Fig 4e).

Figure 6. One earner couples

(4e) no child	(4f) with one child
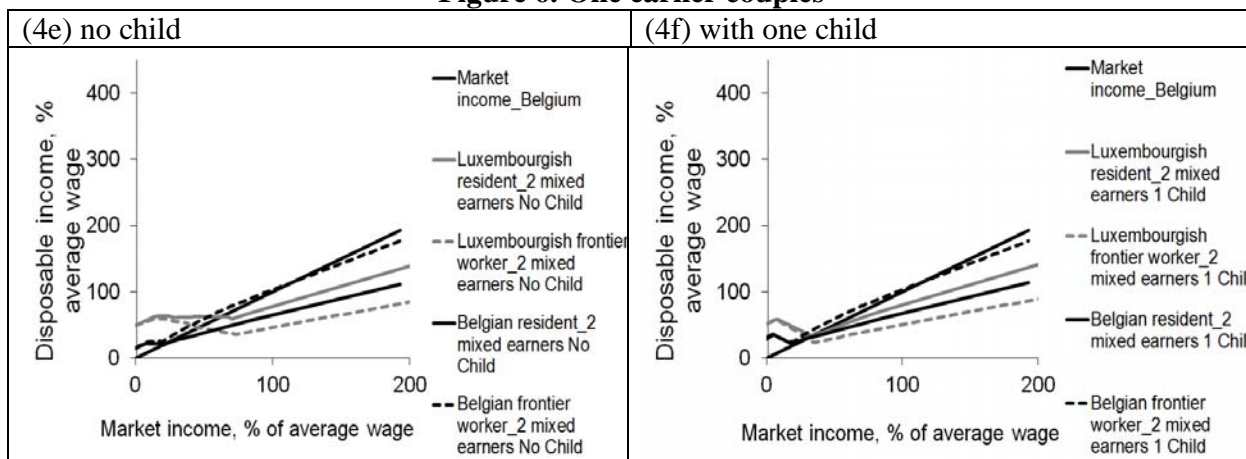
The 'winner' according to the Redistribution Indicators and graphs on disposable incomes are the Belgian frontier workers versus the consequent cases: Luxembourgish residents, Belgian residents and Luxembourgish frontier workers.

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[17]   The acronyms of income slopes are: Market income_Belgium – Belgian gross market income, lu_resident/be_resident – Luxembourgish/Belgian resident, lu_cbw– Luxembourgish resident working in Belgium, be_cbw – Belgian resident working in Luxembourg.

[18]   Mixed couple is refers to couples in which spouses work in two different countries.

When measuring inequality, one needs to take into account that individuals have different resources (equality of resources), skills and opportunities (equality of opportunity) that can increase or decrease the welfare gap between individuals. Work mobility for Belgian frontier workers offer, in this case, fiscal advantages that are not present in Belgium. These relate to: generous child benefits, mobility deductions and child tax credits.

5.2. Horizontal Inequity and Labour Mobility.

Section 7 seeks to examine horizontal equity – i.e., 'equal treatment of equals'. A family with children should be as better off as a family without children. To determine the difference in income levels between families that commute to other countries and those who do not, the "equivalized disposable income" is deducted by computing the overall income of the households after taxes divided by the number of members in the household (Eurostat definition). The disposable income of various family types is divided into the disposable income of the reference group (a single earner in the country of residence).

The higher the coefficient on the y axis the higher the equivalence scales. If the ratio on the y axis is 1, the equivalence scale is 1. This means that the needs of a certain family type are achieved in a similar manner as the needs of a household of a single earner. If the coefficient is lower than 1 however, the particular household type is not well supported by the prevailing taxation system. Fig. 5 (a) presents the case where disposable incomes of one or two earners with/without children is divided by the disposable income of single earners in Luxembourg. This estimates how different their income is from 1.

Figure 7. Equivalence scales, Luxembourg
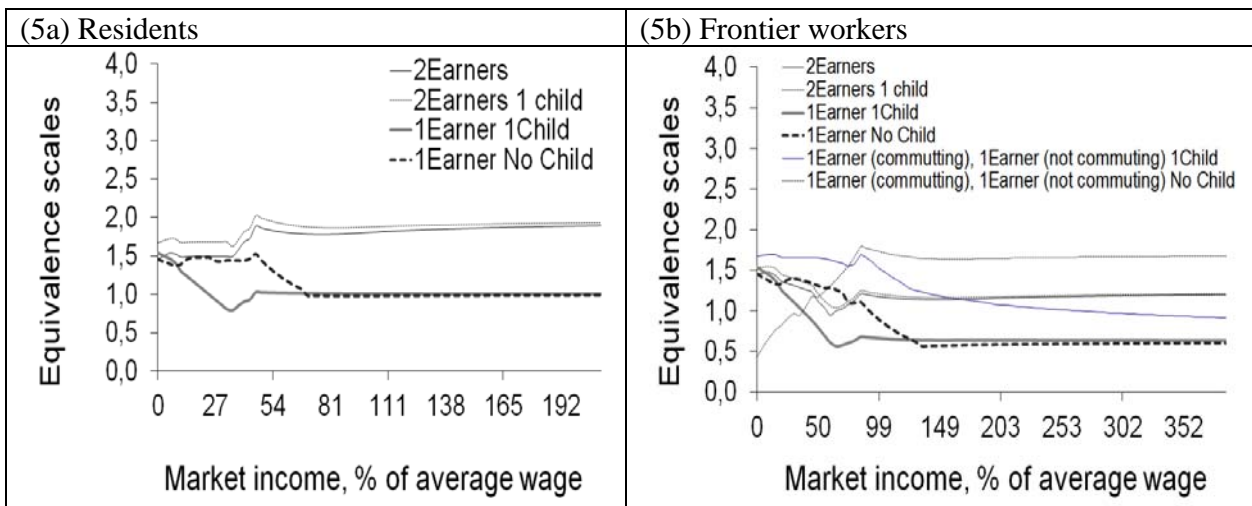
A couple of one earner with/without a child is as better off as a single earner with no family working and residing in Luxembourg. On the contrary, similar family-types that commute to Belgium for work earn much less (see Fig. 5b).

Two earner couples should have an equivalence scale of two, compared to one in case of a single earner. As we can observe, this is the case of two earner couples with/without children working

and residing in Luxembourg, see Fig. 5(a). They seem to be equally better off. However they have an equivalence scale of less than 1.5 when commuting to Belgium for work (see Fig. 5b). Similarly, mixed couples without children are worse off than frontier workers and resident couples without children, see Fig. 5 (b).

Figure 5 (a) and 5 (c) illustrates that the Belgian resident families working in Belgium seem to be slightly better off than Luxembourgish-two earner couples without/with children. Full-time earners show an equivalence scale of 2,2/2,4 versus 1,8/2,0 in Luxembourg. One of the explanations might refer to the individual Belgian tax system versus joint taxation in Luxembourg. Studies on joint versus individual taxation (Immervoll et al., 2009, Piggott and Whaley, 1994) illustrate that joint taxation, especially at the bottom of the distribution, display negative impact and tax burden on married couples.

Low earner-couples without children in Belgium have an equivalence scale of 0,7 rising till 2,2. This is due to low social assistance benefits for childless couples. Similarly, the Luxembourgish low income couples have a low equivalence scale rising from 1,4 to 1,8. "Marriage penalties" result reveals that penalties depend primarily on the incomes of the lowest-earning spouses (OECD Report, p.29, p.67).

Figure 8. Equivalence scales, Belgium

(5c) Residents	(5d) Frontier workers
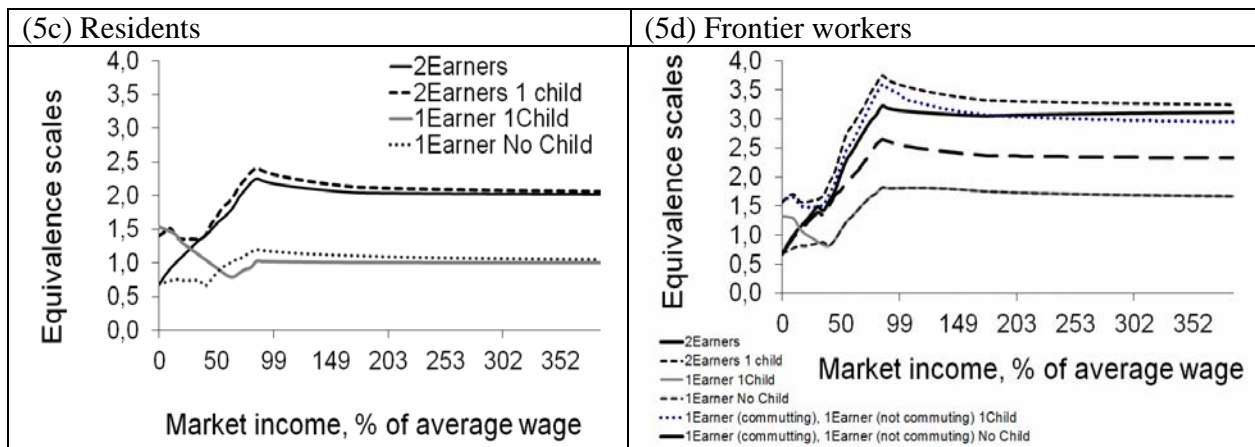
In both countries, full-time single earner residents with children have an exact equivalence scale of 1 - meaning that these households do not differ in income with single couple earners with children. Luxembourgish and Belgian child tax credit and social assistance for couples with children seem to favour single earner-couples with children. Low income one earner couples with children are more favoured in Luxembourg than in Belgium - due to the generous social assistance scheme.

Owing to the generous social assistance scheme moreover, low income one earner childless couples are more advantaged in Luxembourg than in Belgium. The kink in slope for low income earners in the Figure 5(c) to the left is due to marital quotient tax deduction, which increases as spouse's income increase. Full time one earner childless couples are slightly better off in Belgium than in Luxembourg.

If formerly, couples with two earners with/without children had the highest equivalence scale, in the case of cross-border earners, the peak was reached by *mixed couples* (one spouse commutes to another country, while another works in the residence country) without children, in the case of Luxembourg and mixed couples with children, in the case of Belgium. Although, the difference is quite substantial for Belgian frontier workers (coefficient of 3,9) and Luxembourgish commuters (of 1,7), it becomes obvious that being part of two systems at the same time, can bring significant advantages (as is the case of Belgians).

The second highest equivalence scale in both countries is for mixed couples with children. Compared to ordinary Luxembourgish resident couples with one child, the Luxembourgish cross-border commuters in Belgium have a much lower equivalence scale. Figure 6(d), clearly shows very high equivalence scale for various types of families, illustrating a clear advantage compared to the Belgian residents. Last but not least, we aim to display the variation of frontier workers' disposable income for different types of families compared to the residents (division of Luxembourgish resident disposable income to Luxembourgish frontier worker's income). See Figs. 5(e) and (f).

Figure 9. Equivalence scales, frontier workers versus residents
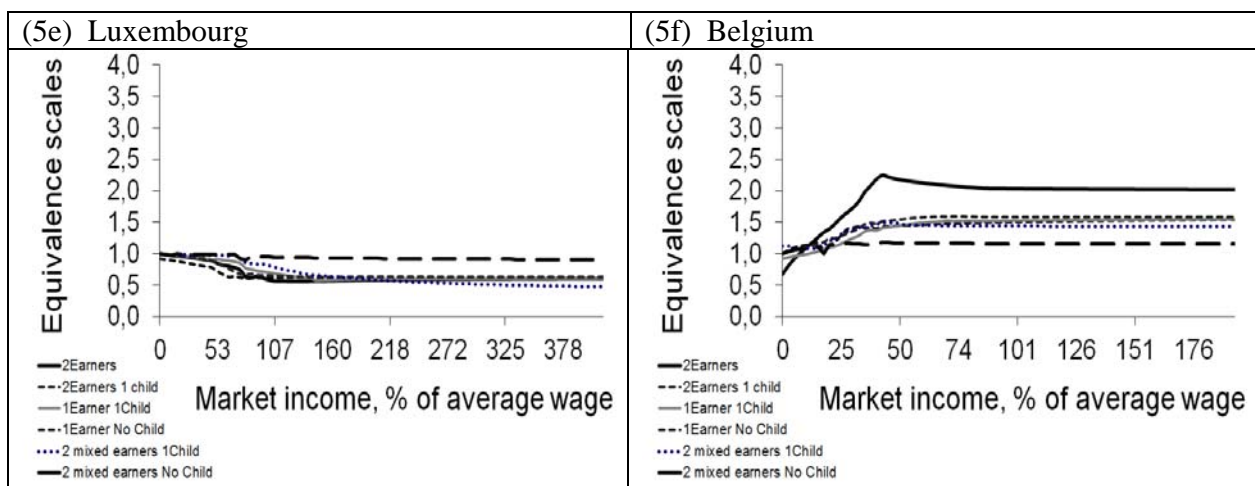
Figures 5(e) and (f) illustrate the fact that the Luxembourgish frontier workers in Belgium are more disadvantaged working in Belgium. This applies to all types of families, especially to the mixed childless couples. For Belgian families, the equivalence scales are higher than one for all types of families - except for those income groups that receive social assistance. It can be concluded that the equivalence scales present high discrepancy in incomes for Belgian frontier workers versus Belgian residents.

6 Conclusions.

This analysis quantifies the impact of mobility on the welfare of individuals by examining the objectives that the welfare states achieve through national policies. It further demonstrates how changes in life-cycle (such as unemployment, family extension, or poverty) can affect the welfare of "mobile" families. Under the concurrent functionality of two welfare states, we examine how frontier workers from Belgium and Luxembourg are insured against unemployment and poverty and, moreover, how this compares to earners who work locally in Luxembourg and Belgium. We propose a more integrated approach of impact evaluation on welfare by examining the impact of tax-benefit systems in two countries with relatively similar welfare state characteristics. The analysis focused on three welfare state objectives: unemployment insurance, vertical inequity, and horizontal inequity.

Coping with the systems of two welfare states that follow similar objectives (e.g. to insure residents against sudden fall in income) produces different impacts on welfare for each state's citizens. On one hand, we find that differences between unemployment entitlements and benefit amounts, along with costs of living, can negatively affect the income of Luxembourgish frontier workers. They pay low Belgian insurance contributions and, due to lower previous earnings in Luxembourg, suffer income loss compared to Luxembourgish earners who commute for work to Belgium. On the other hand, Belgian frontier workers are not treated fairly compared to their Luxembourgish colleagues, since they pay high unemployment contributions but have to comply with Belgian legislation when it comes to unemployment benefits. At the same time, high social insurance payment in Luxembourg and low Belgian unemployment benefits can still cover for the unexpected loss of income of Belgian frontier workers at a higher level than faced by Belgian non-frontier residents.

The general assumption behind coordination of unemployment benefits is that former frontier workers pay insurance contributions in the country of work, but receive benefits in their country of residence - because they are most likely to find a job in their residence country due similar language and education. Nonetheless, as Pennings F. (2010) argues, this still does not explain why frontier workers cannot receive unemployment benefits in the country where they have previously paid social insurance contributions.

Examining the case of Luxembourg and Belgium, we have concluded that regardless if the country of employment and residence belongs to the same welfare regime, the differences in living costs, benefits structures and income taxation lead to different outputs for earners who commute between these countries.[19] The reason for such variations is explained by the objectives each welfare state has. Depending on its population needs, political dynamics and traditions in social security, the welfare state follows various objectives. For example, Luxembourg offers high benefits which attract commuters (Hartman H., 2009, 2010). One of the most discussed objectives is the insurance and equity objective (Barr N., 2004).

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[19] Despite many commonalities in welfare state traditions (e.g. conservative-corporatist welfare regime) and long history of cross-border cooperation, the discrepancies in income taxation allowances and rates, the differences in benefits amounts and conditions, lead to large differences in earnings of domestic and frontier workers.

The insurance objective aims to smooth the income of earners who are not able to insure themselves during a particular life-event (e.g. health issues, unemployment, retirement). The results of our research shows that from income smoothing point of view, Belgian frontier workers in Luxembourg who become unemployed are better insured than Belgian domestic earners, but less insured than Luxembourgish earner.[20] The equity objective refers to a distribution of resources in a manner that would achieve the most equal distribution of welfare in a society (Dworking R., 1980). Two types of distributions are examined: vertical (from rich to poor) and horizontal (between different types of earners).

Mobility creates vertical inequity among Belgian and Luxembourgish earners. The fiscal advantages offered in Luxembourg and not present in Belgium (e.g. generous child benefits and child tax credit, tax mobility deductions), leads to vertical inequality in Belgian case. A Belgian frontier couple with one child earns almost as much as the Belgian couple with one child without being taxed. On horizontal equity dimension[21], the results point that when comparing mixed couples versus couples where earners have both worked in the same country, being part of two systems at the same time can bring significant income advantages, as is the case of Belgians.

It can be concluded that due to higher income of Belgian frontier workers compared to domestic earners, vertical and horizontal equity objective are not achieved by the Belgian and Luxembourgish welfare state. Similarly is the case of insurance objective. Namely, Belgian welfare system hosts Belgian domestic and frontier workers, but these are treated differently. The differences in income of mobile and domestic earners are not proportionally addressed, because differently than Luxembourgish welfare state, the Belgian system does not aim to attract frontier workers and do not offer mobility deductions, or other tax-benefit incentives. These two systems follow different objectives, which are reflected in the structure of the benefits, their amounts, and various policy incentives.

The current framework of coordination leaves the procedural differences between national social security systems unaffected - "it does not intend to set up, not even gradually, a unified European social security system"[22] At the same time, the wide variation of fiscal rules and social benefits procedures present administrative challenges and reduced level of contentment and the rate of mobile earners within the EU.

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[20] The provision of the supra-national regulation (EC Regulation 883/2004) on social security foresees that unemployment benefits are mainly provided in the country of residence.[20] Belgium offers unemployment benefits of approximately 60% of previous earnings for a single earner, while Luxembourg 80% of previous earnings. This means that Belgian frontier workers in Luxembourg who have paid the same unemployment contributions as Luxembourgish workers receive lower unemployment benefits and are less insured than Luxembourgish workers. At the same time, due to higher earnings in Luxembourg, they are better insured than Belgian domestic earners.

[21] The needs of a household grow with each additional member, not in a proportional way (OECD definition) and the equivalence scales indicate to what extent the needs of a household are proportionally met with their income.

[22] DG Employment, Social Affairs and Equal Opportunities, 2009.

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