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INCOME, WEALTH AND CONSUMPTION OF CROSS-BORDER COMMUTERS TO LUXEMBOURG

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Income, wealth and consumption of cross-border commuters to Luxembourg [*]

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Abstract:

Exceeding 40% of domestic employment cross-border commuters are extremely important to Luxembourg's economy and labour market in general. This paper presents unique information on their income, wealth and consumption using representative survey data from cross-border commuter households to Luxembourg. The estimated average total net wealth of cross-border commuter households is about €240,000, which falls substantially short of comparable estimates for Luxembourg resident households exceeding €700,000. Cross-border commuters do not only receive money from but also leave money in Luxembourg. In terms of consumption expenditures, they spend on average more than €9,300 per year inside Luxembourg's borders, representing about 15% of their total gross income and 17% of their gross income from Luxembourg.

Keywords: household, survey, wealth, income, consumption, cross-border, commuter
JEL Codes: D31, C81, C83, J61

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Table of contents

Résumé non-technique

Introduction

Depuis 2000, le nombre de non-résidents qui travaillent au Luxembourg a augmenté de 77%, pour atteindre 44% de l'emploi intérieur en 2011. Néanmoins, jusqu'à présent, il existe peu d'informations concernant la situation financière (revenus, actifs, passifs) des ménages non-résidents en général et des travailleurs frontaliers en particulier. Ce cahier fournit des estimations préliminaires sur le revenu, le patrimoine et la consommation des ménages frontaliers résultant d'une enquête effectuée par la BCL en 2010-2011 en coopération avec le CEPS/Instead, ainsi qu'une description détaillant la collecte et le traitement des données. Il s'agit d'une enquête complémentaire à celle concernant les ménages résidant au Luxembourg (dont les premiers résultats ont été publiés dans un encadré du bulletin BCL 2012-1). L'objet d'étude de l'enquête auprès des ménages frontaliers sont les ménages résidant dans les régions limitrophes du Luxembourg et dont au moins un membre travaille au Luxembourg à la date de l'enquête.

Estimations du revenu et du patrimoine

Le revenu perçu au Luxembourg peut comprendre les salaires de plusieurs membres du même ménage. Pour l'année 2009, le **revenu total brut** s'élève en moyenne à €55 000 pour les ménages frontaliers français (médiane €41 250), à €69 000 pour les belges (médiane €55 000) et à €70 000 pour les allemands (médiane €55 000). Comme base de comparaison, parmi les ménages résidant au Luxembourg qui disposent d'un revenu, la valeur moyenne est de pratiquement €74 000. Pour 46% des ménages frontaliers, le revenu au Luxembourg est complété par un revenu obtenu dans le pays de résidence, qui correspond généralement au revenu d'un conjoint. Néanmoins, seuls 14% du revenu total proviennent du pays de résidence, c.à.d. que le revenu en provenance du Luxembourg est moins déterminant pour les différences du revenu total entre les ménages résidants et frontaliers.

Le **patrimoine net** estimé (la cumulation des actifs réels (biens immobiliers, véhicules, etc.) et les actifs financiers (comptes bancaires, parts d'OPC, participations, assurance-vie) et en déduisant les dettes éventuelles) par ménage est estimée à €240 000 pour les frontaliers. En moyenne, le patrimoine net des ménages frontaliers ne représente que 34% du patrimoine net des ménages résidents. En tout cas, les mêmes différences caractérisent les deux principales composantes du patrimoine, à savoir les biens réels et les biens financiers.

En moyenne, il est légèrement plus probable qu'un ménage frontalier soit propriétaire de sa résidence principale. Pour les ménages résidant, 67% possèdent leur résidence principale, la proportion correspondante atteignant 72%. La résidence principale sert de collatéral d'un prêt hypothécaire pour 40% et 33% des ménages frontaliers et luxembourgeois. En ce qui concerne les seuls ménages frontaliers qui sont propriétaires de leur résidence principale, la valeur moyenne de l'immeuble est de €268 000, ce qui représente 44% de la valeur moyenne se rapportant aux ménages résidants (soit près de € 612 000). La valeur de la résidence principale ne varie pas significativement entre pays frontaliers. Pour les ménages frontaliers qui détiennent un prêt hypothécaire sur leur résidence principale, la valeur

moyenne correspondante est de €114 000. Cette valeur est très inférieure au chiffre relatif aux ménages résidants (€169 000).

Parmi les ménages frontaliers, 60% déclarent posséder du **patrimoine financier**[1]. Parmi les ménages frontaliers qui déclarent détenir du patrimoine financier, le montant moyen est de €55 000, soit un montant largement inférieur à la somme moyenne des ménages résidants (soit €73 000). Même si la plus grande part du patrimoine financier est investie dans le pays de résidence, les ménages frontaliers investissent également ailleurs. En moyenne, les ménages frontaliers qui investissent à l'étranger détiennent €30 000 au Luxembourg. Environ un tiers des ménages frontaliers ont contracté d'autres prêts que des emprunts hypothécaires. Ce chiffre est le plus élevé parmi les frontaliers français (38%) et le moins élevé parmi les frontaliers allemands (25%). Il est relativement fréquent pour les ménages frontaliers de contracter une partie de ces prêts en dehors de leur pays de résidence. Parmi les ménages qui ont contracté un prêt non-hypothécaire, la valeur moyenne est de €26 000, contre €22 000 relatif aux ménages résidant au Luxembourg.

Estimations de la consommation du ménage frontalier

Les ménages frontaliers ont dépensé en moyenne €9 300 au Luxembourg en 2010. Les dépenses les plus importantes sont engagées par les ménages frontaliers en provenance de Belgique (€10 000), suivi par les ménages frontaliers de la France (€9 900) et de l'Allemagne (€7 600). Les achats de combustibles représentent la plus grande part de ces dépenses, soit près de €2 500 en moyenne avec un écart négligeable entre les pays de résidence. En moyenne, environ 17% du revenu brut perçu de Luxembourg, qui sont estimés pour un montant total d'environ €925 millions par an, sont également consommés sur le territoire du Grand-Duché.

Conclusions

Ce cahier présente des résultats préliminaires portant sur le revenu, le patrimoine et la consommation des ménages de travailleurs frontaliers au Luxembourg résidant au sein de la Grande-Région. Il contribue ainsi à combler une lacune importante dans les statistiques relatives à ce groupe de salariés, qui revêt une importance grandissante pour l'économie luxembourgeoise, également en ce qui concerne la consommation de produits et services sur le territoire luxembourgeois. Les premiers résultats montrent que la différence entre ménages résidents et ménages frontaliers est plus importante en termes de patrimoine qu'en ce qui concerne les revenus. La différence majeure provient de la valeur des biens immobiliers.

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[1] Ce chiffre semble peu fiable, car il est très inférieur à la proportion correspondante enregistrée auprès des ménages résidant au Luxembourg (98% déclarant posséder des actifs financiers). Ce résultat reflète probablement la structure moins détaillée du questionnaire soumis aux frontaliers, qui mentionne en vrac des instruments financiers simples tels que les comptes courants et des instruments plus complexes.

1 Introduction and motivation

Luxembourg is a highly international economy with a share of more than 40% of foreigners residing and working in Luxembourg. Adding the continuously increasing number of non-resident cross-border workers or in short cross-border commuters, which in the last ten years increased by 77% and made up 44% of the Luxembourg's domestic employment (154,000 of 347,000) in 2011 (Statec, 2012b), increased the share of foreigners in domestic employment to about two thirds. Almost the total entirety of cross-border commuters resides in three neighbouring countries; about 50% of the cross-border workers reside in France, about 25% in Belgium and Germany, respectively. With a geographical size of 2,586 km^2 and an estimated total population of 512,000 inhabitants in 2011 (Statec, 2012a) Luxembourg is the second smallest country in both dimensions in the EU. Still, Luxembourg is the country with the second highest number of cross-border in-commuters recorded in the European Economic Area (EEA), second only to Switzerland (see for example MKW and Empirica, 2009).

These cross-border commuters contribute very substantially to Luxembourg's GDP. It is estimated that, in 2007 cross-border commuter households spent on average €9,076 per year in the Grand Duchy (Genevois and Zanardelli, 2008). Our estimates referring to 2010 support these estimates; cross-border commuter households pour on average €9,300 per annum into the Luxembourg economy, representing about 17% of their gross household income from Luxembourg. While plenty of information is available on numbers, country of origin, the employment or the gender distribution of cross-border commuters, mainly stemming from administrative data sources, such as the social register of Luxembourg, the Inspection Générale de la Sécurité Sociale (IGSS), little to nothing is known about the financial situation (i.e. income, wealth) of cross-border commuter households and in particular how they correspond to the income and wealth of Luxembourg resident households. A number of surveys conducted by CEPS/INSTEAD in cooperation with STATEC in 2002, 2003 and 2007 among cross-border commuters provide information on their consumption expenditures in Luxembourg, the types of products and motives they tend to consume, allowing an aggregate depiction (Allegrezza et al., 2005; Genevois and Zanardelli, 2008). However, for the lack of adequate data questions concerning income and wealth and their relationship with consumption could hitherto not be explored.

This paper is descriptive in nature; it presents income, wealth and consumption estimates of cross-border commuter household to Luxembourg based on a representative survey, the Luxembourg Cross-border Household Finance and Consumption survey (XB-HFCS). Further, it puts the income and wealth estimates in a comparative context to estimates from the Household Finance and Consumption Survey among households resident in Luxembourg (LU-HFCS). Both surveys were conducted by the Banque centrale du Luxembourg (BCL) in cooperation with CEPS/INSTEAD in 2010/11. Section 2 briefly presents the XB-survey, the data and main sample characteristics. A detailed description of the survey (incl. a translated version of the questionnaire), the sample selection, data treatment

(i.e. editing and imputation) is provided in the appendix of this document. Section 3 lays out the employment and income statistics. Section 4 presents the wealth of cross-border commuter households and compares them to Luxembourg resident households. Section 5 discusses their consumption pattern. Section 6 concludes.

2   Survey, data treatment and sample characteristics

2.1   Survey, questionnaire and data treatment

The XB-HFCS is a companion survey to the Luxembourg Household Finance and Consumption Survey (LU-HFCS) also conducted in 2010-2011 and covering households residing in Luxembourg. The LU-HFCS is part of the Household Finance and Consumption Network (HFCN), which was created in early 2007 to address the lack of harmonised micro data concerning households' financial situation and consumption behaviour. The European System of Central Banks (ESCB) initiated the Eurosystem Household Finance and Consumption Survey (HFCS), which is conducted in 17 ESCB countries to gain new insights concerning the economic behaviour of European households (ECB, 2008). For the sake of brevity, we will not separately present the LU-HFCS here. For a detailed description and some preliminary results of the LU-HFCS please refer to Mathä, Porpiglia and Ziegelmeyer (2012a).

The XB-HFCS in general (and the questionnaire in particular) centres on the household as the unit of analysis and targets households living in adjacent regions of Luxembourg, the so-called *"Grande-Région"*[2], where at least one household member works in Luxembourg at the date of data collection. The XB-HFCS was designed to investigate the income, wealth and consumption pattern of the cross-border commuter households.[3] The **questionnaire** comprises two main parts (for the complete questionnaire translated into English see Appendix 1): part I is targeted to characteristics of the cross-border worker as well as the household composition and part II is targeted to the household as an entity (as main unit of analysis). The topics regarding household-level questions relate to the subsequent areas: i) real assets and their financing, ii) other liabilities/loans, iii) private businesses/financial assets, iv) household income and v) consumption. Questions regarding consumption contain a geographical and product breakdown. Questions on an individual level cover the following areas with different level of detail for cross-border workers and for other house-

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[2]   The *"Grande-Région"* includes Luxembourg and the regions Wallonie (Belgium), Lorraine (France), Saarland and Rheinland-Pfalz (both Germany).

[3]   The household definition is the same as the definition applied in the LU-HFCS and therefore in line with the ECB guidelines approved by the Household Finance and Consumption Network (HFCN). One principal aim of the XB-HFCS survey was to obtain comparable (aggregate) data to the LU-HFCS. The decision to conduct the XB-HFCS as postal survey required substantially shortening the questionnaire, resulting in less detail in particular with regard to the wealth related questions. The comparability of the aggregates with the LU-HFCS is preserved.

hold members: vi) demographics and vii) employment.[4] The questionnaire was drafted in German and French; the version sent to cross-border commuter households in Belgium and France differs just in one aspect, different specifications and breakdowns of the education levels.

The sample contains 42 **strata** along three dimensions: country of residence, gender of the cross-border worker and income. To account for the right skewness of the wealth distribution wealthy households are oversampled. Within each stratum individuals are randomly selected. To reach the initial target of 500 completed interviews almost 5,000 cross-border households were contacted by postal mail. Table A2 in Appendix A2.4 presents the breakdown of the contacted household by stratum and the corresponding response rates.

The **fieldwork** was carried out by CEPS/INSTEAD, a public Luxembourg research institution with a long history in conducting and analysing household surveys. The field phase spanned from November 2010 to the end of January 2011. In November 2010, the questionnaire was sent by mail to the sampled households. It was accompanied by an introduction letter jointly signed by the president of the BCL and CEPS, an information leaflet and a blank return envelope to send back the completed questionnaire. A designated web page was created and put on the BCL and CEPS/INSTEAD websites. Households interested in receiving more detailed information received a dedicated telephone number or e-mail address to contact the BCL or CEPS/INSTEAD. The final sample size is 715 households. With about 15% the response rate can be considered relatively high taking the complexity, sensitivity and survey mode of this survey into account.

The **weighting** takes into account the: i) construction of design weights based on selection probability, ii) non-contact/non-response adjustment, iii) analytic weights construction. The XB-HFCS is representative of 99,181 households residing outside Luxembourg and within in the *"Grande-Région"* (representing 294,772 individuals and 127,186 cross-border commuters) where at least one household member works in Luxembourg at the time of the data collection.[5] Personal characteristics of cross-border commuters are weighted on a person level. Variables on a household level such as income, wealth and consumption are weighted on a household level. Item non-response is generally a widespread phenomenon in such complex micro datasets. Since the pattern of missing values is not completely at random, the complete dataset was multiply stochastically imputed. For our purposes, we use an adapted version of the ECB Multiple Imputation Routine (EMIR) used for the imputation of the LU-HFCS.[6]

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[4] In contrast to the LU-HFCS, a section on future pension entitlements/insurance policies is not present. This is mainly related to the difficulty to adequately answer such questions without the support of an experienced interviewer.

[5] Figures indicating the number of households and the number of individuals are calculated using cross-border commuter household level weights, figures indicating the number of cross-border commuters are calculated using the cross-border commuter level weights.

[6] For detailed information on the imputation procedure see Mathä, Porpiglia and Ziegelmeyer (2012a).

2.2 Socio-demographic characteristics of weighted sample

Table 1 shows socio-demographic characteristics of cross-border commuters. Almost one half of cross-border commuters in Luxembourg reside in France, the other half is almost equally divided between Belgium and Germany. As expected the majority of cross-border workers are natives (defined here as country of birth) of their respective country of residence. More than 80%, 90% and 85% of cross-border workers from Belgium, France and Germany are born in their respective country of residence.[7]

According to STATEC (2012b), 67% of cross-border commuters are male. This gender gap is also reflected in the XB-HFCS where 63% of all commuters are male. The respective numbers are 66% for cross-borders commuters from Belgium, 60% from France and 67% from Germany. The average age of cross-border commuters is similar in all three countries: 40 years for cross-border commuters from Belgium; the corresponding ages for France and Germany are 39 and 41 years. These figures correspond closely to those in Allegrezza et al. (2005) where male and female cross-border commuters were estimated to be on average 37.4 and 34.7 years of age (data referring to 2002). The civil status is similar across countries; the mode is *"married"*, with relative frequencies of 59% in Belgium, 53% in France, and 59% in Germany; the second most frequent category is *"single"* with a share of around 22-25% in all three countries. The distribution of educational levels is as follows: the mode is to have achieved a first stage tertiary education, and the second most frequent category is to have achieved a (upper) secondary education degree. The data shows that cross-border commuters tend to have a high level of education regardless of the country of residence. The median household size is 3 for workers resident in France and Belgium. It is 2 for cross-border commuters residing in Germany. In summary, even if there are differences in detail with respect to the socio-demographic descriptive statistics over the three neighbouring countries, cross-border workers tend to be natives in the residence country, are relatively young, and highly educated.

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[7] The sample characteristics match the characteristics published by STATEC well. STATEC (2012) estimates the respective share of Belgian, French and German cross-border commuters from Belgium, France and Germany to be 90%, 96% and 92%.

Table 1: Socio-economic characteristics of cross-border commuters

		BE	FR	DE	Total
Country of residence	Observations	192	353	170	715
	Percentage	26.9%	49.4%	23.8%	100.0%
	Percentage weighted	25.7%	49.9%	24.4%	100.0%
Country of birth, in %	Belgium	82.5%	1.6%	1.1%	22.3%
	France	6.6%	92.0%	0.2%	47.6%
	Germany	1.3%	1.0%	86.3%	21.9%
	Luxembourg	3.4%	1.6%	6.9%	3.4%
	Rest EU	3.0%	1.6%	4.0%	2.5%
	Rest of the world	3.3%	2.3%	1.4%	2.4%
Gender	Male	65.5%	60.0%	67.2%	63.2%
Age	Mean	40.0	38.7	40.7	39.6
	Median	40	38	40	39
Marital status	Single/never married	22.1%	24.4%	25.1%	24.0%
	Married	58.8%	52.6%	58.9%	55.8%
	Consensual union on a legal basis	8.0%	16.7%	0.8%	10.6%
	Widowed	0.6%	0.5%	1.9%	0.9%
	Divorced	10.4%	5.8%	13.4%	8.9%
Education	Primary education or first stage of basic education	0.7%	0.9%	0.0%	0.6%
	Lower secondary or second stage of basic education	9.1%	3.0%	16.5%	7.8%
	(Upper) secondary education	35.5%	49.3%	28.3%	40.6%
	Post-secondary and non-tertiary education	2.4%	0.0%	19.5%	5.4%
	First stage of tertiary education	51.6%	44.9%	33.1%	43.8%
	Second stage of tertiary education	0.8%	2.0%	2.5%	1.8%
Household size	Mean	3.1	3.0	2.6	2.9
	Median	3.0	3.0	2.0	3.0

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted on a person level.

Table 2: Employment related characteristics

		BE	FR	DE	Total
Employment status	Self-employed - with and without employees	3.1%	2.0%	1.6%	2.2%
	Employee	96.9%	98.0%	98.4%	97.8%
	thereof with permanent contract	97.2%	97.1%	98.0%	97.3%
Employment status spouse	Job in Luxembourg	43.1%	34.9%	26.0%	34.9%
	Job in home country	32.3%	43.7%	49.2%	42.1%
Sector of company / employer (incl. NACE Code, Rev. 2)	Industry (B, C, D, E)	16.6%	17.5%	12.6%	16.0%
	Construction (F)	5.9%	10.4%	13.8%	10.1%
	Wholesale & retail trade; repair (G)	13.6%	11.2%	13.2%	12.3%
	Financial services (K)	20.5%	16.5%	24.7%	19.5%
	Market services (H, I, J)	18.2%	18.7%	7.4%	15.8%
	Non market services (L-S)	25.2%	25.7%	28.3%	26.2%
Working hours / week	Mean	39.3	39.4	39.9	39.5
	Median	40.0	40.0	40.0	40.0
Working years in Luxembourg	Mean	11.8	9.8	9.2	10.2
	Median	9.0	9.0	7.0	9.0
Means of transport	By car only	82.3%	75.6%	86.5%	80.0%
	By public transport only	2.7%	5.2%	3.7%	4.2%
	Both	15.0%	19.3%	9.8%	15.9%
Distance to workplace in km	Mean	47.7	45.8	47.4	46.7
	Median	40.0	40.0	47.0	43.0

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted on a person level.

With about 98%, almost all cross-border commuters are employees, with a negligible variance among the different countries of residence. 97% of all cross-border commuter employees have a permanent contract. By far the most important sector for cross-border commuters is the Services sector, where almost two thirds of jobs are. At a more disaggregate level, the main sectors of activity are Non-market Services and Financial Services followed by Industry and Market Services. The median and mean number of working hours is 40 and 39.5 hours per week. The median number of years of employment in Luxembourg is 9 years; the mean is 10.2 years.

The average and median commuting distance are 46.7 and 43.0 kilometres, with German commuters having a slightly longer median commute (47 km) than commuters from Belgium and France (40 km for both). Cross-border commuters predominantly arrive by car. For an estimated 80% of cross-border commuters, it represents the sole mode of transport. The respective share for commuters from Belgium, France, and Germany are 82%, 76% and 87%. 16% are estimated to use both car and public transport and a low 4% use public transport only.

The employment status of the partner varies across countries of residence. The mode for commuter households from Belgium is that even the partner is a cross-border commuter (43%). In France and Germany, the mode is that one partner is a cross-border commuter, while the other is in employment in the country of residence. Still, in both countries a relevant fraction of partners are cross-border commuters, too. In France and Germany, 35% and 26% of partners commute to Luxembourg.
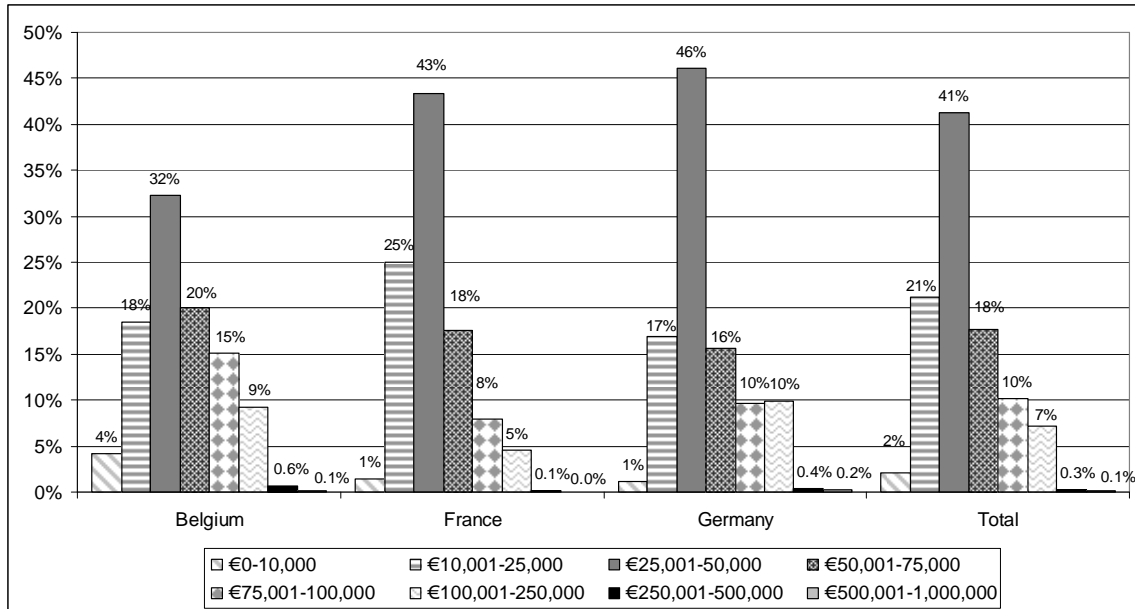
3   Income of cross-border commuter households

The survey contains questions regarding the income of cross-border commuter households. Questions are asked for both income from Luxembourg and income in the country of residence. For either case, households had to indicate their respective income by choosing between different income ranges that were provided in the questionnaire.[8] Over the last twelve months, most cross-border commuter households received an income in Luxembourg between €25,001 and €50,000 (Figure 1). Overall, 41% of cross-border commuter households fall into this income bracket, ranging from 32% for Belgium to 43% in France and 46% in Germany. Around 26% of cross-border commuter households from France received an income of €25,000 or less. The corresponding share is 23% for Belgium and 18% for German cross-border commuter households. Moreover, 45% of cross-border commuter households from Belgium received an income from Luxembourg of more than €50,000.

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[8]   The questionnaire (see appendix) asked households to provide their total gross income including income received from pension, unemployment benefits, rental income, interest payments and dividends. In reality, however, for most cross-border commuter households, gross *labour* income in Luxembourg is likely to equal total gross income. This is caused by the design of the sample, which focused on cross-border commuters active on the Luxembourg labour market, and thus excluded pensioners and unemployed. Hence, pension income and unemployment benefits from Luxemburg are not relevant for cross-border commuters. Also, rental income, interest payments and dividends from Luxembourg should, if at all, play a minor role only (see Table 5).

36% of cross-border commuter households from Germany are located in the higher income bracket of €50,000 and above; this is the case for 30% of cross-border commuter households from France only.

Figure 1: Total gross income from Luxembourg

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted.

Figure 2: Total gross income from respective country of residence

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted.

For 46% of cross-border commuter households income from Luxemburg is complemented by income from the country of residence (Figure 2). If households receive additional income in the country of residence, the mode is between €10,001 and €25,000 per household.

Since exact income values are not available, the mid-point of each income bracket is taken to obtain a rough notion of mean and median total gross income received in total or separately in Luxembourg and the respective country of residence. Table 3 shows that the average (median) total gross income is about €55,000 (€41,000) in France, €69,000 (€55,000) in Belgium and €70,000 (€55,000) in Germany. Only a minor fraction of approximately 14% of the average total gross income derives from the country of residence. Differences (in absolute terms) in average total gross income are, thus, mainly driven by income from Luxembourg. Cross-border commuters from Belgium receive the highest gross income from Luxembourg with around €61,000 on average, whereas those from Germany and France receive €59,000 and €47,000 respectively.

Table 3: Gross household income by country of residence

Country of residence	Luxembourg		Home country		Total	
	Mean	Median	Mean	Median	Mean	Median
Belgium	60,640	37,500	8,686	0	69,327	55,000
France	46,925	37,500	8,145	0	55,071	41,250
Germany	59,037	37,500	10,580	251	69,617	55,000
Total	53,501	37,500	8,904	0	62,405	55,000

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted.

The average gross income for a resident household in Luxembourg conditional on receiving employment income is slightly more than €73,000, which is a weighted average of about €76,000 for nationals and about €70,000 for foreigners living in Luxembourg.[9] Thus, on average, cross-border commuter households earn roughly €8,000 a year less than foreign resident households and €13,000 less than households with Luxembourg citizenship.[10] This difference might partly be explained by the fact that income levels in Luxembourg and neighbouring countries differ strongly and cross-border commuter households rely at last partly on income from their country of residence.

Thus, it is interesting to ask, whether there are systematic differences in the income earned in Luxembourg for cross-border commuter households and households residing in Luxembourg. For this comparison, the income of cross-border households is restricted to income from Luxembourg divided by the number of cross-border commuter household members. For households resident in Luxembourg income is divided by the number of

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[9]   As total gross income earned in Luxembourg is likely to be almost equal to gross labour income for cross-border commuters, we decided to compare on total gross income of cross-border commuter households earned in Luxembourg with gross labour income of resident households.

[10]   The immigration and native status is determined by nationality of the household head.

employed household members. On average, a Luxembourg resident household has 1.5 household members in paid employment. The corresponding figure for cross-border commuter households is 1.3 members in employment in Luxembourg (Table 4). After this adjustment, income differences are partially reduced. Nevertheless, with approximately €52,000 Luxembourg nationals still earn the highest gross income per employed household member. Foreigners resident in Luxembourg receive on average €45,000 per employed household member and cross-border commuters €41,000. For the latter the country of residence strongly influences the average income figure. At the top end are Germany and Belgium with €48,000 and €46,000. At the bottom end is France, with a household member employed in Luxembourg receiving slightly more than €36,000.

Table 4: Mean gross income of cross-border commuter & Luxembourg resident households

	Cross-border commuter households				Luxembourg resident households		
	Belgium	France	Germany	Total	Nationals	Foreigners	Total
Gross (labour) income earned in LU per household	60,640	46,925	59,037	53,501	75,855	70,250	73,420
Gross (labour) income in Luxembourg / employed household member	45,886	35,779	47,940	41,356	52,178	44,901	48,876
Number of household members working in Luxembourg	1.32	1.31	1.23	1.29	1.45	1.56	1.50

Source: own calculations based on the XB-HFCS 2010 and the LU-HFCS 2010/2011; data are multiply imputed and weighted. It is assumed that all household members of a household living in Luxembourg receive labour income in Luxembourg.

4 Wealth distribution of cross-border commuter households

Table 5 shows the mean of all wealth categories collected in the XB-HFCS for each country of residence. Moreover, it compares the mean estimates to the resident HFCS in total and separate for nationals and foreigners resident in Luxembourg. The focus is on a comparison of the complete population of each sample. For this reason, the descriptive statistics in this section are not adjusted for the labour market status of households resident in Luxembourg. The different structure of the LU-HFCS and the XB-HFCS and especially the different detail of the questions on wealth items are likely to lead to an underestimation of the cross-border commuter households' wealth compared resident households' wealth. Table 5 additionally presents how different summarizing asset categories are constructed.

The estimated mean of total household net wealth is around €337,000 for cross-border commuter households from Belgium, €198,000 and €225,000 for cross-border commuter households from France and Germany. This value is relatively low compared to households resident in Luxembourg, especially taking in consideration households headed by a Luxembourg national; on average the total net wealth of cross-border commuter households is about 35% of the value of Luxembourg resident households. Breaking down the average cross-border commuter household total net wealth into its principal components the percentage remains roughly stable. The mean cross-border household net real wealth amounts to 34% of the average household resident in Luxembourg. The respective figure for mean cross-border household net financial wealth is 38%.

Table 5: Mean wealth categories over country of residence

Wealth category	Cross-border households				Luxembourg resident households		
	Belgium	France	Germany	Total	Nationals	Foreigners	Total
fraction in %	25%	49%	26%	100%	62%	38%	100%
household main residence	227,549	183,254	182,614	194,346	530,148	214,993	410,615
+ other real estate	66,187	27,549	63,312	46,492	280,948	112,572	217,086
+ business wealth	44,084	2,111	9,073	14,552	40,192	54,663	45,681
+ vehicles	14,276	13,930	16,499	14,673	24,448	15,036	20,878
+ valuables	-	-	-	-	12,334	4,053	9,193
+ total real wealth	**352,097**	**226,844**	**271,498**	**270,063**	**888,070**	**401,317**	**703,453**
mortgages household main residence	48,537	33,140	64,850	45,143	58,266	50,449	55,301
+ mortgages other real estate	13,294	4,873	12,512	8,962	18,849	17,757	18,435
- total mortgage debt	**61,831**	**38,012**	**77,362**	**54,104**	**77,115**	**68,206**	**73,736**
+ net real wealth	**290,266**	**188,831**	**194,136**	**215,959**	**810,956**	**333,111**	**629,717**
financial wealth country of residence	29,986	15,318	28,058	22,296	-	-	-
+ financial wealth Luxembourg	19,590	4,027	8,976	9,244	-	-	-
+ financial wealth other country	1,122	242	2,648	1,079	-	-	-
+ total financial wealth (excl. pension wealth)	**50,698**	**19,587**	**39,681**	**32,619**	**86,231**	**47,598**	**71,578**
non-collaterised loans country of residence	3,553	9,402	7,540	7,440	-	-	-
+ non-collaterised loans Luxembourg	900	1,331	1,293	1,212	-	-	-
+ non-collaterised loans other country	5	31	111	45	-	-	-
- total non-collaterised loans	**4,457**	**10,764**	**8,943**	**8,697**	**7,817**	**8,428**	**8,049**
+ net financial wealth	**46,240**	**8,823**	**30,738**	**23,922**	**78,414**	**39,170**	**63,529**
total net wealth	**336,506**	**197,654**	**224,874**	**239,881**	**889,370**	**372,280**	**693,246**
total gross wealth	**402,794**	**246,430**	**311,179**	**302,682**	**974,302**	**448,915**	**775,031**

Source: own calculations based on the XB-HFCS 2010 and the LU-HFCS 2010/2011; data are multiply imputed and weighted.

Table 6: Participation rates over wealth categories and country of residence

Wealth category	Cross-border commuter households				Luxembourg resident households		
	Belgium	France	Germany	Total	Nationals	Foreigners	Total
household main residence	82.7%	69.7%	67.4%	72.4%	83.0%	41.1%	67.1%
other real estate	22.2%	11.4%	25.2%	17.7%	28.5%	27.6%	28.2%
business wealth	8.2%	1.8%	6.6%	4.7%	6.4%	5.4%	6.0%
vehicles	94.8%	96.6%	98.4%	96.6%	88.6%	83.6%	86.7%
valuables	-	-	-	-	27.1%	18.4%	23.8%
total real wealth	**98.3%**	**98.9%**	**99.4%**	**98.9%**	**96.1%**	**89.6%**	**93.6%**
mortgages household main residence	52.9%	28.3%	48.5%	39.7%	36.2%	27.2%	32.8%
mortgages other real estate	9.8%	4.5%	13.0%	8.0%	6.4%	11.5%	8.4%
total mortgage debt	**55.9%**	**31.0%**	**53.7%**	**43.1%**	**39.8%**	**37.1%**	**38.8%**
financial wealth country of residence	56.3%	47.8%	67.9%	55.1%	-	-	-
financial wealth Luxembourg	40.0%	23.6%	35.9%	30.9%	-	-	-
financial wealth other country	2.8%	1.5%	3.8%	2.4%	-	-	-
total financial wealth (excl. pension wealth)	**60.9%**	**51.9%**	**73.4%**	**59.7%**	**99.3%**	**95.9%**	**98.0%**
non-collaterised loans country of residence	23.0%	33.1%	18.9%	26.9%	-	-	-
non-collaterised loans Luxembourg	10.7%	8.5%	7.8%	8.9%	-	-	-
non-collaterised loans other country	0.1%	0.6%	1.0%	0.6%	-	-	-
total non-collaterised loans	**31.7%**	**38.3%**	**24.6%**	**33.1%**	**36.3%**	**38.0%**	**36.9%**

Source: own calculations based on the XB-HFCS 2010 and the LU-HFCS 2010/2011; data are multiply imputed and weighted.

Differences across countries of residence are pronounced with cross-border commuter households from Belgium exhibiting higher figures for all presented wealth aggregates; in fact, their average net real wealth and average net financial wealth represents 46% and 73% of the respective figures for the average Luxembourg resident household.

Table 6 shows the participation rate for each wealth component. The household main residence ownership is slightly higher among cross-border commuter households than among Luxembourg resident households. 67% of Luxembourg resident households own their main residence whereas this is the case for 72% of cross-border commuter households. However, the ownership share is about 13-16 percentage points higher for cross-border commuter households from Belgium (83%) than for cross-border commuter households from France (70%) or Germany (67%).

Cross-border commuter households from Belgium and Germany are more likely to invest in other real estate and to own business wealth than their counterparts from France; for cross-border commuters from Belgium and Germany, the participation rates for these two wealth components are close to those of Luxembourg resident households. In contrast, cross-border commuter households from France experience a gap of more the 17 percentage points to Luxembourg resident households for investment in other real estate and 4 percentage points for business wealth ownership.

Mortgage ownership rates amount to 56%, 31% and 54% for cross-border commuter households from Belgium, France and Germany, respectively. The lower mortgage ownership rate for cross-border commuter households from France is mainly explained by the lower share of other real estate ownership. With a gap of almost 4 percentage points, mortgage ownership rates are slightly higher among cross-border commuter households than among Luxembourg resident households.

At least one of the different components of financial wealth is owned by an estimated 60% of cross-border commuter households. This figure is much lower than the estimated figure for Luxembourg resident households (98%). With respect to this component, it is necessary to recall the differences in the structure of the LU-HFCS and of the XB-HFCS questionnaire; in the latter, basic financial instruments, such as current accounts, are grouped together with more complex financial instruments, which is likely to lead to an underreporting of ownership rates and amounts. Financial wealth ownership is distributed differently among the cross-border commuter households from different countries. 73% of cross-border commuter households from Germany declare to own at least one of the financial wealth components. The corresponding figures for France and Belgium are 52% and 61%.

The geographical diversification of financial wealth of the cross-border commuter households among the three different countries of residence is of interest. More than 30% of cross-border commuter households have a geographically diversified financial wealth portfolio, i.e. hold the financial wealth at banks not exclusively in their country of residence: In Belgium 40% of cross-border commuter households hold part of their financial wealth in Luxembourg and 3% in a country different from their country of residence or commuting destination. The corresponding figures for cross-border commuter households from France are 24% and 1.5% and from Germany are 36% and 4%.

Cross-border commuter households' ownership rate of non-mortgage loans is estimated at 33%. With 38%, the figure is highest for cross-border commuter households from France; the figure is lowest for German resident cross-border commuter households (25%). Thus, it is rather common for cross-border commuter households to hold a part of non-mortgage loans outside the country of residence. 11%, 9% and 8% of cross-border commuter households from Belgium, France and Germany, respectively hold non-mortgage loans in Luxembourg, less than 1% hold loans in a country different from the country of residence or commuting destination.

Table 7 and Table 8 present the mean and median of each wealth component conditional on ownership. Although, the home ownership rate is higher among cross-border commuter households (Table 6), the conditional mean value of the main residence of an average cross-border commuter household equals 44% of the mean value of the average household resident in Luxembourg. This is expected as real estate prices are much higher in Luxembourg than in the neighbouring regions across the border. The differences in the conditional mean of the household main residence for cross-border commuter households in the three countries considered are not particularly pronounced. For cross-border commuter households, the conditional mean for investments in other real estate and business wealth equal respectively 34% and the 41% of the corresponding figure for the Luxembourg resident households. The conditional average (median) of net real wealth spans from the more then €358,000 (€260,000) for cross-border commuter households (Belgium) to €229,000 (€189,000) (France).

Table 7: Mean wealth categories over country of residence conditional on ownership

Wealth category	Cross-border commuter households				Luxembourg resident households		
	Belgium	France	Germany	Total	Nationals	Foreigners	Total
household main residence	275,219	262,987	271,033	268,447	638,953	522,507	611,873
other real estate	298,050	241,576	251,021	263,045	985,088	408,219	770,842
business wealth	539,468	117,350	136,644	312,735	627,863	1,004,414	756,600
vehicles	15,061	14,423	16,763	15,191	27,599	17,976	24,078
valuables	-	-	-	-	45,468	22,032	38,601
total real wealth	**358,363**	**229,272**	**273,230**	**273,138**	**923,948**	**447,845**	**751,157**
mortgages household main residence	91,699	117,089	133,840	113,704	161,082	185,182	168,678
mortgages other real estate	135,729	107,690	96,065	111,568	292,797	153,914	220,203
total mortgage debt	**110,563**	**122,589**	**143,943**	**125,415**	**193,905**	**183,791**	**190,232**
financial wealth country of residence	53,296	32,023	41,349	40,475	-	-	-
financial wealth Luxembourg	49,003	17,079	25,031	29,937	-	-	-
financial wealth other country	39,466	16,145	69,944	44,538	-	-	-
total financial wealth (excl. pension wealth)	**83,297**	**37,705**	**54,026**	**54,639**	**86,876**	**49,625**	**73,046**
non-collaterised loans country of residence	15,430	28,398	39,826	27,630	-	-	-
non-collaterised loans Luxembourg	8,412	15,697	16,627	13,671	-	-	-
non-collaterised loans other country	4,300	5,279	11,512	7,945	-	-	-
total non-collaterised loans	**14,067**	**28,103**	**36,294**	**26,247**	**21,528**	**22,183**	**21,784**

Source: own calculations based on the XB-HFCS 2010 and the LU-HFCS 2010/2011; data are multiply imputed and weighted.

Table 8: Median wealth categories over country of residence conditional on ownership

Wealth category	Cross-border commuter households				Luxembourg resident households		
	Belgium	France	Germany	Total	Nationals	Foreigners	Total
household main residence	250,000	221,940	250,000	250,000	500,000	408,055	500,000
other real estate	200,000	150,000	180,000	180,000	350,000	200,000	300,000
business wealth	312,597	40,000	75,000	100,000	193,932	145,345	186,156
vehicles	12,000	10,500	12,397	12,000	18,000	12,000	16,000
valuables	-	-	-	-	15,000	10,000	12,381
total real wealth	**260,000**	**189,000**	**228,000**	**215,000**	**536,621**	**241,020**	**470,000**
mortgages household main residence	80,000	120,000	130,000	100,000	120,000	134,000	121,500
mortgages other real estate	82,334	100,000	65,000	70,000	120,000	102,829	115,000
total mortgage debt	**83,000**	**119,696**	**130,000**	**103,000**	**124,711**	**135,000**	**127,000**
financial wealth country of residence	22,000	15,000	14,000	16,000	-	-	-
financial wealth Luxembourg	15,000	7,000	10,103	10,000	-	-	-
financial wealth other country	15,000	8,000	13,000	10,000	-	-	-
total financial wealth (excl. pension wealth)	**40,000**	**19,922**	**20,000**	**20,000**	**23,618**	**10,500**	**18,199**
non-collaterised loans country of residence	8,000	13,000	12,000	11,000	-	-	-
non-collaterised loans Luxembourg	5,000	15,000	15,000	11,000	-	-	-
non-collaterised loans other country	4,300	5,000	2,000	5,000	-	-	-
total non-collaterised loans	**8,000**	**15,000**	**12,000**	**12,000**	**11,000**	**9,500**	**10,000**

Source: own calculations based on the XB-HFCS 2010 and the LU-HFCS 2010/2011; data are multiply imputed and weighted.

The conditional mean (median) for mortgage held by cross-border commuter households from the Grande-Region is €125,000 (€103,000). This figure is lower than the corresponding figure of €190,000 (€127,000) for Luxembourg resident households. Among cross-border commuter households, German households have the highest mortgages, with a conditional mean (median) of over €144,000 (€130,000), of which the median is similar in magnitude to that of both Luxembourg native and immigrant households.
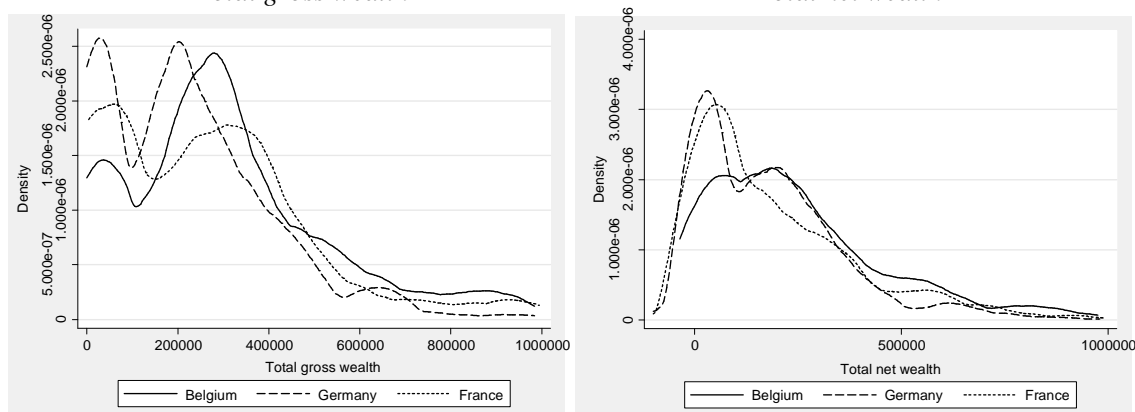
The cross-border commuter households' conditional average of net financial wealth (excluding private pension wealth) amounts at €55,000, a figure substantially lower than the corresponding figure for Luxembourg resident households (about €73,000). This figure presents a considerable variability spanning from the more than €83,000 for cross-border commuter households from Belgium to €38,000 for those from France. However, at the median differences between cross-border commuter and Luxembourg resident households are muted.

Despite the most relevant part of the financial wealth being owned in the country of residence, the conditional average value of financial wealth located abroad is substantial in all the three countries of residence; the conditional average value of financial wealth held by cross-border commuter households in Luxembourg is almost €30,000. The conditional average value of non-mortgage loans held by cross-border commuter households is €26,000. This figure is 20% larger as the corresponding figure for Luxembourg resident households (€22,000). Cross-border commuter households from Belgium hold the lowest level of non-mortgage loans with a conditional mean of €14,000 whereas, with a conditional mean of more than €36,000, cross-border commuter households from Germany have the highest value. Similar to financial wealth, the conditional average value of non-mortgage loans held in the country of residence is higher than the corresponding value for loans held

abroad. For the latter, loans held in Luxembourg are the most relevant with a conditional mean value of more than €14,000.

Figure 3 and 4 show the respective distribution of total gross and net wealth across countries of residence. The distribution is right–skewed, as expected. The mode of total net wealth is similar in France and in Germany, while it is somewhat higher in Belgium. As can be nicely seen from Figure 3 (left side), the first peak in the distribution of total gross wealth is related to households without real estate and the second peak to household owning their household main residence. These peaks are more smoothed out if mortgages are taken into account as for total net wealth (Figure 3, left side). Furthermore, the higher level of net wealth and of its positive components for cross-border commuter households from Belgium is likely to reflect the long history of economic and monetary integration between Belgium and Luxembourg, and thus the fact that the employment duration of cross-border commuters from Belgium is longer.

Figure 3: Total gross and net wealth over country of residence
Total gross wealth   *Total net wealth*

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted.

5 Consumption of cross-border commuter households

Mean annual expenditures per cross-border commuter household in 2010 are presented in Table 9 and compared to figures previously reported from a survey conducted by CEPS/INSTEAD and STATEC in 2007 (Genevois and Zanardelli, 2008). Importantly, the presented figures conceal methodological differences between the two surveys. While in practice it may possibly not matter a lot, consumption expenditures in the XB-HFCS refer to all household members, the survey by CEPS/INSTEAD and STATEC restricts consumption expenditures to those incurred by cross-border commuters and other household members in presence of cross-border commuter household member. For this reason, but also for reasons related to measurement error, we hasten to add that any differences in consumption expenditures between the two surveys can only partly be attributable to changes in quantities and prices. Therefore any changes should be regarded as indicative.

Table 9: Consumption expenditures of cross-border commuters in 2007 and 2010

Product category	XB-HFCS				CEPS/INSTEAD and STATEC 2007			
	Belgium	France	Germany	Total	Belgium	France	Germany	Total
Durables								
Durables (e.g. furniture, TV, computer …)	580	590	122	468	551	442	216	417
Vehicles	865	1,590	1,000	1,256	758	2,262	768	1,544
Non-durables								
Fuel	2,468	2,392	2,583	2,460	2,038	2,009	2,162	2,051
Tobacco	455	688	429	563	336	580	397	477
Alcohol	335	239	109	230	218	187	91	173
Food at home	1,971	1,411	1,025	1,455	1,720	1,444	1,161	1,447
Food outside home	1,076	1,115	911	1,053	1,271	1,545	1,052	1,363
Public transport	55	65	80	66	44	47	35	44
Culture	64	55	45	55	228	279	166	240
and leisure	-	-	-	-				
Education	5	27	121	46	18	29	11	22
Travelling, train or plane tickets	607	450	343	463	390	432	201	368
Maintenance and repair of vehicles	107	152	121	132	73	123	90	103
Health	191	162	161	169	144	65	100	93
Clothes	1,030	794	447	765	672	643	385	591
and shoes	-	-	-	-				
Secondary residence	-	-	-	-	17	21	23	20
Other expenditures	191	151	54	136	179	79	130	116
Total	9,999	9,882	7,551	9,317	8,657	10,187	6,988	9,069

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted. Enquête «Dépenses des frontaliers» 2007, STATEC, CEPS/INSTEAD.
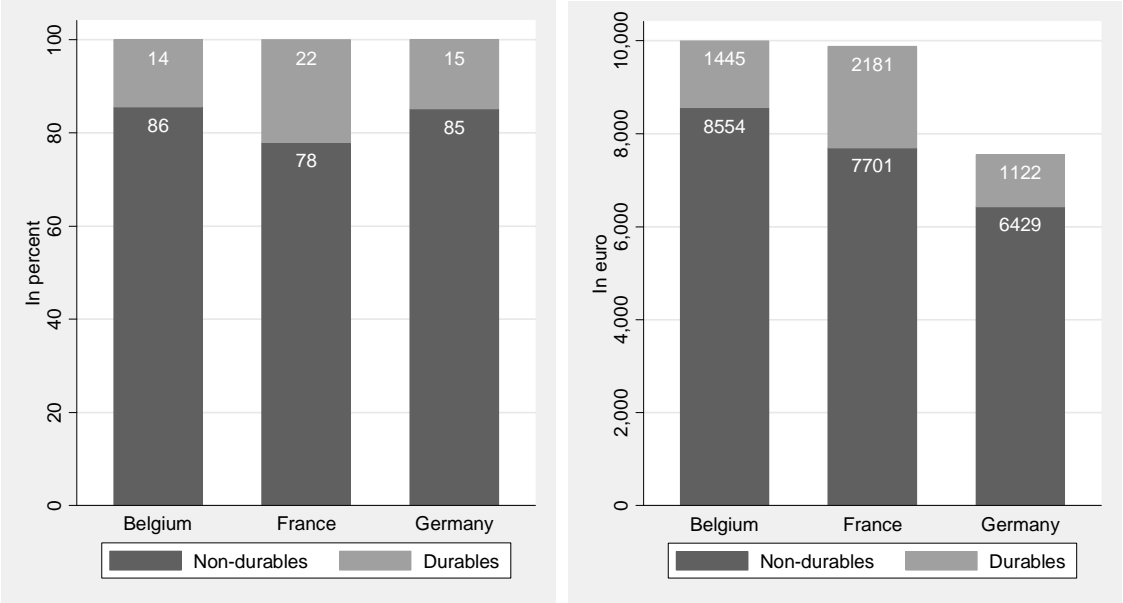
According to the estimates from the XB-HFCS, cross-border commuter households spent on average €9,300 in Luxembourg in 2010. The highest expenditures are incurred by cross-border commuter households from Belgium (€10,000), followed by cross-border commuter households from France (€9,900) and Germany (€7,600). Compared to the 2007 estimates reported in Genevois and Zanardelli (2008), total consumption expenditures increased by 3% in nominal terms. This nominal increase is lower than the 7.6% cumulated increase of the Luxembourg HICP between June 2007 and November 2010 (these two months mark the starting month of the field period of the respective survey) (Statec, 2007, 2010). In nominal terms, total consumption expenditures changed by +15%, +8% and -3% for cross-border commuter households from Belgium, Germany and France, respectively.

Fuel purchases represent the largest share of consumption expenditures in Luxembourg, representing almost €2,500 on average. The variation between the countries of residence is small. The increase of about 20% in nominal terms since 2007 is similar in all three countries. This corresponds exactly to the price increase of fuel between June 2007 and November 2010.

Expenditures for tobacco products and alcohol rose by 18% and 33% in nominal terms compared to HIPC change of +21% and +10% for these products. The strongest expenditure increases are observed for Belgian cross-border commuter households, which increased expenditures by 35% and 53% respectively. Nominal expenditures for food at home remained largely unchanged since 2007 (HIPC change: +12%). In stark contrast, expenditures for food outside home shrank substantially (-23%) and stands against a HIPC

change of +14%. Thus, this is indicative of a behavioural change of cross-border commuter households, spending less money on drinks and eating out in Luxembourg. Public transport expenditures have seen a rise of about 50%; this is mainly attributable to cross-border commuters from Germany increasing their expenditures by more than 100%. This may be a reflection of better public transport connections between border regions in Germany and Luxembourg. However, average total yearly expenditures of €66 veils that the majority of cross-border commuter households still use exclusively the car for their daily journey to work (Table 2). Expenditure increases can be observed for all the remaining categories with the exception of cars, where the decline is mainly driven by a decline of expenditures for vehicles of cross-border commuter households from France.

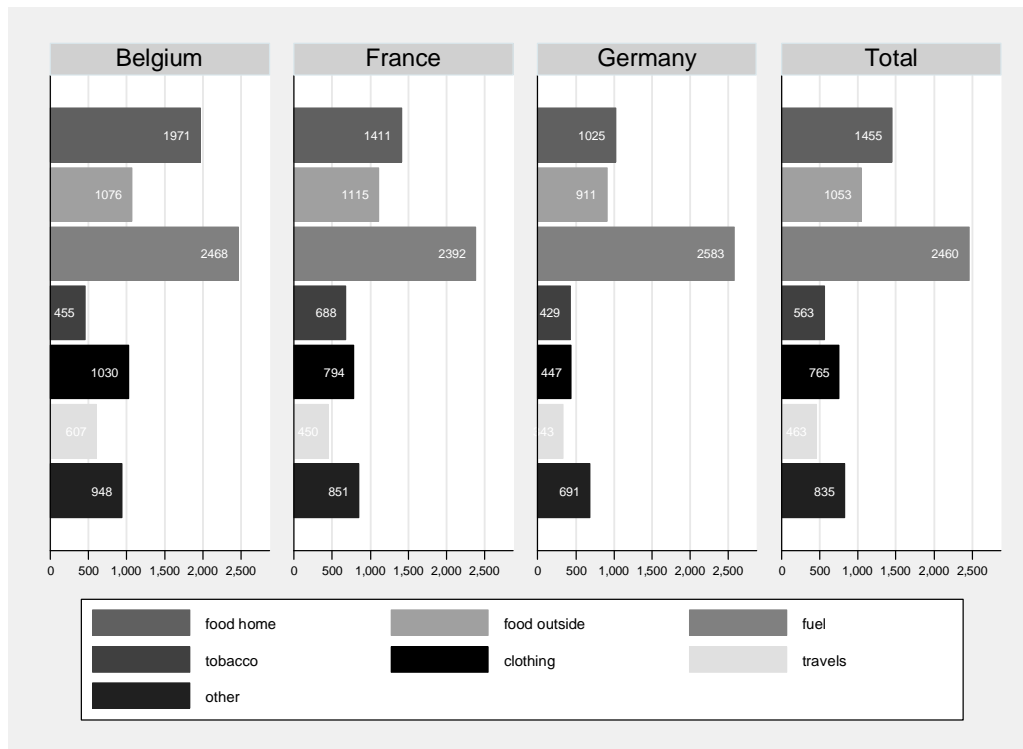*Figure 4: Durables and non-durables over country of residence*

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted.

Figure 4 shows the consumption breakdown over durables and non-durables. Durables consist out of the categories vehicles and durables (e.g. furniture, TV, computer …). Non-durables are the sum of all other categories. Vehicles present the major part of durables with around 73%. Total consumption expenditure in Luxemburg consists out of 19% durables and 81% non-durables. Cross-border commuter households from France have the highest absolute and relative share of durables, which is mainly due to larger expenses for vehicles despite a strong decline observed between 2007 and 2010 (Table 9).

With around 32% fuel presents the largest part of non-durable consumption expenditures (Figure 5). In both absolute and relative terms, cross-border commuter households from Germany have the highest fuel expenditures. This can be due to both a longer distance to the workplace and the high fraction of car users (Table 2). The second largest category is expenditures for food at home (19%) followed by food outside home (14%). Cross-border households from Germany have the lowest expenditures for food at home which might be

that food in supermarkets is relatively cheaper in Germany compared to France and Belgium. The remaining expenditures for durables are spending on clothes (10%), tobacco (7%), travelling (6%) and the sum of all other categories (11%).

Figure 5: Expenditures of non-durables categories, by country of residence, in euro

How does the consumption expenditure of cross-border commuter households vary over the income distribution? Table 10 displays how much of the gross income from Luxembourg is spent in Luxembourg. If a household received a yearly gross income between €0-10,000, the household spend on average €5,900 for consumption in Luxembourg. Whereas absolute consumption expenditures increase with higher income brackets, the share between consumption in Luxembourg and gross income from Luxembourg shrinks, e.g. households in the lowest income bracket consume according to Table 10 more in Luxembourg than their income. However, this is likely to be due to the way we had to approximate income, i.e. due to taking the midpoint of each income bracket, which for this category may simply reflect that most households' income in this bracket is closer to the upper end than to the lower end of the bracket. The fraction of income consumed in the highest income bracket of €500,000-1,000,000 is only 6%. On average, approximately 17% of the gross income received from Luxembourg is also consumed in Luxembourg, representing about 925 million euro per annum.

Table 10: Consumption in Luxembourg as a fraction of income

€/year	Mean consumption	Income LU midpoint bracket	Consumption in % of income LU	Total income	Consumption in % of total income
€0-10,000	5877	5000	118%	18631	32%
€10,001-25,000	7869	17500	45%	26897	29%
€25,001-50,000	7942	37500	21%	46051	17%
€50,001-75,000	8784	62500	14%	71966	12%
€75,001-100,000	14045	87500	16%	97013	14%
€100,001-250,000	16116	175000	9%	179639	9%
€250,001-500,000	24944	375000	7%	382212	7%
€500,001-1,000,000	42258	750000	6%	869782	5%
Total	9317	53501	17%	62405	15%

Source: own calculations based on the XB-HFCS 2010; data are multiply imputed and weighted.

6 Final remarks

This paper presents results on income, wealth and consumption of cross-border commuter households to Luxembourg based on a recent household survey (XB-HFCS). We compare key figures to a corresponding household finance and consumption survey conducted among Luxembourg resident households (LU-HFCS). We show that despite limited differences in the income patterns between Luxembourg residents and cross-border commuter households, sizable difference exists in their wealth patterns. Luxembourg resident households have around on average (median) €450,000 (€220,000) more total net wealth than cross-border commuter households. The main differences (of around 50% on average) in the wealth patterns of resident and cross-border commuter households can be attributed to differences in the value of the household main residence (see also Mathä, Porpiglia and Ziegelmeyer (2012b) on this particular aspect). Not only do cross-border commuters represent a significant share of Luxembourg employment, but they also spend a substantial part of their income from Luxembourg (about €9,300 or 17% on average per annum) within Luxembourg's borders. Their annual total consumption expenditure is estimated to amount to more than €900 million.

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Appendix 1: Questionnaire

Finance and consumption survey of cross-border commuter households
PLEASE RETURN THE QUESTIONNAIRE BY 6 DECEMBER 2010

The questions of sections 1 and 2 concern the cross-border commuter to whom the letter was sent

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ⓘ   **SECTION 1: General characteristics of the cross-border commuter**

1.01   You are: 1. ☐ Male   2. ☐ Female

1.02   Your age is: !___!___! years

1.03   In which country are you born: _____

1.04   Which civil status do you have?

        1. ☐ Single/never married
        2. ☐ Married
        3. ☐ Consensual Union
        4. ☐ Widow/er
        5. ☐ Divorced

1.05   Which is the highest educational certificate that you have successfully completed?

1. ☐ Primary school	6. ☐ A-levels/baccalaureate
2. ☐ Vocational training	7. ☐ Vocational training (master craftsman certificate)
	8. ☐ University college
3. ☐ Secondary school – lower	9. ☐ University degree
4. ☐ Secondary school – higher	10. ☐ Postgraduate degree, doctorate, Post-doc
5. ☐ College of further education/technical secondary school	11. ☐ Other – please specify: _____

1.06   Which means of transport do you normally use to get to work?

       1. ☐ Exclusively by   2. ☐ Exclusively by   3. ☐ Both
           car   public transport

1.07   How many kilometres do you travel from home to work?

     !___!___!___! km

1.08   How many people live in your household excluding yourself?

ⓘ   If people live in your household from time to time (every second week, at the weekends, during holidays) include them only if they consider your household as their main household.

☐ None, I live alone   Please go to question 2.01

1☐   2☐   3☐   4☐   5☐   6 and more ☐   Please go to question 1.09

1.09   Please complete the table below as described in the example.

Family tie with you	Age	Situation		Gender
1. Me myself				
2. Person ✕ Husband/wife or partner Son/daughter Brother/sister Father/mother Other	37 years	Pupil/student Works in Luxembourg ✕ Works elsewhere	Unemployed Retired/pre-pension Other situation	Male ✕ Female
3. Person Husband/wife or partner ✕ Son/daughter Brother/sister Father/mother Other	12 years	✕ Pupil/student Works in Luxembourg Works elsewhere	Unemployed Retired/pre-pension Other situation	✕ Male Female

Family tie with you	Age	Situation		Gender
1. Me myself				
2. Person Husband/wife or partner Son/daughter Brother/sister Father/mother Other	!___!___! years	Pupil/student Works in Luxembourg Works elsewhere	Unemployed Retired/early retired Other situation	Male Female
3. Person Husband/wife or partner Son/daughter Brother/sister Father/mother Other	!___!___! years	Pupil/student Works in Luxembourg Works elsewhere	Unemployed Retired/early retired Other situation	Male Female
4. Person Husband/wife or partner Son/daughter Brother/sister Father/mother Other	!___!___! years	Pupil/student Works in Luxembourg Works elsewhere	Unemployed Retired/early retired Other situation	Male Female
5. Person Husband/wife or partner Son/daughter Brother/sister Father/mother Other	!___!___! years	Pupil/student Works in Luxembourg Works elsewhere	Unemployed Retired/early retired Other situation	Male Female
6. Person Husband/wife or partner Son/daughter Brother/sister Father/mother Other	!___!___! years	Pupil/student Works in Luxembourg Works elsewhere	Unemployed Retired/early retired Other situation	Male Female
7. Person Husband/wife or partner Son/daughter Brother/sister Father/mother Other	!___!___! years	Pupil/student Works in Luxembourg Works elsewhere	Unemployed Retired/early retired Other situation	Male Female
8. Person Husband/wife or partner Son/daughter Brother/sister Father/mother Other	!___!___! years	Pupil/student Works in Luxembourg Works elsewhere	Unemployed Retired/early retired Other situation	Male Female

SECTION 2: YOUR PROFESSIONAL SITUATION

2.01   In your main job you are:
      1. ☐ Employee
      2. ☐ Self-employed – with employees
      3. ☐ Self-employed – without employees
      4. ☐ Helping family member (working in a family business without being paid)

2.02   What is your professional title? Please describe your tasks briefly:

      _____

2.03   What is the main activity of the company you are working for?

      _____

2.04   What kind of labour contract do you have?

      1. ☐ Permanent contract   2. ☐ Fixed-term contract

2.05   How many hours do you normally work per week?

      !___!___! hours/week

2.06   How many years have you already been working in Luxembourg?

      !___!___! years

The questions of sections 3, 4, 5, 6 und 7 concern the household as such. We would appreciate if the person knowing best about the finances of the whole household answers these questions.

S.1   Are you the person knowing best the financial situation of the whole household?

      1. ☐ YES   Please go to question 3.01   2. ☐ NO Please go to question S.2

S.2   Who are you in relation to the characteristic in the table of question 1.09?

      1. ☐ The 2nd person   5. ☐ The 6th person
      2. ☐ The 3rd person   6. ☐ The 7th person
      3. ☐ The 4th person   7. ☐ The 8th person
      4. ☐ The 5th person

SECTION 3: REAL ESTATE WEALTH AND ITS FINANCING

3.01   How many square metres does your residence measure? (Please enter the living space of your dwelling only)

!___!___!___! m²

3.02   Is your household owner or tenant of the total or part of the residence, or does your household use the residence for free?

1. ☐ Owner of the total dwelling   Please go to question 3.05
2. ☐ Owner of part of the dwelling   Please go to question 3.04
3. ☐ Tenant/sub-tenant   Please go to question 3.03
4. ☐ Use for free   Please go to question 3.11

3.03   What is the monthly rent? (if possible do not include costs for heating, electricity, etc...)

!___!___!___!___! Euro   Please go to question 3.11

3.04   How large is the share of the residence (of the total value of the residence) that your household owns?

!___!___!___! %

3.05   In what year did your household become owner of the residence (self-constructed, letting be built, inherited)?

!___!___!___!___!

3.06   What was the value of the residence at the time you bought your residence, constructed it, letting it be constructed, inherited it (in euro)? (In case your household only owns part of the dwelling, please enter the total value of the residence and not only the part your household owns).

!___!___!___!___!___!___!___!___! Euro

3.07   What is the current value of the property, i.e. if your household decided to sell the residence, how much money do you think your household could get for it? (In case your household only owns part of the residence, please enter the total value of the residence and not only the part your household owns).

!___!___!___!___!___!___!___!___! Euro

3.08   Are there currently any outstanding mortgages or loans that use this property as collateral?

    1. ☐ YES   Please go to question 3.09   2. ☐ NO   Please go to question 3.11

3.09   How many such mortgages or loans do you have?

    !___!___!

3.10   What is the total outstanding balance on the mortgage(s) or loan(s)?

    !___!___!___!___!___!___!___!___! Euro

3.11   Apart from your house/apartment, if you own it, do you or anyone else in your household own any other properties? (e.g. houses, apartments, garages, offices, hotels, other commercial buildings, farms, land, etc…)

    1. ☐ YES   Please go to question 3.12   2. ☐ NO   Please go to question 3.17

3.12   How many such properties does your household, i.e. you or any other household member, own in full or partially?

    !___!___!

3.13   What is the current value of these properties, i.e. if you could sell them now what do you think would be the total price of the properties?

    !___!___!___!___!___!___!___!___! Euro

3.14   Are there currently any outstanding mortgages or loans that use this property/any of these properties as collateral?

    1. ☐ YES   Please go to question 3.15   2. ☐ NO   Please go to question 3.17

3.15   How many such mortgages or loans do you have?

    !___!___!

3.16   What is the total outstanding balance on the mortgage(s) or loan(s)?

    !___!___!___!___!___!___!___!___! Euro

3.17   How many vehicles does your household own?

Please do not account for vehicles under leasing contracts or business vehicles.

Type of vehicle	Number
Cars……………………………………………………....................	!___!___!
Motorbikes…………………………………………………....	!___!___!
Lorries…………………………………………..………...…	!___!___!
Small transport vehicles/vans…………………………………	!___!___!
Aeroplanes…………………………………………………..	!___!___!
Boats/yachts…………………………………………………...	!___!___!
Other vehicles (please specify)…………………………………..	!___!___!

3.18   If you decided to sell this vehicle/these vehicles, how much do you think you would get in total?

!___!___!___!___!___!___!___!___! Euro

SECTION 4: OTHER LOANS AND CREDITS

4.01   Do you or any other household member have further loans, i.e. other than those already mentioned? Please include also those relating to overdraft facilities with your financial institution and credit card limits that you exceeded (i.e. with outstanding balance).

1. ☐ YES   Please go to question 4.02   2. ☐ NO   Please go to question 5.01

4.02   What is the total outstanding balance on this loan/these loans? Please separate by the country of the granting financial institution(s).

Country of residence   !___!___!___!___!___!___!___!___! Euro

Luxembourg….……...   !___!___!___!___!___!___!___!___! Euro

Other country ……....   !___!___!___!___!___!___!___!___! Euro

SECTION 5: PARTICPATION IN PRIVATE BUSINESSES (NON-TRADED) AND FINANCIAL ASSETS

5.01   Do you or any other household member own in full or partially any business(es) that is(are) not publicly traded?

1. ☐ YES   Please go to question 5.02   2. ☐ NO   Please go to question 5.04

5.02   What is the net value of your household's share in this/these business(es)? That is, what could you sell it/them for taking into account all assets associated with the business(es) and deducting all liabilities?

$$!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!$$ Euro

5.03   Where is/are the business/businesses located?

Country of residence   1. ☐ YES   2. ☐ NO

Luxembourg………….   1. ☐ YES   2. ☐ NO

Other country…….......   1. ☐ YES   2. ☐ NO

5.04   Does your household, i.e. you or any other household member, own financial assets, i.e. (current accounts, salary accounts, savings accounts, deposit certificates, other bank deposits, other funds, hedge funds, any type of business obligations or country, treasury and other bonds, company shares)?

1. ☐ YES   Please go to question 5.05   2. ☐ NO   Please go to 6.01

5.05   What is the current market value of these financial assets? Please separate the values according the country where they are located.

Country of residence …. $!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!$ Euro

Luxembourg…………... $!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!$ Euro

Other country……......... $!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!\_\_\_!$ Euro

SECTION 6: INCOME OF THE HOUSEHOLD

6.01   INCOME FROM LUXEMBOURG DURING THE LAST 12 MONTHS

What was the approximate total gross amount of your household income that your household received from Luxembourg during the last 12 months? (to be included: salaries, overtime pay, bonuses, 13th and 14th months' salary, income from self-employment, pension income, unemployment benefit, family allowances, interest, dividends, rents)

1. ☐ 0 to 10.000 €/year   6. ☐ 100.001 to 250.000 €/year
2. ☐ 10.001 to 25.000 €/year   7. ☐ 250.001 to 500.000 €/year
3. ☐ 25.001 to 50.000 €/year   8. ☐ 500.001 to 1 million €/year
4. ☐ 50.001 to 75.000 €/year   9. ☐ More than 1 million €/year
5. ☐ 75.001 to 100.000 €/year

6.02   INCOME DURING THE LAST 12 MONTHS OTHER THAN IN LUXEMBOURG

What was the approximate total gross amount of your household income that your household received other than in Luxembourg during the last 12 months? (to be included: salaries, over-time pay, bonuses, 13th and 14th months' salary, income from self-employment, pension income, unemployment benefit, family allowances, interest, dividends, rents)

1. ☐ None
2. ☐ 1 to 500 €/year
3. ☐ 501 to 1.000 €/year
4. ☐ 1.001 to 2.500 €/year
5. ☐ 2.501 to 5.000 €/year
6. ☐ 5.001 to 10.000 €/year
7. ☐ 10.001 to 25.000 €/year

8. ☐ 25.001 to 50.000 €/year
9. ☐ 50.001 to 75.000 €/year
10. ☐ 75.001 to 100.000 €/year
11. ☐ 100.001 to 250.000 €/year
12. ☐ 250.001 to 500.000 €/year
13. ☐ 500.001 to 1 million €/year
14. ☐ More than 1 million €/year

SECTION 7: CONSUMPTION

7.01   During the last 12 months, about how much did your household spend in a typical month on all the usual consumer goods and services? This includes expenditure for food and drinks at home and outside home, running costs (water, gas, electricity…), clothes, leisure activities, etc. Please do not include rent, costs for residential maintenance, taxes, financial payments (for loans, insurance, pensions, etc. …) and one-off payments (e.g. cars, furniture, furnishings etc. ...).

!___!___!___!___!___!___! Euro/month

7.02   Did some of these consumer expenditures take place in Luxembourg?

1. ☐ YES   Please go to question 7.03   2. ☐ NO Please got to question 7.05

7.03   What was the percentage share of these consumer expenditures that was incurred in Luxembourg?

!___!___! %

7.04   What was the main reason to buy these products in Luxembourg?
    (1 answer only)

1. ☐ Because you do not have any other choice
2. ☐ Because it is more convenient and doing so you save time
3. ☐ Because you can find certain products, that you do not find where you live
4. ☐ Because it is cheaper

7.05 Does your household buy fuel in Luxembourg (petrol, Diesel, etc. ...)?

    1. ☐ YES   Please go to question 7.06   2. ☐ NO   Please go to question 7.07

7.06 How much money does your household spend on average in a typical month for fuel in Luxembourg?

    !___!___!___!___!___!___! Euro/month

7.07 Does your household buy tobacco products (cigarettes, cigars, tobacco, etc. …) in Luxembourg?

    1. ☐ YES   Please go to question 7.08   2. ☐ NO   Please go to question 7.09

7.08 How much money does your household spend on average in a typical month for tobacco products in Luxembourg?

    !___!___!___!___!___!___! Euro/month

7.09 Does your household buy alcohol in Luxembourg?

    1. ☐ YES   Please go to question 7.10   2. ☐ NO   Please go to question 7.11

7.10 How much money does your household spend on average in a typical month for alcohol in Luxembourg?

    !___!___!___!___!___!___! Euro/month

7.11 What was the average monthly expenditure that your household incurred on food and drinks at home during the last 12 months?

    !___!___!___!___!___!___! Euro/month

7.12 Thinking of those expenditure, could you please tell me, approximately, how much your household incurred in your country of residence, in Luxembourg and if applicable in other countries (in %)?

    Country of residence……   !___!___! %

    Luxembourg……………   !___!___! %

    Other countries…...........   !___!___! %

7.13 What was the average monthly expenditure that your household incurred on food and drinks outside home during the last 12 months? This is expenditure that you made in restaurants, snacks, cantinas, coffee shops and other establishments of this kind.

!___!___!___!___!___!___! Euro/month

7.14 Thinking of this expenditure, could you please tell me, approximately, how much your household incurred in your country of residence, in Luxembourg and if applicable in other countries (in %)?

Country of residence….   !___!___! %

Luxembourg……………   !___!___! %

Other countries…..........   !___!___! %

7.15 Do you or any other member of your household use public transport to get to work in Luxembourg?

1. ☐ YES   Please go to question 7.16   2. ☐ NO   Please go to question 7.18

7.16 Does your household buy tickets from a Luxembourg transport company (CFL or Luxembourg bus company)?

1. ☐ YES   Please go to question 7.17   2. ☐ NO   Please go to question 7.18

7.17 How much money does your household spend on average in a typical month on public transport in Luxembourg?

!___!___!___!___!___!___! Euro/month

7.18 Does your household buy clothing in Luxembourg?

1. ☐ YES, often   Please go to question 7.19
2. ☐ YES, occasionally Please go to question 7.19
3. ☐ NO   Please go to question 7.20

7.19 How much money does your household spend on average in a typical month on clothing in Luxembourg?

!___!___!___!___!___!___! Euro/month

7.20 During the last 12 months, did your household incur any expenditure for cultural events in Luxembourg (inclusive subscriptions)?

    1. ☐ YES   Please go to question 7.21   2. ☐ NO   Please go to question 7.22

7.21 How much money did your household spent on it in Luxembourg during the last 12 months?

    !___!___!___!___!___!___! Euro/year

7.22 During the last 12 months, did your household book any travels, aeroplane or train tickets in Luxembourg?

    1. ☐ YES   Please go to question 7.23   2. ☐ NO   Please go to question 7.24

7.23 How much money did your household spent on it in Luxembourg during the last 12 months?

    !___!___!___!___!___!___! Euro/year

7.24 During the last 12 months, did your household incur any expenditure for furniture, electrical and household appliances in Luxembourg? (Computer, telephone, TV, fridge, washing machine, photo camera etc. …)

    1. ☐ YES   Please go to question 7.25   2. ☐ NO   Please go to question 7.27

7.25 How much money did your household spent on it in Luxembourg during the last 12 months?

    !___!___!___!___!___!___! Euro/year

7.26 What was the main reason to buy these products in Luxembourg?
    (1 answer only)

    1. ☐ Because you do not have any other choice
    2. ☐ Because it is more convenient and doing so you save time
    3. ☐ Because you can find certain products, that you do not find where you live
    4. ☐ Because it is cheaper

7.27 During the last 12 months, did your household buy any vehicles in Luxembourg? (cars, motorbikes, caravans, etc...)

    1. ☐ YES   Please go to question 7.28   2. ☐ NO Please go to question 7.29

7.28   How much money did your household spent on it in Luxembourg during the last 12 months?

         !___!___!___!___!___!___! Euro/year

7.29   During the last 12 months, did your household use any garage for repairs or maintenance of any vehicle in Luxembourg?

         1. ☐ YES   Please go to question 7.30   2. ☐ NO Please go to question 7.31

7.30   How much money did your household spent on it in Luxembourg during the last 12 months?

         !___!___!___!___!___!___! Euro/year

7.31   During the last 12 months, did your household incur any health related expenditure in Luxembourg (medication, doctor's visit, etc. …)?

         1. ☐ YES   Please go to question 7.32   2. ☐ NO   Please go to question 7.33

7.32   How much money did your household spent on it in Luxembourg during the last 12 months?

         !___!___!___!___!___!___! Euro/year

7.33   During the last 12 months, did your household incur any expenditure for education (language course, IT course, etc. …)? (Please do not include expenditure covered by the employer)

         1. ☐ YES   Please go to question 7.34   2. ☐ NO   Please go to question 7.35

7.34   How much money did your household spent on it in Luxembourg during the last 12 months?

         !___!___!___!___!___!___! Euro/year

7.35   During the last 12 months, did your household incur any expenditure other than reported so far in Luxembourg?

         1. ☐ YES   Please go to question 7.36   2. ☐ NO   end of questionnaire

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7.36   How much money did your household spent on it in Luxembourg during the last 12 months?

         !___!___!___!___!___!___! Euro/year

THANK YOU FOR HAVING COMPLETED THIS QUESTIONNAIRE

Appendix 2: Survey design and data treatment

A2.1 Definition of the target population

The target population of the survey is the set of households living in adjacent regions of Luxembourg, the so-called *"Grande-Région"*, where at least one household member works in Luxembourg at the date of the data collection. The social security register of Luxembourg (Inspection Générale de la Sécurité Sociale, IGSS) at 31ˢᵗ December 2009 is used as the sampling frame. The sampling unit is the individual cross-border commuter to Luxembourg with permanent residence within the *"Grande-Région"*. The objective to sample individuals working in Luxembourg at the time of the data collection required to make some adjustments to account for individuals changing their employment status between the reference date of the sampling frame and the reference date of target population. This is reflected in weighting scheme.

A2.2 Sampling design

The main objective of the XB-HFCS is to analyse households' income, wealth and consumption behaviour. To this end and to obtain a more precise representation of the cross-border population, a stratified sampling scheme is used to construct the XB-HFCS sample. The population was divided in 42 strata along three dimensions: country of residence, gender of the cross-border worker and income (Table A1). To account for the right skewness of the wealth distribution and their more complex portfolio composition wealthy households are oversampled. Given the absence of information on wealth in the sampling frame and assuming a strong link between income and wealth, individuals (and their households) with a labour income exceeding €6,000 per month were oversampled, with a oversampling rate of 20%[11]; to make the sample statistics representative of the underlying population which it represents, the wealthier strata are subsequently down weighted. To reach the initial target of 500 completed interviews almost 5,000 cross-border households were contacted by postal mail.

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[11] The sampling strategy was implemented in two steps. In the first step, 80% of the gross sample were selected from the sampling frame following a random stratified sampling. In the second step, the remaining 20% of the gross sample were selected from high income strata only. Wealthy households, thus, represent the 28% of the final gross sample.

Table A1: Strata of the XB-HFCS

Country	Gender	Income	Population	Gross sample	in %
France	male	less than 1500€	763	30	3.9%
		1500-1999€	2,386	75	3.1%
		2000-2499€	7,917	250	3.2%
		2500-2999€	8,648	275	3.2%
		3000-3999€	9,094	286	3.1%
		4000-5999€	6,489	204	3.1%
		6000€ or more	3,426	453	13.2%
	female	less than 1500€	3,550	112	3.2%
		1500-1999€	4,108	131	3.2%
		2000-2499€	4,530	136	3.0%
		2500-2999€	2,866	88	3.1%
		3000-3999€	4,404	138	3.1%
		4000-5999€	4,015	125	3.1%
		6000€ or more	1,207	187	15.5%
Belgium	male	less than 1500€	418	15	3.6%
		1500-1999€	1,293	38	2.9%
		2000-2499€	3,864	116	3.0%
		2500-2999€	4,377	132	3.0%
		3000-3999€	4,731	142	3.0%
		4000-5999€	4,176	125	3.0%
		6000€ or more	3,829	238	6.2%
	female	less than 1500€	1,144	35	3.1%
		1500-1999€	1,436	44	3.1%
		2000-2499€	1,615	50	3.1%
		2500-2999€	1,141	33	2.9%
		3000-3999€	1,906	57	3.0%
		4000-5999€	2,116	63	3.0%
		6000€ or more	975	156	16.0%
Germany	male	less than 1500€	605	20	3.3%
		1500-1999€	1,054	34	3.2%
		2000-2499€	4,215	135	3.2%
		2500-2999€	4,047	130	3.2%
		3000-3999€	4,259	136	3.2%
		4000-5999€	3,665	118	3.2%
		6000€ or more	2,933	218	7.4%
	female	less than 1500€	1,357	44	3.2%
		1500-1999€	1,186	39	3.3%
		2000-2499€	1,750	56	3.2%
		2500-2999€	1,329	42	3.2%
		3000-3999€	1,951	61	3.1%
		4000-5999€	1,967	63	3.2%
		6000€ or more	729	146	20.0%
total			127,471	4,976	3.9%

Source: own calculations based on IGSS data as at 31/12/2009.

A2.3 The Fieldwork

The fieldwork was carried out by CEPS/INSTEAD, a public Luxembourg research institution with a long history in conducting and analysing household surveys, such as the EU-SILC. Recently, it also conducted a number of cross-border surveys together with the Luxembourg statistical institute Statec. In November 2010, the questionnaire was sent by mail to the sampled households. The questionnaire was accompanied by an introduction letter jointly signed by the president of the BCL and CEPS, an information leaflet and a blank return envelope to be sent back with the completed questionnaire. A designated web page was created and put on the BCL and CEPS/INSTEAD websites. The households selected were provided with dedicated telephone numbers and e-mail addresses to facilitate contacting the BCL or CEPS/INSTEAD to obtain further information. The field phase spanned from November 2010 to the end of January 2011. As the initial response rate after 4,000 contacted households was low, another set of almost 1,000 households were contacted. This led to a higher number of completed questionnaires than initially envisaged. The final sample comprises 715 households.

A2.4 Data treatment

Unit non-response
Table A2 presents some descriptive statistics on households' (non-)response behaviour. For each stratum, it provides three different reasons resulting in unit non-response, i.e. out of scope, address problems and refusal. The category out of scope contains one household not working in Luxembourg (any more) at the time of the survey and two households where the contacted household member had retired. Address problems occurred for around 4% of the gross sample. The overall response rate is 14.4%. Correcting for address problems and out of scope observations, the response rate increases to 15% (see Table A2). The response rate is fairly high considering that this survey is conducted as a postal survey.

The corrected response rate varies substantially between strata (2.5% - 26.5%). Due to the survey method, information about refusing households cannot be collected. Thus, the unit non-response analysis rests on information provided by each stratum. To analyse the unit non-response behaviour of households we estimate a probit model where a response is coded as 1 and a refusal as 0. The independent variables are country of residence, gender, income [in brackets] and all their interactions. We exclude out of scope households and households with address problems since the aim is to analyse household characteristics influencing refusals. According to the coefficient estimates income seems to have a significantly positive influence on the probability of a household participating in the survey (Table A3). The income effect is even stronger in Germany. For German females the response rate is lower.

Table A2: Response behaviour for each stratum

country	gender	income	total	accept to participate	refuse to particpate	wrong address	out of scope	response rate	corrected response rate
France	male	less than 1500€	30	4	24	2	0	13.3%	14.3%
		1500-1999€	75	9	64	2	0	12.0%	12.3%
		2000-2499€	250	34	200	16	0	13.6%	14.5%
		2500-2999€	275	38	222	15	0	13.8%	14.6%
		3000-3999€	286	33	241	12	0	11.5%	12.0%
		4000-5999€	204	29	168	7	0	14.2%	14.7%
		6000€ or more	453	80	362	11	0	17.7%	18.1%
	female	less than 1500€	112	7	93	11	1	6.3%	7.0%
		1500-1999€	131	13	107	11	0	9.9%	10.8%
		2000-2499€	136	20	105	11	0	14.7%	16.0%
		2500-2999€	88	11	71	6	0	12.5%	13.4%
		3000-3999€	138	25	100	13	0	18.1%	20.0%
		4000-5999€	125	18	101	6	0	14.4%	15.1%
		6000€ or more	187	32	146	9	0	17.1%	18.0%
Belgium	male	less than 1500€	15	3	12	0	0	20.0%	20.0%
		1500-1999€	38	6	29	3	0	15.8%	17.1%
		2000-2499€	116	9	101	6	0	7.8%	8.2%
		2500-2999€	132	19	111	2	0	14.4%	14.6%
		3000-3999€	142	16	120	6	0	11.3%	11.8%
		4000-5999€	125	21	100	3	1	16.8%	17.4%
		6000€ or more	238	44	192	2	0	18.5%	18.6%
	female	less than 1500€	35	4	31	0	0	11.4%	11.4%
		1500-1999€	44	5	39	0	0	11.4%	11.4%
		2000-2499€	50	13	36	1	0	26.0%	26.5%
		2500-2999€	33	6	26	1	0	18.2%	18.8%
		3000-3999€	57	4	51	2	0	7.0%	7.3%
		4000-5999€	63	10	51	2	0	15.9%	16.4%
		6000€ or more	156	32	119	4	1	20.5%	21.2%
Germany	male	less than 1500€	20	1	18	1	0	5.0%	5.3%
		1500-1999€	34	5	29	0	0	14.7%	14.7%
		2000-2499€	135	10	118	7	0	7.4%	7.8%
		2500-2999€	130	10	116	4	0	7.7%	7.9%
		3000-3999€	136	21	112	3	0	15.4%	15.8%
		4000-5999€	118	17	99	2	0	14.4%	14.7%
		6000€ or more	218	50	163	5	0	22.9%	23.5%
	female	less than 1500€	44	3	36	5	0	6.8%	7.7%
		1500-1999€	39	4	35	0	0	10.3%	10.3%
		2000-2499€	56	3	51	2	0	5.4%	5.6%
		2500-2999€	42	1	39	2	0	2.4%	2.5%
		3000-3999€	61	9	50	2	0	14.8%	15.3%
		4000-5999€	63	8	51	4	0	12.7%	13.6%
		6000€ or more	146	28	111	7	0	19.2%	20.1%
total			4,976	715	4,050	208	3	14.4%	15.0%

Source: own calculations based on the XB-HFCS 2010.

Table A3: Multivariate Probit Analysis with interactions

	(1)	
	Marg. eff.	Std. err.
Male (d)	-0.001	(0.139)
Belgium (d)	0.077	(0.173)
* Male (d)	-0.074	(0.113)
* Income	-0.001	(0.030)
Germany (d)	-0.556 **	(0.196)
* Male (d)	0.098	(0.119)
* Income	0.086 **	(0.033)
Income	0.054 *	(0.022)
* Male (d)	-0.005	(0.026)
Observations	4765	
Pseudo R-squared	0.011	

Marginal effects; Standard errors in parentheses; (d) for discrete changes of dummy variable from 0 to 1; * p<0.05, ** p<0.01, *** p<0.001. A low income household with a female cross-border worker resident in France is the base category.

Weighting

The sampling procedure follows[12], where appropriate, the one used for the LU-HFCS (see Mathä, Porpiglia and Ziegelmeyer, 2012a). It contains the following steps: i) construction of design weights based on selection probability, ii) non-contact/non-response adjustment, iii) analytic weights construction. Due to a lack of available data it was not possible to calibrate analytic weights to external data sources.

i) Due to the response rate of 14.4%, observations had to be aggregated from initially 42 strata into 6 strata during the construction of the design weights (Table A4). Accordingly with this strata aggregation, the design weights are calculated as the inverse of the selection probability. Having been oversampled, the weights of high income households are adjusted downward.

ii) The survey mode does not allow distinguishing between non-contacts and non-responses in the XB-HFCS. The non-contact and non-response adjustments of the analytic weights are therefore performed in the same step. The non-contact/non-response adjustment is calculated using the Calmar procedure developed by French National Statistics Institute (INSEE) (e.g. Deville et al., 1993). Auxiliary information necessary for this procedure (at population and sample level) was derived from the IGSS database as defined at 31st December 2009.

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[12] For a detailed description of the XB-HFCS weighting procedure, including the description of the auxiliary vectors and intermediate statistics, see Berger (2012).

Table A4: Aggregation of sampling strata

Country of Residence	Individual monthly income	Stratum	Population size	Sample size
France	Less than €6,000	1	58,770	1,850
	€6,000 or more	2	4,633	640
Belgium	Less than €6,000	3	28,217	850
	€6,000 or more	4	4,804	394
Germany	Less than €6,000	5	27,385	878
	€6,000 or more	6	3,662	364
Total			127,471	4,976

Source: Berger (2012).

iii) The last step in the weighting procedure is the construction of the analytic weights. First, the weights are adjusted for over-coverage. Over coverage arises due to the time lag between the reference date of the sampling frame (31st December 2009) and the reference date of the data collection. In this period some individuals may change their employment status (e.g. individuals retire). This step within the weighting procedure aims to exclude those households from the selected sample and from the sampling frame.

After this intermediate step two sets of analytic weights are constructed: the first set of weights results in the 715 observations being representative of 127,186 individuals working in Luxembourg and residing within the *"Grande-Région"*; the second set of weights accounts for the possibility that household may have more than one cross-border commuter making the sample representative of 99,181 cross-border commuter households residing within the *"Grande-Région"*, consisting of 294,772 individuals.

Item non-response and imputation
Item non-response, which is the failure to respond to one or more questions, is generally a widespread phenomenon in micro datasets since respondents have difficulties to recall events or are unwilling to provide sensitive information, such as information on income and wealth. Table A5 gives a detailed overview about the missing pattern for each variable collected. It contains the number of applicable, unapplicable, and undetermined cases, displaying the minimum number of values to be imputed and the maximum number to be imputed, which depends on the number of missing values in the parent variable(s).

Gender, age, marital status, and means of transport to the workplace have no missing values at all. Other socio-demographic variables like country of birth, education and household size have missing rates below 1%.[13] Variables about the current job situation have missing rates below 3%. Even the missing rates about real estate und its financing remain very low. Only the past and current values of the household main residence reach missing

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[13] The missing rate reported in the text refers to the number of imputed values (excluding undetermined cases) relative to applicable cases.

rates between 10% and 14%. A similar pattern can be observed for the rest of the dataset. Question concerning monetary values or percentages have missing rates between 5% and 16%. The only exception is the amount of business assets for which the missing rate increases to almost 26% for the minimum amount of imputed values relative to the applicable cases. The remainder of the questionnaire has in general missing rates below 5%.

Since the pattern of missing values is not completely at random, the data is multiply stochastically imputed. Multiple imputations help to overcome the bias caused by item nonresponse and increase the efficiency of the estimates due to the increased sample size. For our purposes, we use an adapted version of the ECB Multiple Imputation Routine (EMIR).[14]

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[14] See Mathä, Porpiglia and Ziegelmeyer (2012a) for a more complete description in case of the LU-HFCS.

Variable name	Label	Applicable abs.	in % *	Undetermined abs.	in % *	Min. imp. abs.	in % **	Max. imp. abs.	in % **	Edited abs.	in % **
Section 1: basic socio-demograhic variables of the cross-border worker											
P101D	gender	715	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
P102C	age	715	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
P103K	country of birth	715	100.0%	0	0.0%	1	0.1%	1	0.1%	0	0.0%
P104K	marital status	715	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
P105O	education	715	100.0%	0	0.0%	3	0.4%	3	0.4%	0	0.0%
P106K	means of transport - workplace	715	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
P107C	distance to workplace	715	100.0%	0	0.0%	4	0.6%	4	0.6%	0	0.0%
P108C	number of additional persons in hh	715	100.0%	0	0.0%	3	0.4%	3	0.4%	0	0.0%
P109_1P2K	family relationship - person 2	610	85.3%	3	0.4%	3	0.5%	6	1.0%	0	0.0%
P109_1P3K	age - person 2	444	62.1%	3	0.4%	2	0.5%	5	1.1%	0	0.0%
P109_1P4K	situation - person 2	287	40.1%	3	0.4%	1	0.3%	4	1.4%	0	0.0%
P109_1P5K	gender - person 2	71	9.9%	3	0.4%	0	0.0%	3	4.2%	0	0.0%
P109_1P6K	family relationship - person 3	13	1.8%	3	0.4%	0	0.0%	3	23.1%	0	0.0%
P109_1P7K	age - person 3	0	0.0%	3	0.4%	0		3		0	
P109_1P8K	situation - person 3	0	0.0%	3	0.4%	0		3		0	
P109_2P2C	gender - person 3	610	85.3%	3	0.4%	18	3.0%	21	3.4%	0	0.0%
P109_2P3C	family relationship - person 4	444	62.1%	3	0.4%	11	2.5%	14	3.2%	0	0.0%
P109_2P4C	age - person 4	287	40.1%	3	0.4%	7	2.4%	10	3.5%	0	0.0%
P109_2P5C	situation - person 4	71	9.9%	3	0.4%	1	1.4%	4	5.6%	0	0.0%
P109_2P6C	gender - person 4	13	1.8%	3	0.4%	1	7.7%	4	30.8%	0	0.0%
P109_2P7C	family relationship - person 5	0	0.0%	3	0.4%	0		3		0	
P109_2P8C	age - person 5	0	0.0%	3	0.4%	0		3		0	
P109_3P2K	situation - person 5	610	85.3%	3	0.4%	25	4.1%	28	4.6%	0	0.0%
P109_3P3K	gender - person 5	444	62.1%	3	0.4%	4	0.9%	7	1.6%	0	0.0%
P109_3P4K	family relationship - person 6	287	40.1%	3	0.4%	1	0.3%	4	1.4%	0	0.0%
P109_3P5K	age - person 6	71	9.9%	3	0.4%	0	0.0%	3	4.2%	0	0.0%
P109_3P6K	situation - person 6	13	1.8%	3	0.4%	0	0.0%	3	23.1%	0	0.0%
P109_3P7K	gender - person 6	0	0.0%	3	0.4%	0		3		0	
P109_3P8K	family relationship - person 7	0	0.0%	3	0.4%	0		3		0	
P109_4P2D	age - person 7	610	85.3%	3	0.4%	4	0.7%	7	1.1%	0	0.0%
P109_4P3D	situation - person 7	444	62.1%	3	0.4%	35	7.9%	38	8.6%	0	0.0%
P109_4P4D	gender - person 7	287	40.1%	3	0.4%	25	8.7%	28	9.8%	0	0.0%
P109_4P5D	family relationship - person 8	71	9.9%	3	0.4%	3	4.2%	6	8.5%	0	0.0%
P109_4P6D	age - person 8	13	1.8%	3	0.4%	0	0.0%	3	23.1%	0	0.0%
P109_4P7D	situation - person 8	0	0.0%	3	0.4%	0		3		0	
P109_4P8D	gender - person 8	0	0.0%	3	0.4%	0		3		0	
Section 2: employment											
P201K	professional career	715	100.0%	0	0.0%	6	0.8%	6	0.8%	0	0.0%
P202K	job description	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
P203K	main activity of company	715	100.0%	0	0.0%	21	2.9%	21	2.9%	0	0.0%
P204D	limited/ unlimited contract	715	100.0%	0	0.0%	9	1.3%	9	1.3%	0	0.0%
P205C	working hours	715	100.0%	0	0.0%	7	1.0%	7	1.0%	0	0.0%
P206C	years working in LU	715	100.0%	0	0.0%	6	0.8%	6	0.8%	0	0.0%
P207D	financial respondent yes/no?	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
P208K	person no. of financial respondent	100	14.0%	8	1.1%	1	1.0%	9	9.0%	0	0.0%
Section 3: real estate and mortgages											
H301C	square meters of accomodation	715	100.0%	0	0.0%	14	2.0%	14	2.0%	0	0.0%
H302K	owner or rentee?	715	100.0%	0	0.0%	3	0.4%	3	0.4%	0	0.0%
H303C	rent excluding service charges	150	21.0%	3	0.4%	0	0.0%	3	2.0%	0	0.0%
H304C	owned share of accomodation in %	16	2.2%	3	0.4%	2	12.5%	5	31.3%	0	0.0%
H305C	owner since?	554	77.5%	3	0.4%	13	2.3%	16	2.9%	0	0.0%
H306C	value of accomodation - past	554	77.5%	3	0.4%	55	9.9%	58	10.5%	0	0.0%
H307C	value of accomodation - today	554	77.5%	3	0.4%	77	13.9%	80	14.4%	0	0.0%
H308D	mortgages or other credits yes/ no?	554	77.5%	3	0.4%	14	2.5%	17	3.1%	0	0.0%
H309C	number of mortgages or other credits	313	43.8%	17	2.4%	4	1.3%	21	6.7%	0	0.0%
H310C	amount mortgages or other credits	313	43.8%	17	2.4%	20	6.4%	37	11.8%	0	0.0%
H311D	additional real estate yes/ no?	715	100.0%	0	0.0%	18	2.5%	18	2.5%	0	0.0%
H312C	number of additional real estate	161	22.5%	18	2.5%	2	1.2%	20	12.4%	0	0.0%
H313C	value of additional real estate - today	161	22.5%	18	2.5%	13	8.1%	31	19.3%	0	0.0%
H314D	mortgages or other credits yes/ no? - additional real estate	161	22.5%	18	2.5%	3	1.9%	21	13.0%	0	0.0%
H315C	number of mortgages or other credits - additional real estate	74	10.3%	21	2.9%	3	4.1%	24	32.4%	0	0.0%
H316C	amount mortgages or other credits - additional real estate	74	10.3%	21	2.9%	6	8.1%	27	36.5%	0	0.0%
H317_1C	number of cars	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
H317_2C	number of motorcycles	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
H317_3C	number of trucks	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
H317_4C	number of vans	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
H317_5C	number of airplains	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
H317_6C	number of boats/ yachts	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
H317_7C	number of other vehicles	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
H318C	value of all vehicles	715	100.0%	0	0.0%	69	9.7%	69	9.7%	0	0.0%

Variable name	Label	Applicable abs.	in % *	Undetermined abs.	in % *	Min. imp. abs.	in % **	Max. imp. abs.	in % **	Edited abs.	in % **
Section 4: other credits											
H401D	additional credits yes/ no?	715	100.0%	0	0.0%	9	1.3%	9	1.3%	0	0.0%
H402_1C	amount credits in home country	234	32.7%	7	1.0%	13	5.6%	20	8.5%	0	0.0%
H402_2C	amount credits in LU	234	32.7%	7	1.0%	13	5.6%	20	8.5%	0	0.0%
H402_3C	amount credits in other country	234	32.7%	7	1.0%	13	5.6%	20	8.5%	0	0.0%
Section 5: business assets and financial assets											
H501D	business assets yes/ no?	715	100.0%	0	0.0%	10	1.4%	10	1.4%	0	0.0%
H502C	amount business assets	43	6.0%	10	1.4%	11	25.6%	21	48.8%	0	0.0%
H503_1C	home country is location of business assets	43	6.0%	10	1.4%	0	0.0%	10	23.3%	0	0.0%
H503_2C	LU is location of business assets	43	6.0%	10	1.4%	0	0.0%	10	23.3%	0	0.0%
H503_3C	other country is location of business assets	43	6.0%	10	1.4%	0	0.0%	10	23.3%	0	0.0%
H504D	financial assets yes/ no?	715	100.0%	0	0.0%	31	4.3%	31	4.3%	0	0.0%
H505_1C	amount financial assets in home country	471	65.9%	23	3.2%	76	16.1%	99	21.0%	0	0.0%
H505_2C	amount financial assets in LU	471	65.9%	23	3.2%	76	16.1%	99	21.0%	0	0.0%
H505_3C	amount financial assets in other country	471	65.9%	23	3.2%	76	16.1%	99	21.0%	0	0.0%
Section 6: income											
H601C	cross income LU	715	100.0%	0	0.0%	13	1.8%	13	1.8%	0	0.0%
H602C	cross income home country or other country	715	100.0%	0	0.0%	47	6.6%	47	6.6%	0	0.0%
Section 7: consumption											
H701C	amount spent on non-durable goods	715	100.0%	0	0.0%	44	6.2%	44	6.2%	36	5.0%
H702D	expenditures in LU yes/ no?	715	100.0%	0	0.0%	6	0.8%	6	0.8%	0	0.0%
H703C	share of expenditures in LU	640	89.5%	6	0.8%	10	1.6%	16	2.5%	0	0.0%
H704K	reason for purchasing non-durable goods in LU	640	89.5%	6	0.8%	9	1.4%	15	2.3%	0	0.0%
H705D	petrol purchase in LU yes/ no?	715	100.0%	0	0.0%	3	0.4%	3	0.4%	0	0.0%
H706C	amount petrol purchase in LU	686	95.9%	3	0.4%	11	1.6%	14	2.0%	0	0.0%
H707D	tabacco purchase in LU yes/ no?	715	100.0%	0	0.0%	5	0.7%	5	0.7%	0	0.0%
H708C	amount tabacco purchase in LU	247	34.5%	5	0.7%	2	0.8%	7	2.8%	0	0.0%
H709D	alcohol purchase in LU yes/ no?	715	100.0%	0	0.0%	6	0.8%	6	0.8%	0	0.0%
H710C	amount alcohol purchase in LU	319	44.6%	6	0.8%	6	1.9%	12	3.8%	0	0.0%
H711C	expenditures for drinks/food at home	715	100.0%	0	0.0%	43	6.0%	43	6.0%	51	7.1%
H712_1C	share of expenditures for drinks/food at home in home country	715	100.0%	0	0.0%	46	6.4%	46	6.4%	0	0.0%
H712_2C	share of expenditures for drinks/food at home in LU	715	100.0%	0	0.0%	50	7.0%	50	7.0%	0	0.0%
H712_3C	share of expenditures for drinks/food at home in other country	715	100.0%	0	0.0%	54	7.6%	54	7.6%	0	0.0%
H713C	expenditures for drinks/food outside home	715	100.0%	0	0.0%	47	6.6%	47	6.6%	41	5.7%
H714_1C	share of expenditures for drinks/food outside home in home country	715	100.0%	0	0.0%	79	11.0%	79	11.0%	0	0.0%
H714_2C	share of expenditures for drinks/food outside home in LU	715	100.0%	0	0.0%	81	11.3%	81	11.3%	0	0.0%
H714_3C	share of expenditures for drinks/food outside home in other country	715	100.0%	0	0.0%	85	11.9%	85	11.9%	0	0.0%
H715D	use of public transport to workplace	715	100.0%	0	0.0%	8	1.1%	8	1.1%	0	0.0%
H716D	are tickets purchased from a transport company in LU	156	21.8%	8	1.1%	0	0.0%	8	5.1%	0	0.0%
H717C	amount spent on tickets of a transport company in LU	88	12.3%	8	1.1%	3	3.4%	11	12.5%	0	0.0%
H718K	purchasing clothes in LU yes often/ yes rarely/ no?	715	100.0%	0	0.0%	9	1.3%	9	1.3%	0	0.0%
H719C	amount spent on clothes purchased in LU	495	69.2%	9	1.3%	28	5.7%	37	7.5%	0	0.0%
H720D	expenditures for cultural events in LU yes/ no?	715	100.0%	0	0.0%	12	1.7%	12	1.7%	0	0.0%
H721C	amount spent for cultural events in LU	206	28.8%	12	1.7%	5	2.4%	17	8.3%	0	0.0%
H722D	travel expenditures in LU yes/ no?	715	100.0%	0	0.0%	13	1.8%	13	1.8%	0	0.0%
H723C	amount travel expenditures in LU	200	28.0%	13	1.8%	8	4.0%	21	10.5%	0	0.0%
H724D	durables purchased in LU yes/ no?	715	100.0%	0	0.0%	11	1.5%	11	1.5%	0	0.0%
H725C	amount spent on durable goods purchased in LU	293	41.0%	11	1.5%	10	3.4%	21	7.2%	0	0.0%
H726K	reason for purchasing durable goods in LU	293	41.0%	11	1.5%	7	2.4%	18	6.1%	0	0.0%
H727D	purchase of vehicles in LU yes/ no?	715	100.0%	0	0.0%	11	1.5%	11	1.5%	0	0.0%
H728C	amount spent on vehicles in LU	52	7.3%	11	1.5%	0	0.0%	11	21.2%	0	0.0%
H729D	repairs of vehicle in LU yes/ no?	715	100.0%	0	0.0%	1	0.1%	1	0.1%	0	0.0%
H730C	amount spent on repairs in LU	140	19.6%	1	0.1%	10	7.1%	11	7.9%	0	0.0%
H731D	medical expenditures in LU yes/ no?	715	100.0%	0	0.0%	2	0.3%	2	0.3%	0	0.0%
H732C	amount of medical expenditures in LU	320	44.8%	2	0.3%	16	5.0%	18	5.6%	0	0.0%
H733D	education expenditures in LU yes/ no?	715	100.0%	0	0.0%	4	0.6%	4	0.6%	0	0.0%
H734C	amount of education expenditures in LU	31	4.3%	4	0.6%	0	0.0%	4	12.9%	0	0.0%
H735D	other expenditures in LU yes/ no?	715	100.0%	0	0.0%	9	1.3%	9	1.3%	0	0.0%
H736C	amount other expenditures in LU	99	13.8%	9	1.3%	7	7.1%	16	16.2%	0	0.0%

*Source: own calculations based on the XB-HFCS 2010. * relative to total sample; ** relative to applicable cases (excluding undetermined cases).*

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