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UNDERSTANDING AND EXPLAINING CROSS-BORDER MOBILITY : A FREE WILL / PREDISPOSITION APPROACH

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UNDERSTANDING AND EXPLAINING CROSS-BORDER MOBILITY : A FREE WILL / PREDISPOSITION APPROACH

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To my son, Louis Nonnenmacher. May this work make you want to understand the world around you.

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Abstract

This dissertation investigates the drivers of cross-border mobility from a multidisciplinary perspective. Both qualitative and quantitative methodologies are used in order to understand and explain why workers cross borders. The major contribution of this dissertation is to highlight new determinants of cross-border mobility such as previous migration experience and health state. These drivers have been disregarded in the literature in the past. Moreover, this dissertation validates the motivations of the workers as a relevant driver of cross-border mobility and provides a state of play of the situation of the cross-border workers in Europe, with a specific focus on French cross-border workers. Firstly, this dissertation provides a review of the explanations of cross-border mobility in the existing literature. Secondly, this dissertation analyses the subjective drivers of cross-border mobility using a qualitative dataset composed of 30 interviews of French workers in Luxembourg collected between January 2018 and May 2019. Results highlight that cross-border workers motivate their decision to commute abroad with financial, professional and personal reasons. Furthermore, the motivations of the cross-border workers vary with respect to their socioeconomic profile. Based on these empirical findings, a model of cross-border labour supply was designed. Thirdly, this dissertation assesses the association between migration capital and cross-border mobility using the French part of the European Labour Force Survey called the Enquête Emploi between 2010 and 2018. Results indicate that migrants commute abroad more than non migrants and are also more likely to do so. Migrant children are more likely to commute abroad, suggesting that the capacity to deal with distance and borders can be transmitted throughout generations. The migration capital is a relevant predictor of commuting behaviour, since the higher the capital endowment, the higher the likelihood is to commute abroad. Additional findings can be mentioned. Internal migration does not increase the likelihood to commute abroad. The acquired migration experience is more useful than the inherited migration experience to be engaged in cross-border mobility. Fourthly, this dissertation examines health disparities between cross-border workers and non cross-border workers using the Enquête Emploi between 2013 and 2018. Results

suggest a healthy cross-border phenomenon, the existence of major health disparities among cross-border workers and the rejection of the spillover phenomenon for this specific population. Finally, this dissertation concludes that cross-border mobility is a complex phenomenon still partially explained, probably because of the lack of harmonised dataset about cross-border workers within the EU. Further research on cross-border mobility is needed to better understand this population, especially in public health, where everything remains to be done.

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1. Introduction

1.1. One Worker Two Countries

Free movement of workers is the cornerstone of the European Union (EU). As early as 1951, the article 69 of the Paris treaty stipulated that '*Member States bind themselves to renounce any restriction based on nationality against the employment in the coal and steel industries of workers of proven qualifications for such industries who possess the nationality of one of the Member States*'. The European Economic Community (EEC) regulation n°1408/71 of June 14, 1971, defines a cross-border workers as '*any employed or self-employed person who pursues his occupation in the territory of a Member State and resides in the territory of another Member State to which he returns as a rule daily or at least once a week*'. Cross-border workers are to be distinguished from : (1) migrants and (2) commuters since, (1) migrants dwell and work in the same country and (2) commuters do not cross international borders. While commuting from one country to another, cross-border workers constitute '*a hybrid evolving between two types of economies, two types of legislation and often between two types of cultures*' (Belkacem et al, 2006, 70). For example, cross-border workers depend on Europeans regulation for their social protection and on bilateral agreements between states for taxation issues, due to the absence of a common tax system in the EU (Belkacem et al, 2006).

1.2. Cross-Border Mobility in Europe: France & Germany As the Main Contributors

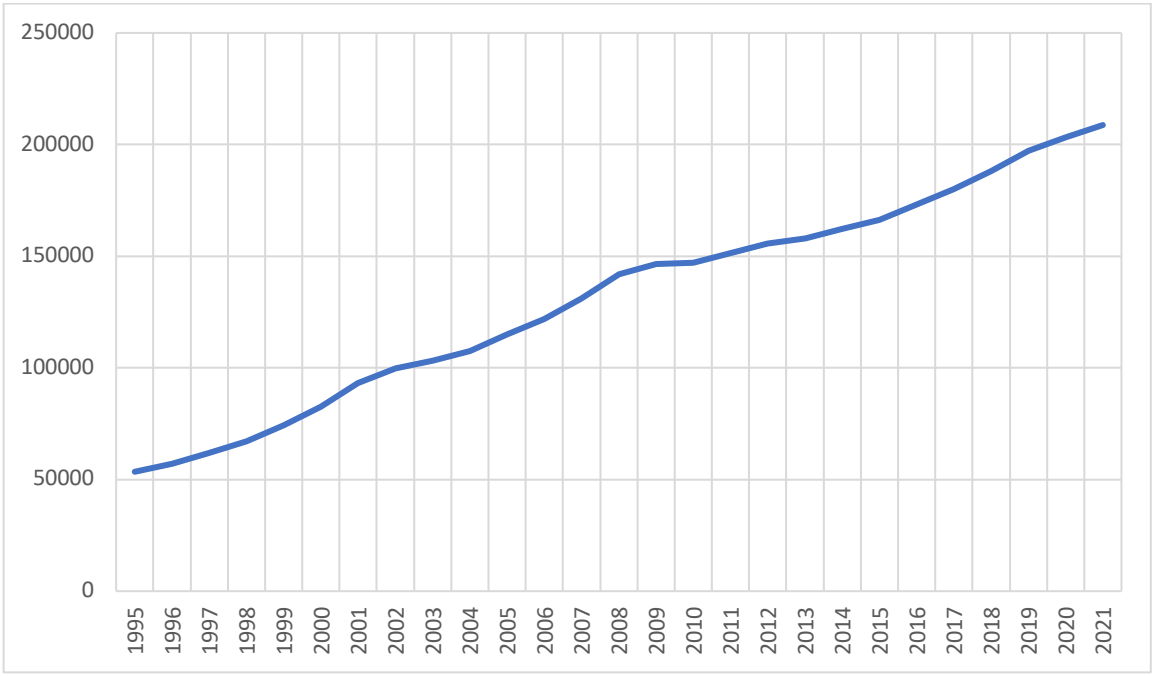
In 2019, 1.5 million (and 2 million including EFTA countries) cross-border workers commuted to another member state in order to work, accounting for 1% of the workforce within the EU (European Commission, 2021). Germany and France account for the largest number of respectively, incoming and outgoing cross-border workers, making German employers and French workers the most important contributors of the European cross-border mobility phenomenon (see Appendix Figure 1). Despite its limited surface, the Grand-Duchy of Luxembourg, is the third host country for European cross-border

workers after Switzerland, making this 'territorial dwarf' (Gengler, 1991) a relevant monitoring centre to analyse this social fact. Germany and Poland are the second and third largest providers of cross-border labour force in Europe.

1.3. A Phenomenon of growing interest

Cross-border mobility is not a recent phenomenon in Europe (see Appendix Figure 2). In 1963, the district of Geneva hosted 5000 cross-border workers (SCS, 1989). In 1967, the INSEE accounted already 7000 workers originating from Lorraine (Belkacem et al, 2006). Cross-border mobility is also distinguished by its extension over the course of the recent history. The number of cross-border workers increased substantially in Luxembourg and Switzerland. The number of cross-border workers was multiplied by 4 in Luxembourg (see Figure 1) and by 2,3 in Switzerland (see Appendix Figure 3) over the last 25 years.

Figure 1. The rise of cross-border mobility in Luxembourg. Number of cross-border workers per years 1995-2021.



Source: Document compiled by the author with the data Le Portail des statistiques du Grand-Duché de Luxembourg. https://statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=12916&IF_Language=fra&MainTheme=2&FldrName=3&RFPath=92

1.4. The Data Issue

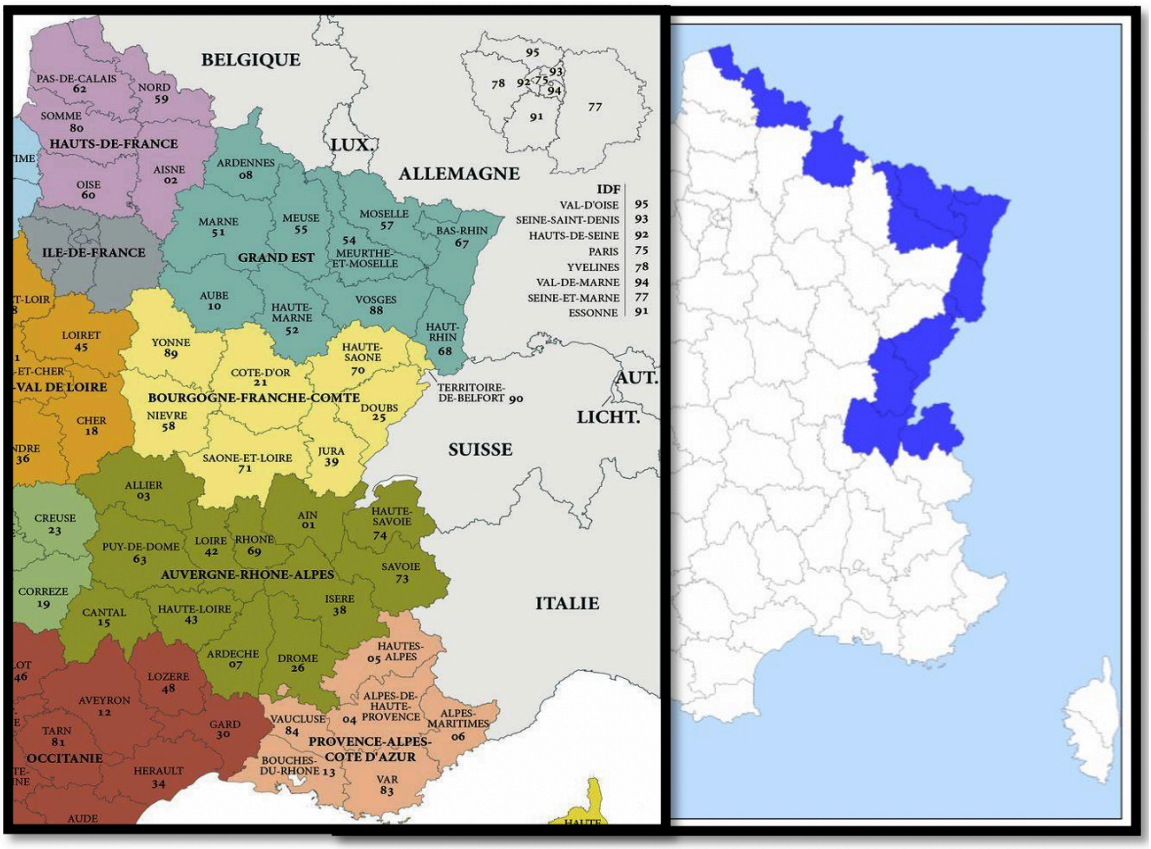
Information about cross-border workers remains fragmented since no harmonized dataset exists about this specific population within the EU (Belkacem et al, 2006) (Mironova, Villaume, 2020). The existing data consists of a heap of national datasets about incoming and outgoing workers, annihilating any comparison attempt. As a consequence, this lack of data compels researchers willing to investigate cross-border mobility to study each national flow separately in order to unpack this complex phenomenon. Since France hosts the largest number of cross-border workers in Europe, the French cross-border workers constitute a suitable population for researchers.

1.5. French Cross-Border Workers: Concentrated and Specialized

France has a land border with height European countries: Belgium, Luxembourg, Germany, Switzerland, Italia, Monaco, Spain and Andorra. France has the largest number of cross-border workers in Europe with 370,300 workers outgoing (Mironova & Villaume, 2020). France has the second largest GDP within the EU and is also characterized by a high mobility of its workforce towards other European countries. Furthermore, this mobility occurs towards a diversity of countries due to the 2913 kilometres of land borders that France shares with its eight neighbours. Few countries share the same situation and have such a disposal for cross-border mobility. As a consequence, France is a particularly relevant country to study cross-border mobility because of its very unique setting.

The French cross-border mobility phenomenon is characterized by a double phenomenon of concentration and specialization (Buch et al, 2009). Firstly, a concentration of the workers in the same area of residence, since 90% of the cross-border workers live at less than 25 kilometres from the border (Mathias, 2003) (Mironova & Villaume, 2019). Furthermore, a concentration of the flow of the workers towards two countries of destination (see Figure 2), since Switzerland and Luxembourg attract 70% of the flow of outcoming workers (Mironova & Villaume, 2020).

Figure 2. The French cross-border region



Source: Document compiled by the author with the help of the websites: http://www.Lion1906.com and https://www.cartes-2-france.com/cartographie/carte-france/x2-carte-france-regions-hd.jpg

Secondly, cross-border workers are specialized by business area depending on the country of destination. Workers moving toward Germany and Belgium are mainly employed in the secondary sector (car and food industries) while thoses toward Luxembourg and Monaco are mainly employed in the tertiary sector (finance, catering, retail trade and health) (Rouaud & Winnicki, 2019) (Mironova & Villaume, 2020) (Debouzy & Simon, 2020). Switzerland singles out as an intermediate model, with a majority of workers employed in the tertiary sector, but with a high share of cross-border workers employed in the secondary sector (watch and pharmaceutical industries) (Kayali & Pic, 2019) (Mironova & Villaume, 2020). This specialization impacts cross-border workers' socio-demographic profile. On the whole, cross-border mobility is a gendered social fact, since 61% of the cross-border workers are men (Mironova & Villaume,

2020). Furthermore, highly educated and white collar workers are overrepresented among workers toward Switzerland, Monaco and Luxembourg whereas poorly educated and blue collar workers are overrepresented among workers toward Germany and Belgium (Mironova & Villaume, 2020).

1.6. How Can Cross-Border Mobility Be Explained?

In the literature many studies tried to capture the drivers of cross-border mobility and two different approaches arise from the literature review. In the free will approach, cross-border mobility is perceived as a matter of personal choice of the workers, who arbitrate between different countries of destination, institutional contexts and labour markets depending on the benefits. In the predisposition approach, cross-border mobility is driven by social forces, and workers are predestined to commute abroad by their belonging to specific social groups that are more likely to commute than others, notwithstanding their willingness to commute.

1.7. The Free Will Approach

The free will approach assumes that cross-border mobility is driven by workers' motivations and that appropriate institutions can support this labour mobility. Cross-border workers are perceived as individuals free from constraints, who arbitrate between working in their country of residence and commuting abroad. In this perspective, institutions are assumed to support the mobility of the workers.

1.7.1. The motivational explanation

Motivations of workers are a key factor to ascertain workers' behaviour on the labour market, since they have been highlighted as a determinant of workers' productivity and decision of a departure from the workplace (Dolea & Adams, 2005). In the literature, it has been shown that cross-border workers motivate their decision to commute abroad with financial, professional and personal reasons (Gengler, 1991) (Belkacem & Pigeron-Piroth, 2006) (Brosius, 2007) (Wille, 2012) (ASTI, 2020). However, these studies were

mostly quantitative and none of them explores the motivations of the specific population of the French cross-border workers whilst they represent half of the cross-border workforce in Luxembourg (OIE, 2021). This is why, qualitative studies aiming to understand French cross-border workers' motivations in Luxembourg are still needed.

On the whole, the free will approach arises many difficulties. Firstly, the existing literature is mainly descriptive and is unable to provide a model explaining cross-border mobility. Secondly, this perspective presupposes an aboveground individual, whose decision to commute abroad is not affected by any social constraints. These difficulties are linked to the point of view adopted that of economists simplifying the decisions of workers in the labour market to individual arbitration. As Bertrand Russell argued : '*While economics is about how people make choice, sociology is about how they don't have any choice to make*' (Bourdieu, 2000, 7). Labour economics perceives labour as a production factor, whereas labour sociology conceives labour as a production factor that cannot be separated from its host, which is a social agent.

The neoclassical theory (Walras, Arrow and Debreu) is based on the rationality of economic agents and assumes the existence of a *homo oeconomicus* (Belkacem & Pigeron-Piroth, 2020). On the labour market, workers search to maximize their wage and minimize their efforts, implying an optimal decision-making. The homogeneity hypothesis upon the labour market implies that all workers are identical, whereas the atomicity hypothesis assumed that all workers have the same weight on the market and cannot influence the equilibrium wage. In the social world, market imperfections and inequalities occur. Human capital (Becker, 1975) introduces wage dispersion on the labour market. The existence of trust blurs the competition mechanism on the market (Akerloff, Shiller, 2011) (Granovetter, 2017). At the opposite, anthropology and sociology have long demonstrated that economic exchanges are framed by social norms and conventions, in a system of social reciprocity, as indicated by the Kula (Malinowski, 2015) or later, by the gift (Mauss, 2006). In the straight line, the theory of the embeddedness (Granovetter, 1985) (Polyani, 1991) pointed out the inconstancy of the *homo economicus* and suggested that economic agents are imbedded in the society. Workers' decisions are not only driven by economic rationality, but by social, legal and

moral norms too. For example, workers cannot decide to quit the market at each and every moment (the free entry and exit assumption) as the employer-employee relationship is regulated by legal norms stated in the employment contract. In contrast, the approach in terms of predisposition aims to overcome these difficulties, by reintroducing the weight of the social in the mobility behaviour of the workers.

1.7.2. The institutional explanation

Once workers have decided to commute abroad, it is still necessary that they can genuinely cross borders. Doing so, institutions regulating the mobility of workers can significantly contribute to cross-border flows. The rise of cross-border workers flows is attributed to the construction of the UE (Zimmermann, 2014).

As early as the 70s, the EU has stimulated labour mobility with the coordination of social security systems of the Member States (Belkacem et al, 2006). The EEC regulation n°1408/71 ensures that all periods of workers' contributions are counted as if the workers had contributed to a single state, even if these workers worked in several Member States of the union. The Treaty of Maastricht and the Schengen Agreement constitute additional policies aiming to foster labour mobility within the EU (Parenti & Pealdi, 2021). The Treaty of Maastricht of 1992 is considered as '*the real turning point for cross-border mobility*' (Parenti & Pealdi, 2021, 199) since it has secured the free movement principle for European workers. The latter allows European citizens to move, to dwell and to work in any other Member State of the EU. This principle is based on the idea that borders restrict labour mobility and should thus be abolished in order to enhance the mobility of the workers. The Schengen Agreement (implemented in 1995) suppressed the borders controls among the Schengen area, reducing the commuting time of the cross-border workers originating from the participating countries.

1.8. The Predisposition Approach

In the predisposition perspective cross-border mobility is driven by social forces, some individuals being predisposed to commute abroad because of their individual characteristics. Workers' socioeconomic profile, linguistic skills and network are key

drivers of cross-border mobility. Moreover, geography as well as housing contribute to workers' mobility decision on the labour market.

1.8.1. The Socioeconomic Profile Explanation

The socioeconomic profile of the workers has been highlighted as a driver of cross-border mobility. Socioeconomic variables such as sex, occupational category or business area have been associated with cross-border mobility in the literature.

Women are less likely to commute abroad than man (Gottholmseder & Theurl, 2007) (Huber & Nowotny, 2013) (Nowotny, 2014) (Pigeron-Piroth al, 2018). Blue collar workers are overrepresented among cross-border workers (Mironova & Villaume, 2019) and are more likely to commute abroad than any other occupational categories (Pigeron-Piroth et al, 2018). Furthermore, workers from the industry are more likely to be engaged in cross-border mobility than workers from any other business area (Gottholmseder & Theurl, 2007) (Pigeron-Piroth et al, 2018). Finally, regarding the size of the company, a study has shown that large companies more often employ commuters than other companies, suggesting a positive association between cross-border mobility and the size of the company (Buch et al, 2009). However, the associations between age (Gottholmseder & Theurl, 2007) (Huber & Nowotny, 2013) (Pigeron-Piroth et al, 2018), education (Gottholmseder & Theurl, 2007) (Huber & Nowotny, 2013) (Nowotny, 2014) (Pigeron-Piroth et al, 2018), marital status (Huber & Nowotny, 2013) (Nowotny, 2014), children (Gottholmseder & Theurl, 2007) (Carpentier, 2012), and cross-border mobility remain unclear in the literature. Nevertheless, any attempt to formalize an ideal type of cross-border worker faces the fact that the profile of the cross-border workers depends largely on the country of destination (see Appendix Figures 4 and 5).

1.8.2. The Geographical Explanation

Researchers have argued that cross-border mobility can be explained by geographical factors. The place of residence and the distance to the border have been highlighted as important drivers of cross-border mobility. For example, it has been shown that workers dwelling at less than 50 km from the border are more likely to commute abroad than

workers residing further away (Pigeron-Piroth et al, 2018). Furthermore, workers dwelling in rural areas are more likely to commute abroad than those residing in urban areas (Pigeron-Piroth et al, 2018). Also, the distance to the border decreases the likelihood to be willing to commute abroad (Huber & Nowotny, 2013).

1.8.3. The Housing Market Explanation

Labour market and real estate market are interconnected markets, since the state of the real estate market modify workers' decisions on the labour market (Decoville et al, 2010) (Rupert & Wasmer, 2012). The dynamics of the real estate market are fuelling the cross-border mobility of two different populations. For the sake of simplification, let us take the case of Luxembourg.

Firstly, when French workers (who dwell in France) get a job in Luxembourg, they have to arbitrate between two mobility strategies: (1) dwelling in France and working in Luxembourg (the commuting strategy) or (2) dwelling and working in Luxembourg (the migration strategy). Since housing cost is a major determinant of migration flows (Stawarz et al, 2021) and the fact that real estate prices are higher in Luxembourg than in France (European Commission, 2019), French workers willing to relocate in Luxembourg face a high migration cost and are thus, discouraged from choosing the migration strategy. Moreover, the incentive to choose the commuting strategy increases with the rise of the price differential in housing. This differential has accelerated, particularly in recent years. For example, between 2019 and 2020, real estate prices have increased by 17% in Luxembourg, against 6% in France and Belgium and 8% in Germany (EUROSTAT, 2021).

Secondly, the rise of the real estate prices pushes part of the local workforce outside their country of residence toward cheaper housing areas located in the neighbouring countries. This phenomenon is known as the elastic migration phenomenon in the literature (Buch et al, 2009) (Isel & Kuhn, 2016) (Pigeron-Piroth et al, 2018). This mobility is significant, since elastic migrants stand for 13% of the flow of French cross-border workers (Isel & Kuhn, 2016). Such mobility has been observed in Luxembourg, Switzerland and Netherlands (Knotter, 2002) (Van Houtum & Gielis, 2006) (Decoville et al, 2010) (Geber & Carpentier, 2012).

1.8.4. The Linguistic Explanation

Moving across borders also implies the capacity to communicate with others, once the border is crossed. The main countries of destination of the French cross-border workers are multilinguistic countries. Luxembourg possesses three official languages: Luxembourgish, French and German whereas Switzerland possesses four official languages: German, French, Italian and Romansh. Following Fehlen (2005) the labour market in Luxembourg has become a linguistic market (Bourdieu, 2001) to which linguistic skills give access. For example, in Luxembourg, the legitimate linguistic competence consists of the mastery of four languages: the four official languages and English. As a consequence, only the workers possessing linguistic skills would be hired by the employers on the labour market and would then, be able to commute to Luxembourg. Furthermore, linguistic skills are used to limit competition between residents and cross-border workers and serve to justify the segmentation of the labour market. The protected sector brings together the best paid, most valued and most secure jobs. However, the access to the protected sector is restricted to workers who possess the legitimate linguistic competence. Workers who do not have this competence, are redirected toward the private sector, which brings together the lowest paid, most precarious and least valued jobs. The findings of one empirical study supports this explanation, since workers with German skills are more likely to be willing to commute (Huber & Nowotny, 2013).

1.8.5. The Network Explanation

In migration studies, it is well established that networks are reducing migration costs (Massey et al, 1993). Such an argument might be advanced for cross-border mobility too. Having family members, friends, colleagues, or weak ties (Granovetter, 1973) on the other side of the border allows workers to have access to information about job offers, salaries, and more generally on the conditions of employment abroad. For example, having a partner working abroad is supposed to provide good information on the foreign labour market (Hauret & Zanardelli, 2010). Furthermore, it has been shown that having

relatives, neighbours, acquaintances or friends abroad is associated with a higher probability to be willing to commute (Huber & Nowotny, 2013).

1.9. A Complex Phenomenon Still Partially Explained

The current explanation given by the literature concerning cross-border mobility is incomplete and fails to highlight the complexity of this social fact.

In the literature the free will and the predisposition approaches are conceived as separate approaches, with no communication between them. Nonetheless, any analysis that is done without one or the other would be doomed to miss some of the information. As Bourdieu argued '*the sociological analysis of human behaviour, whatever it may be, presupposes the construction of models intended to understand and explain*' (Bourdieu, 2017, 29). As a consequence, this work aims to understand (Weber, 1985) and explain (Durkheim, 2017) cross-border mobility, while using both qualitative and quantitative methodologies. Understand the point of view of the cross-border workers, while comprehending the meaning they give to their professional mobility in the straight line of the German comprehensive sociology. Explain the mobility of the workers, while revealing with the use of statistics what happens behind the discourse of the workers. In other words, explaining implies to objectivize the weight of the social on workers' trajectories. Following Bourdieu (2017), the subjectivist and objectivist moments constitute the two main moments of the research in social science. However, scientific works attempting to combine both qualitative and quantitative methodologies in order to capture the complexity of cross-border mobility are lacking in the literature. This work aims to fill the existing gap.

Hitherto, researchers have omitted key drivers of cross-border mobility.

Cross-border mobility is a type of commuting, and migration and commuting constitute two categories of mobility. As a consequence, the mechanisms at work in migration may be similar to those at work in cross-border mobility. Migration studies have extensively studied migrants' behaviour and thus, can be a source of inspiration for researchers interested in cross-border studies. Migration studies brought into light that migrants are more likely to migrate than other individuals, while being more likely to be engaged in

circular migration (Constant & Zimmermann, 2011), onward migration (Nekby, 2006) (Hoon et al, 2020) and internal migration (Schündeln, 2007). As well, the theory of the cumulative causation of migration (Myrdal, 1957) (Massey et al, 1993) supposes that in an existing community, each migration of a member of the community reduces the migration cost for the following migrant. As a consequence, across time migration become more and more likely within this community. If this theory is able to explain the migration of communities, it is not suitable for explaining individual behaviours. However, the idea of migration's cumulativity might be transposed to individuals as well. In fact, we can assume that migration decreases cross-border mobility cost, implying that a worker with previous migration experience is more likely to commute than another one with no migration experience. Regarding migrants' cross-border mobility behaviour little is known, but insights given by the few studies available suggest that migrants are more likely to commute abroad than non-migrants (Huber & Nowotny, 2013) (Pigeron-Piroth et al, 2018). However, no study has specifically addressed this issue yet.

Furthermore, cross-border workers experience an exhausting lifestyle. For example, in Luxembourg, cross-border workers are working for 8 hours a day and commute during another 53 minutes (Schmitz, 2012). Since they commute more than the rest of the workforce, cross-border workers accumulate disadvantages that can negatively affect their health. This lifestyle often implies to leave home early in the morning in order to avoid the traffic jam, which might lead to sleep disorders. Being stuck in the traffic jam or arriving at the train station in time to catch the train induced a lot of stress. Leaving early on in the morning and coming home belatedly restrains the amount of time workers can spend on cooking healthy food or playing sports. In short, it can be assumed that cross-border workers could have a poorer health than non cross-border workers because of this demanding lifestyle.

Commuting deteriorates workers' health through two separate channels: a quantitative one (commuting time) and a qualitative one (commuting modes). In the literature, commuting time has been associated with health problems such as stress (Evans et al, 2002), exhaustion (Kageyama et al, 1998) and mortality risk (Sandow et al, 2014). Long commuting is also associated with an increased probability to be exposed to pollution

(Tainio et al, 2016), which might deteriorate workers' health in the long run. Furthermore, commuting modes might affect cross-border workers' health. The car is the main commuting mode of the cross-border workers, with almost 90% of car drivers among them (Schmitz & Gerber, 2012). Car drivers have a higher body mass index (Flint & Commins, 2016) (Dons et al, 2018) and stress (Gatersleben & Uzzell, 2007) (Legrain et al, 2015) than cyclists. As well, car drivers have a lower perceived health than other commuters (Hansson et al, 2011). These evidences suggest that cross-border workers could be in poorer health than non cross-border workers. Surprisingly, no study has looked at the health of this specific population even though they represent a population at risk for health problems. The literature has not paid sufficient attention to this critical issue yet. This work aims to provide new elements to better understand and explain the phenomenon of cross-border mobility.

1.10. Research Questions

The mobility of the worker is a cornerstone of the EU and cross-border mobility is a growing phenomenon that provides positive externalities. However, the literature has not given enough attention to this specific form of mobility and the drivers of cross-border mobility remained largely unknowned by researchers. Yet, its study is particularly relevant for both construction of the EU and national public policies. Furthermore, if an abundant literature on the driver of commuting exists, these studies mostly investigated internal commuting leaving the case of international commuting under-documented (Parenti & Pealdi, 2021). This dissertation is an attempt to respond to this lack of knowledge while rising the following research questions. Why do cross-border workers come to work in Luxembourg? Are cross-border workers' motivations different according to their socio-demographic profile? Can a motivational approach to cross-border mobility lead to the formalization of a model for explaining this phenomenon? Are migrants more likely to commute abroad than non-migrants? Is the migration capital a relevant concept in order to explain cross-border mobility? Can the ability to deal with distance and borders be transmitted within the family? Can the migration capital predict commuting behaviours? Are there health disparities between cross-border workers and

non cross-border workers? Are there health disparities among cross-border workers? Are income and health associated among the specific population of the cross-border workers?

1.11. Methodology

Qualitative and quantitative methodologies are combined in order to understand and explain cross-border mobility and restore the complexity of the social phenomenon. The use of both qualitative and quantitative methodologies is particularly judicious since these methodologies are complementary. Indeed, each methodology provides a unique point of view on a given phenomenon, implying that each method contributes to enriching the other. In this work, both methodologies were combined in the way that each methodology was used to answer the same research question: 'Why do workers cross borders?'.

1.11.1. Understand

For understanding workers' motivations to commute abroad, semi-structured interviews were realized with 28 cross-border workers in Luxembourg (see Appendix Table 1). Interviews were collected in Luxembourg and in France between January 2018 and May 2019. Collecting interviews with cross-border was time consuming, since we spent 32 hours in the trains and 24 hours in different places such as restaurants, bars, coffee shops. This does not include the time lost in organizing or commuting toward meetings that never happened. Some of the cross-border workers cancelling our meetings last minute or simply by not answering the phone. This is why, the train appears quickly as a trick to coerce them to participate and avoid a response such as 'sorry I'm in a hurry, I don't have the time'. We estimate that 1/3 of the workers that we have contacted finally accept to participate in the study. Convenience and snowball sampling methods were used to constitute the sample. Transcripts were analysed with both categorical thematic content analysis and Grounded Theory methods. The software NVivo 1.4 was employed to analyse the transcripts and to schematize a model of cross-border labour supply. The questionnaire was built as a way to discover cross-border mobility and to familiarize the researcher with the subject. This is why the questionnaire includes a wide range of topics such as social integration, health, linguistic skills, job search…

1.11.2. Explain

For explaining cross-border mobility, logistic models were used to estimate the likelihood of five groups of migrants (immigrants, foreigners, internal migrants, immigrant children and foreigner children) to commute abroad. Results were controlled for the demographic background and labour status of the workers as well as for the so-called elastic migrant phenomenon. A migration capital index was generated, and a complementary factor analysis was used to ascertain its relevance. Then, a binary logistic model was used to predict the probability to commute by migration capital endowments. The software STATA 13.0 was employed in order to perform the statistical analysis. The statistical analysis we ran using the last interrogation of each participant as a robustness check.
Furthermore, logistic models were used to point out health gaps between cross-border workers and their non cross-border workers counterparts. Results were controlled for demographic background and labour status of the workers. A health index was generated and the relationship between health and income was investigated with a linear model. The software STATA 13.0 was used to run the statistical analysis. As a robustness check, results were estimated with the last interrogation of each participant.

1.11.3. Ethical considerations

This research project conforms to research ethics, which aims to preserve the anonymity of the participants. For the qualitative part of the research workers were informed of the aim of the research, that the interviews will be transcribed and anonymized. The oral agreements of the participants were collected during the interviews. The quantitative part supports on the exploitation of the ‘Enquête Emploi’, the French part of the European Labour Force Survey. The ‘Réseau Quetelet’ made the dataset available to the researchers. The need for consent is deemed unnecessary according to national regulations: the participation is mandatory according to the French law n°51–711 of the 7 June 1951. The ‘Enquête Emploi’ has been approved by the ‘Conseil National de l’Information Statistique’ (CNIS) and the ‘Comité du Label de la Statistique Publique’ which in particular verifies that the survey follows the best practices including the

European statistics Code of Practice. The 'Comité du Label de la Statistique Publique' acts as an Institutional Review Board. The survey is conducted by the INSEE the French national statistical institute.

1.11.4. Research dynamic

This research project started with the aim to study the matching frictions existing between French cross-border workers and employers in Luxembourg. The research strategy consisted of two ways of collecting data. Interviews with the cross-border workers for the labour supply part and an observation in a hiring company based in Luxembourg for the labour demand part. For example, the 3 May 2018, we assisted to 3 hiring interviews for a job of senior security engineer, the first one at 8 a.m., the second at 14p.m. and the last at 18p.m. On the whole we assisted to 15 hiring sessions in this hiring firm with the executive and his wife lasting between 20 minutes and one hour. We also interviewed the executive of the hiring firm about his hiring practices and the way he selected candidates. Three other interviews were realized with recruiters or human resources managers in order to identify the criteria of selection of the workforce in Luxembourg. In other words, 19 interviews of employers in Luxembourg were additionally collected but not exploited in this research project (see Appendix Table 2). This part was as well time consuming since the access to the hiring company required that we earn the trust of the executive of the company. Accounting for the time invested in this part of the project is difficult, but we can estimate it at no less than 20 hours. This research project started with a qualitative perspective, since we didn't plan to use quantitative methodology at first. At the end of the project, it turns out that two out of three papers were quantitatively based. The switch relates to the research difficulties we meet during this project and to the progression of the research.

1.11.5. Research setbacks

The first difficulty that we face was to reach cross-border workers. Because of their tiring lifestyle (stress generated by the commuting, 8 working hours per day) and their lack of free time, cross-border workers constitute a population reluctant to participate in surveys.

As a consequence, the only way to reach them is either on their workplace or during their commuting. Considering the difficulty to reach cross-border workers and the time needed to collect and analyse interviews, we renounce to use qualitative data as the only methodology for the research project. Furthermore, the qualitative data we collected was problematic to exploit because of its excess of information and lack of standardization. For these reasons we would advise young researchers to use quantitative data to study cross-border workers, especially in this concise timeline to which the PhD constrains. This limitation induces sampling bias as well, which might limit the generalization of our findings. The second barrier was faced was the complexity of the phenomenon. Since the decision to commute abroad relates to the trajectory of the worker, we make use of the interviews to reconstitute the trajectory of the workers, which took more time than expected on the ground. Interviews also addressed the network of the worker, their health, their previous mobility experiences. All this information was difficult to collect in a limited time schedule, especially during short train rides. Furthermore, this complexity limits the understanding of the cross-border phenomenon by its actors, making the qualitative methodology an incomplete and potentially biased model of explanation of this social fact. We addressed this issue while using both qualitative and quantitative methodologies in our research project. The third barrier was the absence of harmonized dataset regarding cross-border workers as previously exposed. This uncertainty makes us explore the 'Recensement de la Population' provided by the INSEE. If this dataset is suited to describe the socio-demographic profile of the workers, information about workers' situation and behaviour on the labour market are missing. We circumvent this difficulty while using the Enquête Emploi, which offers a wide range of information about cross-border workers characteristics and involvement in the labour market.

1.11.6. Scientific collaborations

This research project was an opportunity to collaborate with various researchers, specialists in different fields such as public health, statistics, economics and sociology. The fourth part of this dissertation has been published March 24, 2021, in the review BMC Public Health under the title 'Cross-border mobility in European countries:

associations between cross-border worker status and health outcomes'. We wrote this paper with Michèle Baumann, Étienne Le Bihan, Philippe Askenay and Louis Chauvel. Our contribution can be estimated at 90% of the paper since we conceived the study and the protocol, collected the data, conducted the literature review, the data analysis, conceived the interpretation of the findings and drafted the paper. Michèle Baumann secured the funding to conduct the research, participated in conducting the literature review, interpreting the findings, and drafting and reviewing the paper. Étienne Le Bihan reviewed the statistical analyses and the paper. Philippe Askenazy and Louis Chauvel both participated in conceiving the data analysis, interpretating the findings and reviewing the paper. The third part of this dissertation was written with Michèle Baumann, Louis Chauvel and Philippe Askenazy. Our contribution can be estimated at 95% since we conceived the study and the protocol, collected the data, conducted the literature review, the data analysis, conceived the interpretation of the findings and drafted the paper. Michèle Baumann, Louis Chauvel and Philippe Askenazy participated in drafting and reviewing the paper. The first part of this dissertation was written with Christian Wille, Louis Chauvel and Philippe Askenazy. Our contribution can be estimated at 98% since we collected the data, transcribed the interviews, conceived the study and the protocol, conducted the literature review, the data analysis, conceived the interpretation of the findings and drafted the paper. Christian Wille participated in reviewing the paper. Louis Chauvel and Philippe Askenazy participated in conceiving the study protocol and reviewing the paper.

After four years spending on investigating the drivers of cross-border mobility, we found three key drivers of cross-border mobility which are the three main parts of this dissertation. The second part emphasizes that workers' decision to commute abroad stems from their motivations. Cross-border workers expressed financial motivations, but our study also stresses the importance of non-financial reasons (professional and personal) in their decision. The third part brings into light the relevance of previous migration experiences in shaping the decision to cross the border. The fourth part highlights the weight of workers' health on their decision to commute abroad.

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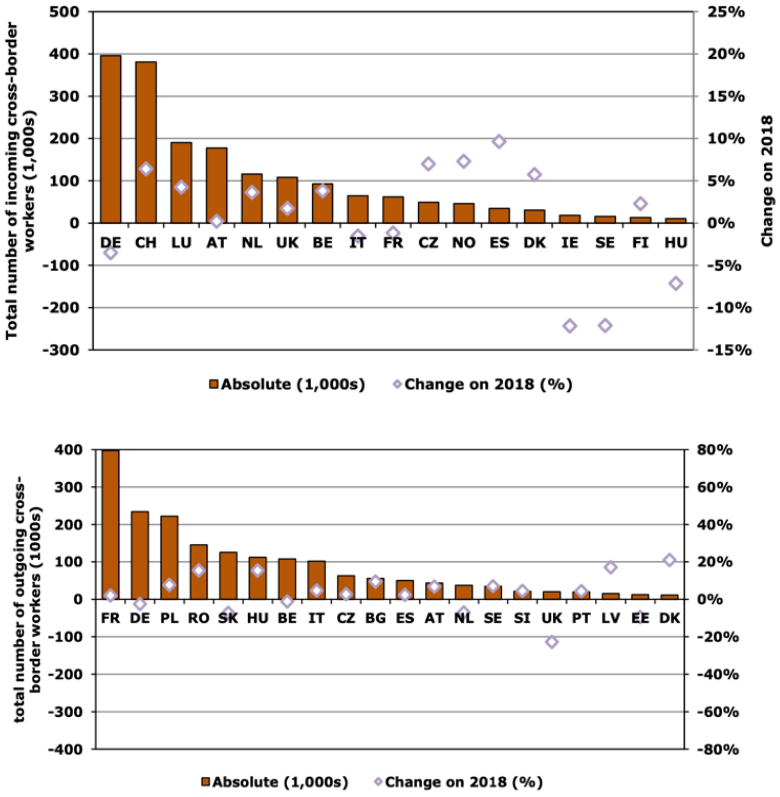
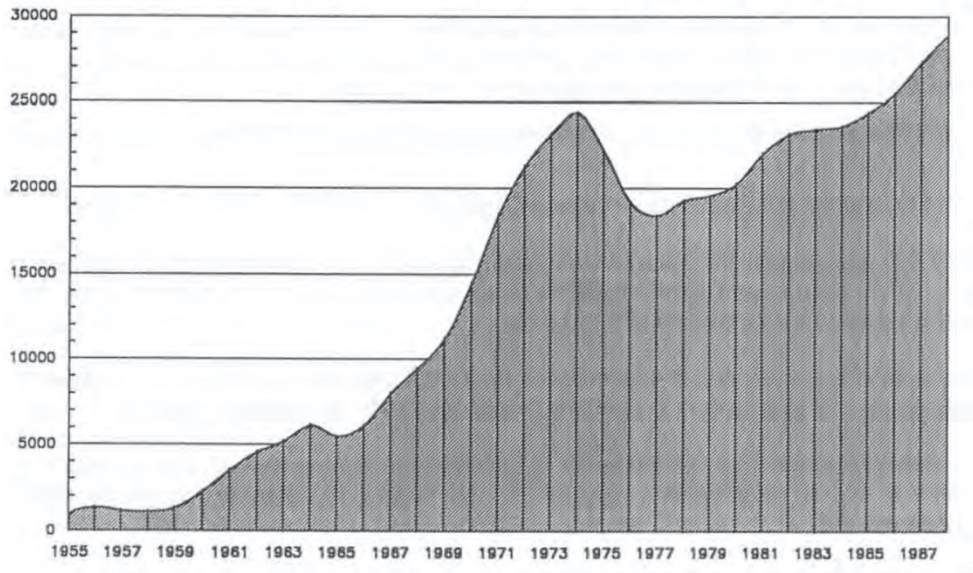
1.13. Appendix

Appendix Figure 1. Most important contributors to the European cross-border mobility phenomenon.



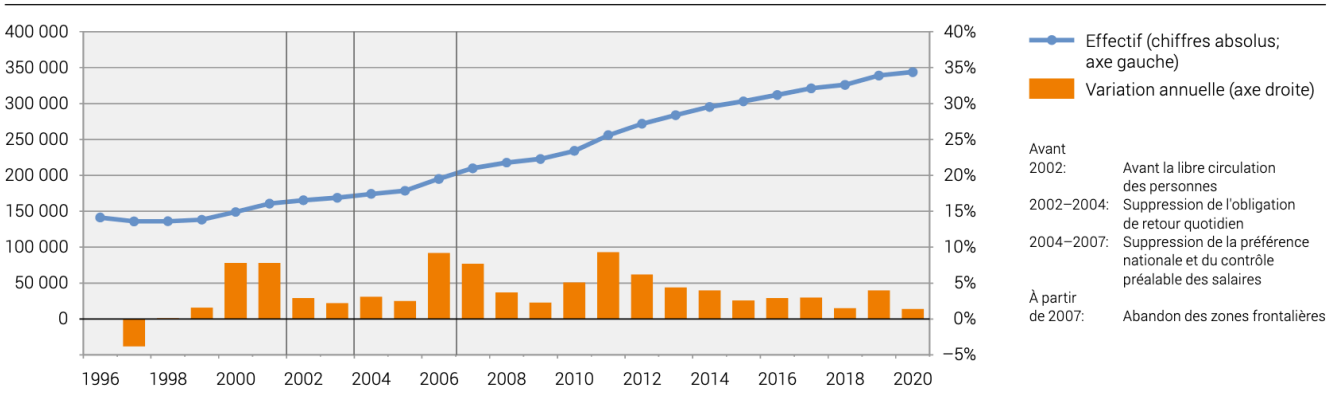
Source: European Commission, 2021.

Appendix Figure 2. Number of cross-border workers in the district of Geneva per years 1955-1987



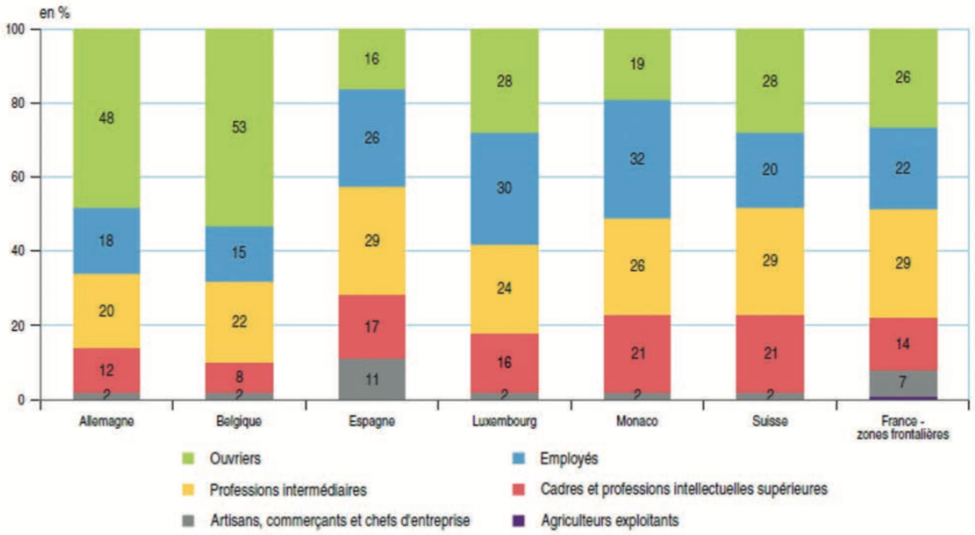
Source: SCS, 1989.

Appendix Figure 3. Number of cross-border workers in Switzerland per year 1996-2020.



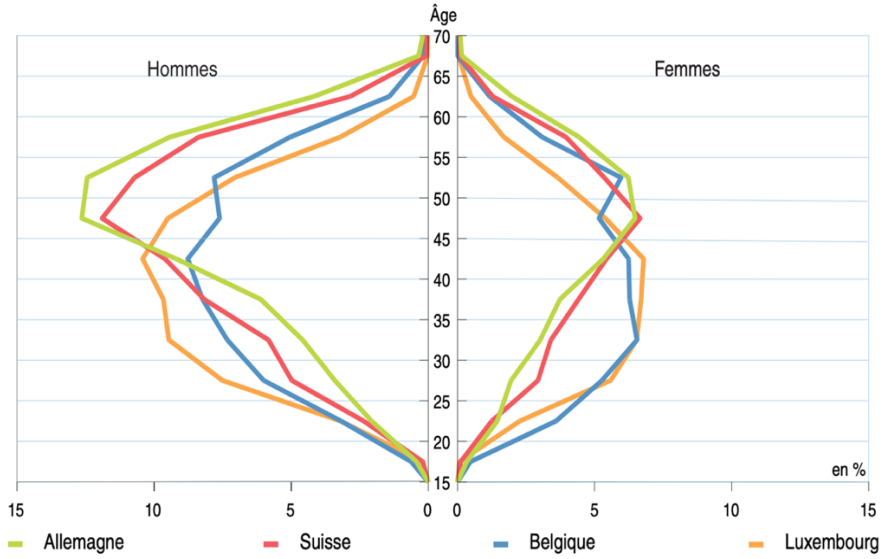
Source: *OFS. Statistique des frontaliers. Les frontaliers en Suisse 1996 à 2020 [Online]. 2021 [cited 2021 November 26]. Available from:* https://www.bfs.admin.ch/bfs/fr/home/actualites/quoi-de-neuf.assetdetail.17205598.html

Appendix Figure 4. Occupational category of the French cross-border workers by country of destination.



Source: Mironova & Villaume, 2020.

Appendix Figure 5. Age pyramid of the French cross-border workers by country of destination.



Source: Mironova & Villaume, 2019.

Appendix Table 1. Interviews listing: the labour supply side

Interviews	Type of worker	Date	Data collection strategy	Duration
1	Cross-border	13/12/2018	Train	1h11min
2	Cross-border	29/05/2019	Train	1h01min
3	Cross-border	19/04/2018	Snow ball	1h54min
4	Cross-border	05/10/2018	Shops' visits	0h45min
5	Cross-border	05/10/2018	Shops' visits	1h22min
6	Cross-border	06/12/2018	Shops' visits	0h59min
7	Cross-border	31/10/2018	Shops' visits	1h02min
8	Cross-border	12/12/2018	Train	1h01min
9	Cross-border	16/01/2018	Shops' visits	1h53min
10	Cross-border	26/10/2018	Snow ball	1h05min
11	Cross-border	29/05/2019	Train	1h10min
12	Cross-border	01/03/2019	Train	0h47min
13	Cross-border	22/11/2018	Snow ball	1h39min
14	Cross-border	22/02/2019	Train	0h30min
15	Cross-border	28/11/2018	Shops' visits	1h43min
16	Cross-border	02/05/2018	Snow ball	2h19min
17	Cross-border	31/10/2018	Shops' visits	0h59min
18	Cross-border	20/12/2018	Train	1h03min
19	Cross-border	19/12/2018	Train	1h00min
20	Cross-border	22/12/2018	Train	0h32min
21	Resident	26/04/2018	Snow ball	4h14min
22	Cross-border	03/04/2018	Train	1h46min
23	Cross-border	28/02/2018	Snow ball	0h55min
24	Posted	21/02/2019	Train	1h05min
25	Resident	10/04/2018	Snow ball	1h15min
26	Cross-border	16/01/2018	Shops' visits	1h53min
27	Cross-border	28/05/2019	Train	0h45min
28	Cross-border	07/12/2018	Train	0h48min
29	Cross-border	20/02/2018	Train	0h55min
30	Cross-border	27/05/2019	Train	1h24min
31	Cross-border	06/12/2018	Train	1h10min

Source: Data compiled by the author.

Appendix Table 2. Interviews listing: the labour demand side

Interviews with recruiters in Luxembourg				
Interviews	Date	Participant	Sector	Duration
1	24/01/2018	HR 1	Retail	1h48min
2	26/01/2018	HR 2	Retail	1h34min
3	17/01/2018	HR 3	Catering	1h52min
4	16/06/2018	Executive 1	HR	1h43min
Observation in a hiring company: feedbacks from job interviews				
Interviews	Date	Participant	Job position	Duration
1	27/03/2018	Executive 1	Salesman IT	25min
2	18/04/2018	Executive 1	Salesman IT	17min
3	03/05/2018	Executive 2	Accounter	15min
4	11/04/2018	Executive 1	IT engineer	1h57min
5	12/04/2018	Executive 1	IT engineer	41min
6	25/04/2018	Executive 1	IT engineer	24min
7	24/04/2018	Executive 1	Financial director	18min
8	03/05/2018	Executive 1	Financial director	18min
9	03/05/2018	Executive 1	Financial director	7min
10	18/08/2018	Executive 1	Financial director	21min
11	28/06/2018	Executive 1	Bank Manager	1h07
12	27/03/2018	Executive 1	Accounter	17min
13	16/04/2018	Executive 1	Director	24min
14	19/04/2018	Executive 1	Director	31min
15	09/05/2018	Executive 1	Director	15min

Source: Data compiled by the author.

2. Crossing the border: Why do cross-border workers commute abroad?

2.1. Abstract

Cross-border workers are attracted to Luxembourg by financial and professional motivations. However, qualitative studies aiming to understand the motivations of cross-border workers are still needed. Furthermore, French cross-border workers stand for half of the cross-border labour supply in Luxembourg, and no study has specifically addressed this issue for this specific population. Therefore, this study aims to: (1) identify workers' motivations for commuting to Luxembourg for work and to (2) infer a theoretical model of cross-border labour supply from our empirical findings.

Interviews were conducted with 31 workers with French nationality in Luxembourg. Convenience and snowball sampling were used as data collection methods. Selection criteria were: (1) working or seeking jobs in Luxembourg and (2) residing in France. Semi-structured interviews were used to retrace workers' personal and professional trajectories and to understand their motivations to commute abroad for work. Categorical thematic content analysis and grounded theory were used as data analysis methods.

A sample of 28 French cross-border workers (13 female and 15 male workers) was retained. French workers commuting to Luxembourg for work are motivated by financial, professional and personal reasons. Their motivations differ with respect to their socio-demographic profile. Cross-border workers have needs and assess the interest of commuting using a sequential model. Additionally, cross-border workers estimate at 500€ the ticket to cross-border mobility.

Policy makers should take these professional and personal motivations into account when creating measures to stabilise the cross-border labour force in Luxembourg and thereby constrain the turnover or the departures of these workers, especially in key business areas such as health care.

2.2. Introduction

The COVID-19 crisis has emphasized the importance of cross-border mobility to ensure the functioning of the economy of the European Union (EU). The case of the European health system, especially within border areas, is evocative in this respect. The crisis led to a shortage of health professionals in hospitals (in Luxembourg many of them are cross-border workers) and the implementation of self-containing policies within the EU. Such policies started with the closing of the borders, violating the right of free movements and constraining the movements of cross-border workers (Wille & Weber, 2020) (Wille & Kanesu, 2020). In the worst-case scenario these policies have resulted in the requisition of the health professionals by each member states thereby coercing the cross-border workers to deliver their workforce in their country of residence. Such measure poses challenges for the health system of member states with a limited local workforce and a high share of foreign workers. Specifically, Luxembourg is particularly at risk. In 2019, the Luxembourgish health ministry highlighted the '*critical threshold making Luxembourg extremely vulnerable*' to neighbouring countries' political decisions and indicated that '*any initiative in France, Belgium or Germany aimed at raising the salaries of the health professions would immediately cause a serious crisis in the Luxembourg health system*' (Santé et prospectives, 2019, p.671).

Cross-border mobility is a vital phenomenon for Luxembourg, which needs foreign workers to run its economy (Mironova & Villaume, 2020). In 2019, Luxembourg fostered 197.000 cross-border workers (OIE, 2021), while its labour force amounted to 432,000 workers (STATEC, 2021). This dependence has developed across time, with cross-border workers accounting for 8% of the labour force in 1980, 18% in 1990 and 46% in 2019 (OIE, 2021). More specifically, Luxembourg is particularly dependent on France to ensure its supply of workers, as cross-border workers are mostly originating from France (52%), followed by Germany (24%) and Belgium (24%) (OIE, 2021). This dependence is enhanced as French cross-border workers are concentrated in key business sectors. For example, the Luxembourgish authorities estimate that 31% of the health professionals are French cross-border workers (Santé et prospectives, 2019), questioning the capacity of the country to provide for the sustainability of health care for its population. This existing situation should encourage policy-makers to stabilise the cross-border workforce in

Luxembourg to avoid turnover or departures. Furthermore, it has been shown that workers' motivations are a major driver of the decision to quit a workplace (Dolea & Adams, 2005). Thus, investigating French cross-border workers' motivations is a challenging topic for Luxembourg in the quest to attract and retain foreign workers in the country.

Why do the workers make the decision to work abroad? In the context of the Eurobarometer, Europeans (and not only cross-border workers) were asked, '*what reasons might encourage you to work in another country?*' (European Commission, 2010). Professional motivations (better working conditions, job opportunities and improve my qualifications) were the most frequently reported, followed by financial motivations (better quality of life and better social and health care system) and by personal motivations (to discover something new and better political situation). The survey highlighted as well motivational differences regarding the socio-demographic profile of the workers. Men more frequently reported being motivated by professional motivations (i.e., career opportunities) than women. Older workers more often reported being motivated by financial motivations (i.e., better quality of life). White collar workers more often reported personal motivations (i.e., to be close to relatives that live abroad and to discover something new) than other professional categories.

Researchers have specifically investigated the motivations of cross-border workers in Luxembourg. A survey conducted at the Banque International de Luxembourg (BIL), highlighted, for example, that financial motivations were more often reported than professional ones and that professional motivations were more often reported than personal ones (Gengler, 1991). However, this study included important sampling bias as Belgian workers represented 85% of the sample, whereas they made up only for 37% of the cross-border workers in Luxembourg at that time, according to Gengler (1991). Furthermore, bank employees might be more often attracted by financial payoffs than other employees, particularly because finance is the most profitable business sector in Luxembourg (Reiff, 2020). Another study found that cross-border workers reported financial motivations more often than professional motivations (Belkacem & Pigeron-

Piroth, 2006). It also highlighted the socio-demographic motivational differences between workers: financial motivations were more often reported by workers aged 30-49 years and blue collar workers. Using a representative sample, another study pointed out that both financial and professional motivations were equally important for cross-border workers (Brosius, 2007). It also confirmed the existence of differences in workers' motivations regarding their profile. Men and poorly educated workers more often reported financial motivations than respectively, women and highly educated workers. Wille (2012) investigated the motivations of the cross-border workers of the Greater Region and found financial and professional motivations to be equally important for cross-border workers, too. However, only a marginal part of the workers mentioned personal motivations to justify their decision to commute abroad. This study also supported the existence of motivational differences regarding the socio-demographic profiles of the workers. Older workers more often reported professional motivations (the lack of professional opportunities in the country of residence) whereas younger workers more often stated financial motivations. Young cross-border workers stressed the importance of personal motivations (learning a foreign language and working in a multicultural environment). More recent data available in Luxembourg on cross-border workers' motivations is provided by survey of the Association de Soutien aux Travailleurs Immigrés (ASTI). The survey's findings corroborated the existence of financial, professional and personal motivations among cross-border workers (ASTI, 2020). Thus, the literature suggests that (1) cross-border workers are motivated by financial, professional and personal reasons and (2) that their motivations differ with respect to their socio-demographic profile.

However, qualitative studies are still needed in order to understand all factors contributing to cross-border workers' decisions to cross the border. Furthermore, little is known about what motivates French cross-border workers to cross nation-state borders to work in Luxembourg. This study aims to overcome this lack of knowledge while (1) identifying cross-border workers' motivations to work in Luxembourg and (2) inferring a theoretical model of cross-border labour supply from our empirical findings. From the insights provided by the literature, the following assumptions can be formulated: (1)

French commuters to Luxembourg are motivated by financial, professional and personal reasons and (2) their motivations depend on their socio-demographic profile.

2.3. Methods

2.3.1. Study Population and Selection Criteria

Workers of French nationality were asked to participate in a qualitative survey in Luxembourg. At present, French cross-border workers in Luxembourg are mainly men, young, and working in the service sector (Belkacem & Pigeron-Piroth, 2006) (Mironova & Villaume, 2019) (Mironova & Villaume, 2020), leading us to spefically focus on these categories of workers. Selection criteria were: 1) currently working in Luxembourg or currently looking for a job in Luxembourg and 2) dwelling in France. Two workers who resided in Luxembourg and one posted worker were excluded from the analysis, because they did not meet our inclusive criteria. The volunteers did not receive any kind of compensation for their participation. Semi-structured interviews were carried out with 31 workers in Luxembourg between January 2018 and May 2019.

2.3.2. Data

Convenience and snowball sampling were used as qualitative data collection methods. Workers commuting by train between Luxembourg and Metz (France) were approached and asked for an interview. Approaching them at the train station or on the train was the easiest way for us to reach cross-border workers. Because workers commuting by car were difficult to reach and commuting to work by train allowed discussion, trains provided us with a straightforward way to collect our interviews. During their working day, cross-border workers do not have time to participate in interviews while working eight hours followed by another 53 minutes of commuting time on average (Schmitz, 2012). Furthermore, we visited the main commercial areas of Luxembourg City and specifically requested the participation of workers in retail trades (restaurants, clothing stores, appliances…). The snowball sampling method (Becker, 1963) was used as a complementary data collection method. Researchers' and participants' personal networks were also drawn upon for collecting part of the data. As well, some interviews were

collected in a recruitment firm based in Luxembourg. At the end of candidates' interviews for a vacant position, the researcher asked them if they would be willing to participate in an interview. However, the use of the snowball method addresses two issues arising in this study. Firstly, a sampling bias, because highly educated and young workers are overrepresented among the researcher network, whereas older and poorly educated workers, and blue collar workers are underrepresented. Secondly, it is likely that some of the participants concealed part of their opinions from the interviewer, as a number of the interviews took place in the context of job interviews or workplaces, which are not neutral interactions but rooted in power relations.

Interviews were collected until we reach the saturation of the data, meaning that collecting the results of a new interview does not bring new information. The interview guide included socio-demographic and economic datasheets such as: job search, working conditions/health, transport, linguistic skills and cross-border workers' perceptions about their country of destination. The question used to assess workers' motivations was: 'What made you want to work in Luxembourg'? The authors interviewed the workers, translated the interviews, used French as the primary source of data and translated the pertinent extracts in English for a greater accessibility of the data to international readers.

2.3.3. Thematic Content Analysis

Categorical thematic content analysis and grounded theory were used as data analysis methods. The software NVivo 1.4 was used to analyse the interviews transcriptions (i.e., coding) and to schematise our model of cross-border labour supply. In the analysis, the order in which motivations appear in the text have been used to rank workers' motivations. For example, mentioning a financial motivation before a professional one during the interview was considered as an indicator that the financial motivation was more important than the professional one. The authors analysed the interviews and classified the related interviews' extracts and grouped these extracts under a common category.

A preliminary categorical thematic content analysis of the interviews was performed in order to compare cross-border workers' motivations (see Table 2). Grounded theory

(Glaser & Strauss, 1967) was used to extract concepts, categories and hypotheses from the interviews, leading us to propose a theoretical model of cross-border labour supply for explaining the relationship between categories. This strategy of qualitative data analysis appears to be particularly suited for the study of labour supply, as it has already been applied for investigating the decision-making process (Orona, 1997).

2.4. Ethics

Participants were briefed about the aims of the qualitative study, that the interviews were recorded, and that the data would be anonymised. Oral agreements were collected from all participants.

2.5. Results

2.5.1. Descriptives

Participants (n=28) were 13 female workers and 15 male workers living in France and working or seeking work in Luxembourg. Volunteers were more often men, aged 30 to 39 years, highly educated, working only in Luxembourg, non-unionised, single, born in the Moselle department (France), working full-time, having family members who worked in Luxembourg, intermediate professions' sons, employed in Luxembourg also before their current job and employed in the retail sector. On average, participants were 39 years old and earned 3,700€ per month.

Table 1. Sociodemographic and economic characteristics. Descriptive statistics

	Obs.	Mean	Std. Dev.	Min	Max	%
Sex	**28**					
Male	15					54
Female	13					46
Age		39	12	24	66	
Not filled out	**1**					
20-29	5					19
30-39	13					48
40-49	4					15
50-66	5					19
Education	**28**					
Up to Baccalaureate	9					32
Up to Bachelor's degree	7					25
Master's degree and above	12					43
Bi-activity						

Yes	2					7
No	26					93
Unionised						
Not filled out	10					
Yes	3					17
No	15					83
Marital status	**28**					
Single	17					61
Married	11					39
Department of birth	**26**					
Not filled out	**2**					
Moselle	16					62
Meurthe-et-Moselle	3					12
Meuse	1					4
Isère	1					4
Territoire-de-Belfort	1					4
Somme	1					4
Aisne	1					4
Vosges	1					4
Other: foreign countries	1					4
Full-time/part-time employment	**28**					
Full-time	20					71
Part-time	8					29
Wage	**24**	3709	4367	500	20000	
Not filled out	**4**					
Family member(s) working in Luxembourg						
Not filled out	**1**					
Yes	15					56
No	12					44
Father's occupational category						
Not filled out	1					4
Farmers	1					4
Artisans, merchants, company directors	4					15
White collar workers	6					22
Intermediate professions	8					30
Employees	4					15
Blue collar workers	4					15
Previous professional status (n-1)						
Employed	18					64
Unemployed	8					29
Student	2					7
Sectors						
Retail	12					43
Finance, insurance	4					14
Transport	1					4
Industry	1					4
Human resources	2					7
Information and communication	4					14
Real estate	1					4
Legal services	1					4
Catering	1					4
Health	1					4

2.5.2. Thematic Analysis

From the categorical thematic content analysis (see Table 2), three kinds of motivations surface from the interviews. Cross-border workers expressed financial, professional and personal motivations to justify their decision to work in Luxembourg.

Table 2: A thematic analysis of cross-border workers' motivations

Interviewees	*Financial*	*Professional*	*Personal*
1	*'Salaries, honestly… if you work 30 hours in Luxembourg (as a saleswoman), that is equivalent to the salary of a manager in Metz.'*		
2			*'I was looking for an end-of-studies internship that takes place abroad ... as I am in a relationship, we had to be able to continue to see each other on a regular basis.'*
3		*'I had chosen a Master 2 internship in Manchester, but there was a problem with the company… going to find an M2 internship in six months, it was a disaster… I looked everywhere I could ... and that was Luxembourg '*	
4	*'The money. Well, it's clear, we're not going to hide it.'*		*'Then there was the pleasure of the job I do.'*
5	*'Salary! It was clear that was the salary. if I had the same salary in France now, I would stay in France.'*		*'It's really a very beautiful city, it's rather quiet, you feel safer than in France'*
6	*'The salary… it's really the salary.'*	*'And perhaps also the advancement opportunities ... no longer remain a simple sales consultant and be for example an assistant or a manager one day.'*	
7	*'And then the money necessarily, we must also talk about it. It's important anyway, I make the concession to make the trips all that, but I also earn a better living.'*		*'For me it was the standing, the prestige, of X, the prestige of the company.'* *'The city, the notion of taking the train, going to the city and seeing a lot of people, seeing traffic ... I really liked it, you're caught up in an energy actually.'*
8		*'I wanted to evolve. Have experience abroad. I couldn't evolve as I wanted. And the working conditions which are better in Luxembourg. It was in terms of working conditions in France.'*	
9	*'On the other hand, because Luxembourg is... an El Dorado for cross-border workers like us... salaries have absolutely nothing to do with what happens in France.'*	*'Why Luxembourg for me? Because first, it was the opportunity for me to work right away.'*	
10	*'And then for the salary!'*	*'And then we get out of school so we kind of see the opportunities that there are. We're not closed to the idea of moving, so I gave it a try! '*	*'It wasn't very far.'*

11	*'Then, the remuneration system certainly. We often hear about the minimum wage, which is a little higher than in France. And that's a big part of the decision.'*	*'There are a lot of companies looking for employees, especially work-study programs.'*	
12	*'With the benefits in kind that I received, a company car, the incentives ... these are all these elements, we make that, by comparing the proposals, I immediately accepted. But the salary difference was huge, come on, if we have to say in euros, we will say 2,000 €.'*	*'When I arrived in Luxembourg I was well received by the employer who hired me with a lot of development prospects. So that's what really attracted me.'*	*'After that there was still the proximity, with IBM you still had to go to Paris.'*
13	*'Well, the salary (Laughs)! But yes, the salary, we should not fool ourselves.'*	*'At the beginning I had searched in France, in the surrounding areas of Metz and unfortunately I had a lot of refusals because of my last name or my skin colour… Like "your face does not correspond to the image that we want to give from the company.'*	
14	*'The salary… for once. It's just the salary and it still remains that way.'*		
15		*'Actually just having a job. I know most people come here for more money. But for me it was just having a job.'*	
16		*'I don't know if we can talk about envy in the end, it was more of an opportunity that fell on me ... My father offered me a position in his company, they had opened a developer position at X.'*	
17	*'The salary, we are not going to lie to each other. I think that's just it.'*	*'The clientele, too, which is perhaps better in Luxembourg than in France. Especially here in luxury, we have a very good clientele.'*	*'No the living conditions, I feel good, it's safe to be in Luxembourg, it's better than my first job at X with weird people. I am not bothered here.'*
18		*'Especially the fact that I couldn't find a professional contract in France. And even if I did an internship in France, I preferred to have a foot in Luxembourg. On the CV I think the experience is more important. And above all to discover another way of working. Because it's different from what I have seen in France… I have to work in an open space with lots of different nationalities, Italians, Luxembourgers, English people. That is what is interesting.'*	
19		*'I know that in France it is quite stuffy, finally in the provinces. It's a pretty busy profession, so I told myself that in Luxembourg I would still have a lot more perspective.'*	*'What made me want to commute was that it allowed me to do the job that I wanted to do for some time.'*
20	*'My first motivation was the salary, clearly. It was the salary, I was young, I had no kids and for me to travel and stuff, leave early, or come home later. Who cares, we don't have a schedule to meet ... If now I am told that I*		

	would have the same salary in France, I am going to France. '		
21	*'Well I think like many who come here, the salary. I don't think there are many other advantages ... I work here but I feel like I'm working in France except I have a better salary.'*		
22	*'*		*'The fact that I came back near Metz to have a more pleasant living environment. To be closer to my family, to my friends, to football, to that type of thing, it was part of a framework that I wished I had.'*
23	*'A girl at X in France has a thousand euros. Hold on! Me, I have double. For the same job.'* *'If you are entitled to full retirement in Luxembourg, you get almost 81% of your salary. In France you will receive 45%. It's not the same thing!'*		
24			*'Ah well only the intellectual interest. Interest in working in a brand new, quality regional hospital that provides skills. But it was absolutely not a financial interest. Because on the days when I work in Luxembourg, I don't work in Nancy. You understand?'*
25	*'I must specify that I never wanted to work in Luxembourg, in relation to schedules and journeys and all that… In fact, the personal situation made it necessary for me to work and earn more money than in France. Because a full-time salary in France wasn't enough for me, so I tried Luxembourg.'*		
26			*'After Luxembourg yes, perhaps also the desire to come back to the region…. And I think that there is above all this balance… So that is decisive! The balance and the quality of life that I can have by being a cross-border worker. Because I am in Metz today, which remains a city on a human scale. The rents are not excessive, so we still have a quality of life which I find is quite pleasant ... But compared to all that the quality of life, I think Luxembourg is very good ... I told myself that for the quality of life and the proximity of the region, I preferred Luxembourg. So that was a pretty obvious choice to watch in Luxembourg. '* *'There is also an interest for me to be able to apply what I have developed in academia, it is used for a bank.'*
27			*'Because there were also offers in France, but Luxembourg seemed*

			more interesting to me. Because it's closer to the countryside and it's a big city… I had an offer and it brought me closer to my region. That's why if I had to choose between Paris and here, I would prefer here. Because it's smaller, it's not a very big city. Yet I came from Athens, but I don't know it is … As much as Athens was different, it was foreign, Paris is too big, too difficult to live there. While in Greece, I had been to Paris for a month, but found it too big. How I prefer to have a house here than to have an apartment. I would have a hard time living in an apartment. It's a matter of comfort of life. '
28	*'Well I won't hide from you that it is the salary, we are not going to lie to each other. Because it is inevitably attractive… When you see for example that there are people who receive 1100 € and that you see that they do not manage to finish their end of the month, that you are obliged to make a credit to pay your housing tax or pay for your car repair because you don't have enough money. Do you find that normal? '*		

Themes: Cross-border workers' motivations

Cross-border workers' motivations were classified from the most important (i.e., motivation 1) to the least important (i.e., motivation 3) (see Table 3). All the participants reported one motivation. However, only 50% and 14% reported two and three motivations, respectively. Our results indicate that cross-border workers are motivated by financial, professional and personal considerations. Considering all motivations, both financial and professional motivations were both expressed by 64% of the participants (*vs.* 36% who did not report it) whereas personal motivations were reported by 40% of the participants (*vs.* 60% who did not mention these), suggesting that financial and professional motivations are the main subjective drivers of cross-border mobility. The concept of wage was the most often expressed by the participants.

Table 3: Cross-border workers' motivations: the coding of concepts

Interviewees	Motivation 1 (n=28)	Motivation 2 (n=13)	Motivation 3 (n=4)
1	Wage		
2	Work-life balance		
3	Find work		

4	Wage	The interest of the job	
5	Wage	Security feeling	
6	Wage	Professional development	
7	Company's prestige	City's attractiveness	Wage
8	Professional development	Working conditions	
9	Find work	Wage	
10	Geographical proximity	Wage	Job opportunities
11	Find work	Wage	
12	Professional development	Wage	Geographical proximity
13	Find work	Wage	
14	Wage		
15	Find work		
16	Job opportunities		
17	Wage	Working conditions	Feeling of security
18	Find work	Have international work experience	
19	To do the job I wanted	Job opportunities	
20	Wage		
21	Wage		
22	Work-life balance		
23	Wage		
24	Intellectual interest		
25	Wage		
26	Apply academic research in companies	Work-life balance	
27	Work-life balance		
28	Wage	Do not pay taxes in France	

Interview extracts were coded into concepts, and these concepts were aggregated in categories (see Table 4). Regarding the first motivation, 39% of the participants reported financial motivations, 39% reported professional motivations and 22% reported personal motivations.

Table 4. Cross-border workers' motivations: concepts & categories

Concepts (16)	**Categories (3)**
	Economical
Wage Do not pay taxes in France	
	Professional
Find work Working conditions Job opportunities Company's prestige Professional development The interest of the job	

International work experience Geographical proximity
Personal
Work-life balance Intellectual interest Apply academic research in companies Feeling of security City's attractiveness To do the job I wanted

Furthermore, our results indicate that workers' motivations vary with respect to their socio-demographic profile. Women's decisions to cross the border are more often motivated by financial considerations, whereas men stated a variety of underlying motivations.

Professional motivations guide the mobility of workers aged 30-39 years, whereas older workers are looking for a financial payoff.

Furthermore, the motivations of the workers varied significantly with respect to their level of education: we increasingly found financial motivations in workers with lower educational levels.

Motivations of highly educated workers' decisions to commute to Luxembourg were based more on personal grounds, whereas educated and poorly educated workers, respectively, evoked more often professional and financial motivations.

In the groups of artisans, merchants, company directors, employees and blue collar workers, financial motivations were most often stated as reasons for their decisions to commute from France to Luxembourg for work. Intermediate professions and white collar workers, in contrast, reported that their decisions were based more often on professional and personal motivations, respectively. These findings indicate that cross-border mobility is perceived differently with respect to the social background of the workers.

Workers coming from a lower social background use cross-border mobility as a way to increase their wages, to pay lower taxes or to receive a higher pension. Middle-class members seek professional development, such as better job opportunities or attaining international work experience, as a way of upward social mobility.

They benefit from the greater availability of professional opportunities in Luxembourg as compared to, for example, Lorraine. Finally, upper-class members use cross-border

mobility as a way to reconcile their professional life with their private life and personal aspirations.

'We have two housekeepers at work who come from an outside company. These women there, who work 40 hours, earn net of tax 1,800-1,900 euros, to be a cleaning lady… uh I'm sorry but… I have a friend who is in a town, Y, you may not know that, but a city of 15,000 inhabitants he is the head of the sports of the city. A good level, he earns 1,500 euros net per month. By exaggerating, he comes to Luxembourg to be a cleaning man he earns almost 2,000 euros ... In clear terms, it's worth getting bored every morning and evening in transport to earn double the minimum wage in France.'
Male, Up to Baccalaureate

'After Luxembourg yes, perhaps also the desire to come back to the region…. And I think that there is above all this balance… So that is decisive! The balance and the quality of life that I can have by being a cross-border worker. Because I am in Y today, which remains a city on a human scale. The rents are not excessive, so we still have a quality of life which I find is quite pleasant ... But compared to all that the quality of life, I think Luxembourg is very good ... I told myself that for the quality of life and the proximity of the region, I preferred Luxembourg. So that was a pretty obvious choice to watch in Luxembourg.'
Male, Master's degree and above

Table 5. Cross-border workers' motivations, by socio-demographic profiles

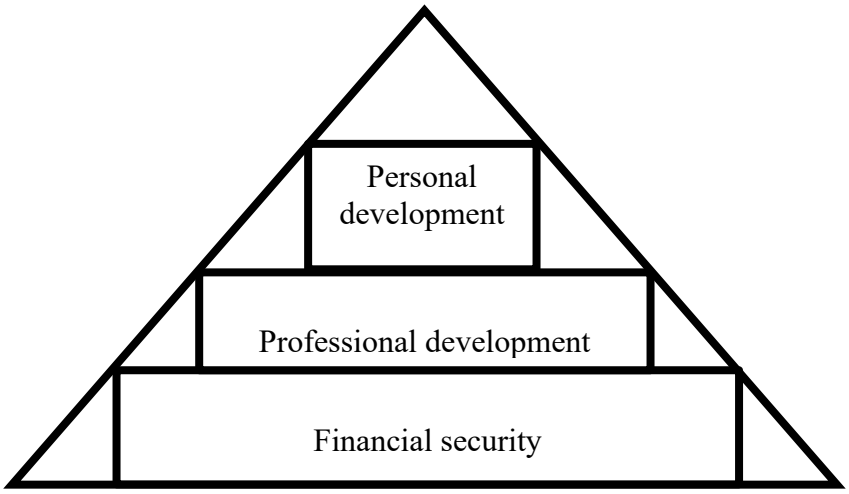
	Financial	**Professional**	**Personal**
Sex			
Women	**54**	38	8
Men	27	40	33
Age			
Not filled out	0	100	0
20-29	40	20	40
30-39	31	**54**	15
40-49	**50**	25	25
50-66	**60**	20	20
Education			
Up to Baccalaureate	**67**	33	0
Up to Bachelor's degree	43	**57**	0
Master's degree and above	17	33	**50**
Father's occupational category			
Not filled out	0	100	0
Farmers	0	100	0
Artisans, merchants, comapany directors	**75**	25	0
White collar workers	17	33	**50**
Intermediate professions	25	50	25
Employees	**75**	25	0
Blue collar workers	**50**	25	25

2.5.3. Cross-Border Workers' Needs

A sequential model of cross-border supply can be outlined from our findings. We assume that workers are willing to work abroad in order to fulfilled different needs: financial security, professional development and personal development (see Figure 1). The order of

fulfilment of these needs begins with the achievment of financial needs before moving on to professional needs and, lastly, personal needs.

Figure 1. Cross-border workers' needs



Source: Figure generated by the authors

2.5.4. A Model of Cross-Border Labour Supply

A worker is arbitrating between commuting abroad to work and working in his country of residence. Crossing the border is costly (time, stress, money) but provides gains (financial, professional, personal). Commuting is chosen as a strategy only if the gains are greater than the costs. In this model we assume that financial gains are easier to obtain than professional gains, and that professional one are easier to reach than personal gains. Thus, if the decision to commute does not, at the very least, yield a financial gain, workers will decide against commuting cross-border to work.

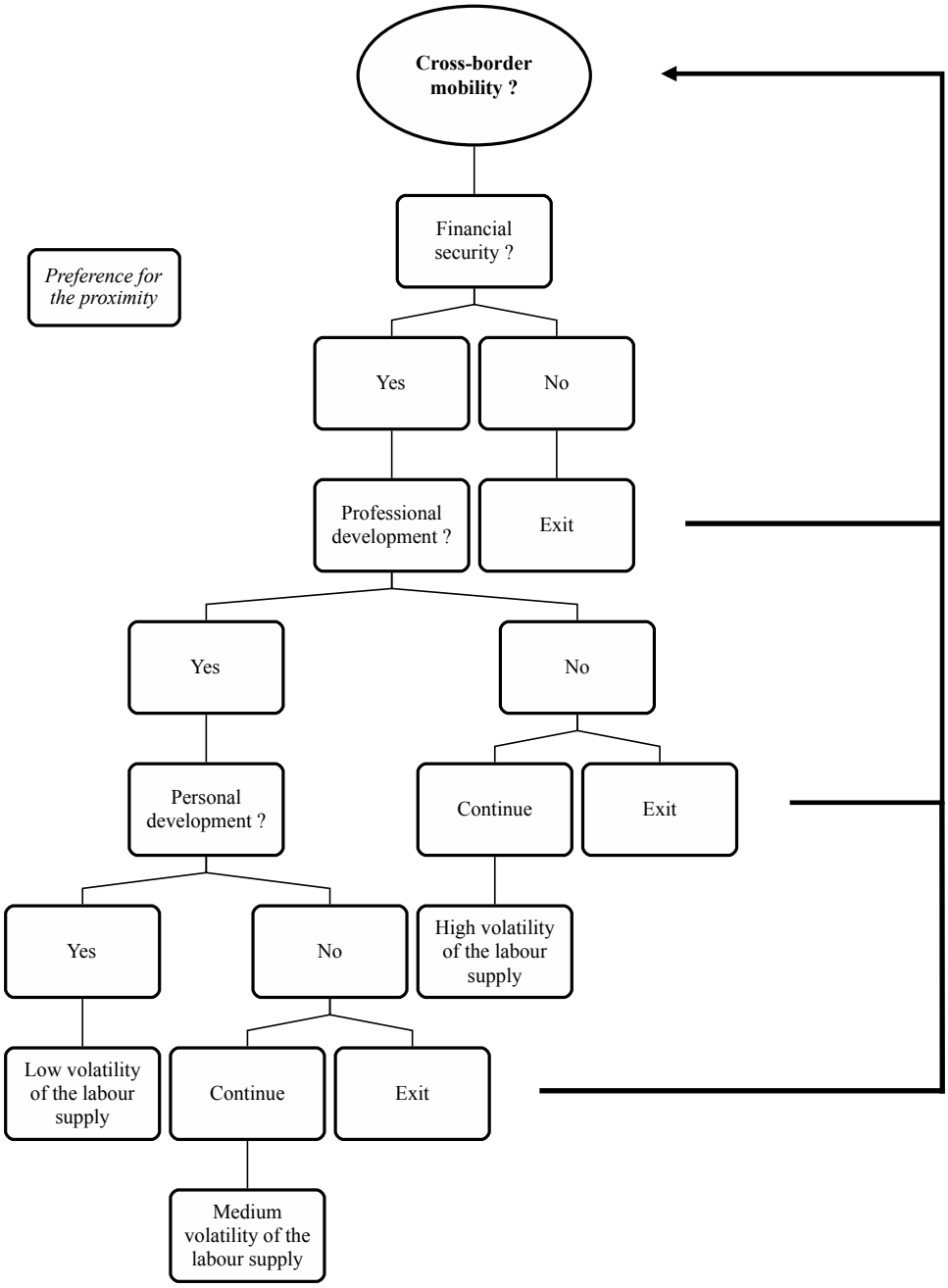
Our interviews highlighted that cross-border workers actually favour avoiding to commute to Luxembourg to work in their country of residence (i.e., the assumption of the preference for proximity), especially because of the transportation involved. As one worker argued: '*If now I am told that I have the same salary in France, I would go to France. I don't have a trip, I don't have the waste of time, I would see my daughter more*'. Our results further indicate that workers will commute if the wage gap between the

country of residence and the country of destination is at least higher than 500€ thus implying that workers estimate the costs of commuting to be equivalent to 500€.

> *'I already have 100 € of transport per month, so already more than 100 €. I do not know. I think like there, here I am at 35 hours and I am around 1,600 € and some. I think that in France as a server you must be at 1,200. I don't know, frankly. How much do servers earn in France? Frankly I do not know. You must be at 1,200 if you don't count tips. What does it do? 400 € difference. I would say 400 or 500.'*
> Male, Up to Baccalaureate, 1,600€
>
> *'This is what we are used to calculating and saying to ourselves "how much can I estimate the time I spend in transport?". I do not know. If it's exactly the same, I don't know, 400 or 500 € more. So, I will go back to France if I lose 500 or 600 €. I could accept something in France.'*
> Male, Master's degree and above, 2,900€

Once financial security is obtained, professional development might or might not be reached (see Figure 2). In the first case, the labour supply to Luxembourg will be highly sensitive to any variation of the wage gap between Luxembourg and France, because the financial gains might easily be overcome by rising wages in France. However, if professional advantages supplement financial payoff, workers' attachment to the Luxembourgish labour market will be stronger because the Lorraine region does not offer such professional advantages, as this worker argued: '*I said to myself, in economics jobs you have to go to the big financial centres, it'll be, go to Paris, go to London, Milan*'. As a consequence, the labour supply will be less sensitive to any change in the wage gap between the country of residence and the country of destination. If supplementary personal gains can be collected from commuting, the labour supply will barely be sensitive to a change in the wage differential. Bacause only highly educated workers reported personal motivations, we postulate that their cross-border labour supply is less volatile than that of the poorly educated workers one.

Figure 2. A sequential model of cross-border labour supply



Source: Figure generated by the authors with NVivo

2.6. Discussion

Our research aimed to investigate motivations for commuting to work and to propose a model of cross-border labour supply. Our key findings are: (1) cross-border workers are driven by financial, professional and personal motivations, (2) their motivations differ with respect to their socio-demographic profile and (3) cross-border workers have needs and assess the interest of commuting using a sequential model: the higher the motivation and the less volatile the labour supply. Additionally, we found that cross-border workers estimate an incentive threshold of 500€ for commuting abroad.

2.6.1. Financial, Professional and Personal Motivations Behind the Decision to Cross the Border

Our findings lead us to validate our first assumption. French cross-border workers are motivated by financial, professional and personal reasons as the literature suggested (Gengler, 1991) (Brosius, 2007) (Wille, 2012) (ASTI, 2020). As Brosius (2007), we found both financial and professional motivations to be the major motivations of the workers, whereas Gengler (1991) found financial motivations to be more important. A possible explanation is that the younger generation of workers might be more concerned with quality of life and work-life balance issues than the previous one. As well, since Gengler's (1991) study took place in a bank, these workers might value financial motivations more than professional or personal motivations. While Wille (2012) emphasised a limited importance of personal motivations and Brosius (2007) brought only financial and professional motivations to light, our study highlights the importance of personal motivations for commuters. For example, one-third of the cross-border workers justify their decision to stop working in Luxembourg because of work-life balance (Hauret & Zanardelli, 2010).

2.6.2. The Motivations of Workers Vary with Respect to Their Profile

Secondly, corroborating previous findings, our study confirms that cross-border workers' motivations differ with respect to their profile (Belkacem & Pigeron-Piroth, 2006) (Brosius, 2007), validating our second assumption. Findings confirm that older, blue

collar and poorly educated workers justify more often their mobility for financial reasons, as has been previously highlighted in the literature (Belkacem & Pigeron-Piroth, 2006) (Brosius, 2007). However, in contrast to Brosius (2007), women expressed financial motivations more often than men during the interviews. This difference might be explained by a change of the motivations of the women across time, with newer generations of women being less reluctant to express their attraction to working abroad for financial reasons. As the author explained: '*The attractiveness of wages has therefore gained in importance for young women*' (Brosius, 2007, 5). Our findings give credit to this assumption.

2.6.3. A Typology of Cross-Border Workers

Another implication of our findings is to provide a typology of the cross-border workers, supported by the Tables 3 and 5. This typology is founded on the three ideal types of cross-border workers that were identified during the interviews. This typology attempts to simplify the complexity of the social world and the diversity of the trajectories of the workers, by pooling together individuals who share a similar vision of cross-border mobility. The three types outlined here are the opportunist, the careerist, and the hedonist. The opportunist (1) pursues a higher wage, better social benefits like family allowance or parental leaves and a lower taxation. Poorly educated and working in the retail sector, the opportunist's commitment in the social life of the country of work is weak and the time spent abroad is only for professional purposes. The linguistic skills of opportunists are restricted, and they have no desire to learn the language of the country of work. In addition, the opportunist harbours rancour toward his country of residence and idealises his country of work. He would like to dwell in the country of work but does not have the financial means to do so. The opportunist characterisation has been previously highlighted in the literature (Hamman, 2020). The careerist (2) pursues career opportunities, including a better match of his qualifications with the job, professional mobility, better working conditions and management opportunities. Careerists are educated and work in the information and communication sector. The hedonistic (3) seeks to align his professional activity with his well-being. Hedonists value the work-life

balance and want to spend time with their families. Specifically, they are looking for a good quality of life, while avoiding very large cities like Paris or London and, by commuting to Luxembourg, these individuals do not have to give up their professional careers in the financial or health sectors. The hedonist does not want to reside in the country of work.

Our study sheds new lights on the individual motivations of cross-border workers. While previous studies used quantitative methodology and predetermined categories of motivations, the qualitative methodology used in the present study allows highlighting a wide range of motivations described in cross-border workers' own terms. Furthermore, we argue that the understanding of workers' motivations can only be achieved in view of the personal and professional trajectory of the social agents. However, only qualitative methodology (interviews) allows researchers to gain such an inner knowledge of cross-border workers' trajectories. During the interviews, many cross-border workers already mentioned their motivations during preliminary questioning about their life course, long before the researcher specifically questioned them about their motivations. In addition, we observed a mismatch between the answers provided by some workers when they were specifically asked about their motivations (which were inconsistent with the life trajectory described earlier in the interview by the worker) and the information given during the presentation of the trajectory. For example, one worker stated that his decision to commute was motivated by a need for change, while the trajectory indicated that a divorce had forced him to seek more gainful employment. Finally, unlike previous studies which remain descriptive, this study offers avenues for theoretical analysis of cross-border mobility based on a motivational approach.

2.7. Strengths and Limitations

One strength point of this study is the fact that the same researcher collected the interviews and analysed the data. This strategy ensured a better understanding of the participants' points of view and avoided comprehension bias compared to a study design in which the data collection and data analysis processes are performed by two (or more) different researchers. Furthermore, our study provides a state of play of the cross-border

mobility of French workers in Luxembourg. Such qualitative evidence is scarce in the literature. Finally, this study reports on cross-border mobility before the COVID-19 pandemic. Our findings are potentially useful for future researchers interested in determining the effect of the pandemic on cross-border workers' motivations.

Some limitations must be mentioned. Firstly, a convenience sampling (Bryman, 2012) was used, implying that our sample is not representative of the French cross-border worker population. Thus, our results cannot be generalised. Secondly, the data collection led to a wide variation of the lenghts of the interviews. For example, this variation was strong for interviews collected while on the train, because (1) we did not know when the cross-border workers would exit the train and (2) rail traffic disturbances led to extended interviews lengths. As a consequence, not all the participants had the opportunity to answer all the questions included in our questionnaire, leading to significant missing values. Finally, the classification of a concept in a category is potentially debatable. For instance, the concept 'geographical proximity' might be attributed equally to professional or personal motivation categories.

2.8. Conclusion

Consequently, authorities in Luxembourg should promote professional and personal advantages and not only focus on the financial payoff, as they are the major determinant of the cross-border mobility decision for the workers. This measure might be particularly effective to stabilise the labour force of poorly educated workers. Setting up professional training programs or improving work conditions constitute interesting tools for promoting the achievement of professional motivations. The establishment of tutoring programs among colleagues and improving the flexibility of the work schedules might be relevant steps that can be taken to foster the achievement of personal motivations. Such actions will enhance the satisfaction of the workers and improve their loyalty towards their country of work, limiting the return of cross-border workers to their country of residence in the event of a rise in wages across the border. Cross-border workers should not only be considered as the workforce in their country of employment, but as a human being requiring the achievement of needs in order to be fulfilled over time.

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2.10. Appendix

Appendix Document 1: Interview guide

Présentation et origines :
Date et lieu de naissance ? Nationalité ? Lieu de résidence actuelle ? Votre formation scolaire ? Diplôme le plus élevé obtenu ? Situation familiale ? Conjoint : Nationalité ? Diplôme le plus élevé ? Professions ? Enfants ? Parents : Nationalités ? Diplômes les plus élevés ? Professions ? Un membre de votre famille a-t-il travaillé en dehors de la France au cours de sa vie professionnelle ? Avez-vous vécu dans d'autres villes / pays au cours de votre vie ? Parcours géographique
Parcours professionnel avant l'entrée sur le marché du travail luxembourgeois
Pourriez-vous me présenter votre parcours professionnel ? En quoi consiste votre emploi actuel ? Avez-vous connu une période de chômage au cours de votre vie professionnelle ? Sur une échelle de 1 à 10, pourriez-vous estimer votre niveau de satisfaction par rapport à votre emploi actuel au Luxembourg ? Avez-vous déjà aidé quelqu'un à trouver un emploi au Luxembourg ?
Luxembourg's labour market soft power
Quelle image aviez-vous du Luxembourg avant de vous y rendre ? Comment avez-vous entendu parler du Luxembourg pour la première fois ? Qu'est-ce qui vous a donné envie de travailler au Luxembourg ? Quelles sont vos motivations pour continuer à travailler au Luxembourg (et non pas en France) ? Songez-vous à retourner travailler en France ? Pourquoi ? Selon vous, dans votre métier, les opportunités d'emplois au Luxembourg sont : très faibles, faibles, fortes, très fortes ?
Processus de recherche d'emplois vers le Luxembourg
À quelle date votre recherche d'emploi a-t-elle débuté ? Combien de temps a duré votre recherche d'emploi ? Dans quels pays recherchiez-vous un emploi ? Visiez-vous une taille d'entreprise particulière durant vos recherches ? TPE -10 salariés PME -250 ETI +250 GE +5000

Quel est l'intitulé du poste ou des postes que vous recherchiez ?
Pourriez-vous m'expliquer quelles démarches concrètes avez-vous effectuées pour rechercher un emploi ?
Recherche physique via dépôt de CV
Contact d'entreprise par téléphone
Agences publiques pour l'emploi : Pôle Emploi ou ADEM
Cabinet de recrutement
Entreprise intérim
Annonces dans les journaux (Wort, Essentiel…)
Site d'annonces d'offres d'emploi (X, X, X)
Site internet des entreprises visées par votre recherche
Réseaux sociaux sur Internet (X, X, lesfrontaliers.lu)
Réseaux sociaux professionnels (X, X)
Réseaux de connaissances (familial, amical, professionnel, associatif)
Salon pour l'emploi

Combien de CV avez-vous envoyés durant période de recherche d'emploi ? (Format papier ou numérique ?)
Combien d'entretiens avez-vous passés durant cette période de recherche ?
Recherchiez-vous un emploi avec la même intensité pendant toute la période de recherche ?

Internet in Job Search

De quelle manière avez-vous utilisé Internet au cours de votre recherche d'emploi ?
Quels sites internet avez-vous fréquentés ? (X, X, X, X)
Sur combien de sites différents avez-vous créé un compte ?
Si utilisation de X (ou autres sites), quelles informations donniez-vous aux recruteurs potentiels (loisirs, qualités, compétences, langues, éducation)
Lors de votre recherche utilisiez-vous des applications de recherche d'emplois sur votre smartphone (X…) ?
Si oui : Combien de fois par jour utilisez-vous ces applications ?
Sur quels sites aviez-vous déposé votre CV en ligne ?

Situation professionnelle actuelle

Quel est l'intitulé du poste que vous occupez actuellement ?
Quels sont vos horaires de travail ?
À quelle date votre contrat de travail a-t-il commencé ? (JJ/MM/AAAA)
Êtes-vous en CDI ou en CDD ?
Travaillez-vous à temps plein ou à temps partiel ?
Idéalement, quel nombre d'heures souhaiteriez-vous travailler chaque semaine ?
Avec votre expérience, diriez-vous que vous avez éprouvé des difficultés pour trouver un emploi au Luxembourg ?
Quel est le différentiel minimum de salaire entre la France et le Luxembourg pour lequel vous accepteriez de supporter les trajets ?

Conditions de travail / Santé :

Combien d'heures supplémentaires réalisez-vous par mois ?

Considérez-vous que votre activité professionnelle actuelle au Luxembourg soit génératrice de stress ?
Selon vous, le travail est-il davantage stressant au Luxembourg ou en France ?
Sur une échelle de 1 à 10, pourriez-vous estimer le stress engendré par votre emploi actuel ?
Sur une échelle de 1 à 10, pourriez-vous estimer votre état de santé actuel ?
Combien de fois êtes-vous allé chez le médecin en 2018 ?
Combien de fois avez-vous été hospitalisé en 2018 ?
Nombre total de jours de congé maladie en 2018 ?
Prenez-vous régulièrement des médicaments ?
Pratiquez-vous du sport ?
Êtes-vous fréquemment atteint de ?
Maux de tête
Douleurs d'estomac
Eczéma / problèmes de peaux
Douleurs de dos ou de nuque
Fatigue
Vertiges
Troubles de la vue
Avez-vous des allergies ?
Quelle est votre taille ?
Quel est votre poids ?

Transport

Êtes-vous titulaire d'un permis de conduire ?
Quel moyen de transport utilisez-vous pour vous rendre au travail chaque jour ?
Vous arrive-t-il d'utiliser d'autres moyens de transport ?
Combien de temps passez-vous quotidiennement dans les transports ?
Quel temps de trajet maximum accepteriez-vous de réaliser pour vous rendre sur votre lieu de travail ?

Compétence linguistique légitime

Savez-vous parler luxembourgeois ?
Sinon, souhaitez-vous apprendre cette langue ? Si oui, comment avez-vous appris le luxembourgeois ?
Vous a-t-on déjà reproché de ne pas parler luxembourgeois au cours de votre activité professionnelle ?

Perception du Luxembourg et des Luxembourgeois

Pourriez-vous définir la mentalité luxembourgeoise ?
Souhaiteriez-vous résider au Luxembourg ?

Intégration sociale des frontaliers au Luxembourg

Vous sentez-vous intégré à la société luxembourgeoise ?
Êtes-vous syndiqué ? Pourquoi ?
Où faites-vous vos courses (alimentaires, vestimentaires, électroménagers…) ?
Consommez-vous régulièrement des produits issus de l'agriculture biologique ?

Êtes-vous membre d'une association ?
Si oui : Dans quel(s) pays ?
Réalisez-vous certaines activités au Luxembourg, notamment le weekend, en dehors de votre activité professionnelle (sport, concert, cinéma, visites chez des amis au Luxembourg) ?
Avez-vous des amis de nationalité luxembourgeoise ?
Connaissez-vous le site lesfrontaliers.lu ? Si oui, êtes-vous membre du site ou de la page X ?

Capitaux

Économique

Pourriez-vous m'indiquer le niveau de votre rémunération nette mensuelle ?
Propriétaire ou locataire de votre résidence principale ?
Dans quel type de bien immobilier résidez-vous ?
Quelle est la taille de votre logement en m2 ?
Résidence secondaire ?
Combien de fois partez-vous en vacances chaque année ?
Êtes-vous propriétaire de votre voiture ?

Culturel

Possédez-vous une bibliothèque au sein de votre foyer ?
Combien de langues différentes pouvez-vous parler ? Niveau ?
Quelles langues utilisez-vous durant votre activité professionnelle au Luxembourg ?
Combien de fois êtes-vous allé au musée cette année ?
Combien de fois êtes-vous allé à l'opéra cette année ?
Combien de fois êtes-vous allé au théâtre cette année ?
Possédez-vous des œuvres d'art originales ? Si oui, de quels artistes ?
Possédez-vous des antiquités ?
Quels journaux lisez-vous ?
Quelles stations radios écoutez-vous ?
Combien de livres avez-vous lus en 2018 ?
Quels types d'ouvrages lisez-vous ?

Social

Combien de contacts avez-vous sur les réseaux sociaux ?
Combien de fois par mois participez-vous à des diners/ soirées ?
Êtes-vous membre d'un cercle, club ?
Êtes-vous membre d'un parti politique ?
Quelle est la profession de votre meilleur(e) ami(e) ?

Symbolique

Avez-vous fait l'objet d'une décoration honorifique ?
Votre profession vous amène-t-elle à porter fréquemment des costumes et des cravates / des tailleurs ?
Quelle est la dernière personne qui a sollicité votre avis pour une décision que vous jugez importante ?
Sur une échelle de 1 à 10, estimez votre beauté ?
Sur une échelle de 1 à 10, estimez votre charisme ?

3. Migrants' cross-border commuting behaviour: Associations between migration capital and cross-border mobility

3.1. Abstract

Migration behaviour and commuting behaviour have been widely studied, but few are documented about their migrants' cross-border commuting behaviours. Our study aims to: (1) estimate migrants' likelihood to commute abroad, (2) ascertain the transmission of the capacity to deal with distance and borders and (3) predict the probability to commute abroad by migration capital endowment.

The French part of the European Union Labour force Survey (FLFS) was operated for years 2010-2018, leading to an initial sample of 3,812,743 observations. The first part of the study focused on five groups of migrants (immigrants, foreigners, internal migrants, immigrant children and foreigner children) whereas the second focused on the use of a Migration Capital Index (validated through a complementary factor analysis) to predict the probability to commute. Binary logistic regression models were applied for the statistical analysis and controlled for demographic background and labour status variables and elastic migration.

32,495 workers were retained for the analysis. Our key findings are: (1) migrants (immigrants, foreigners, immigrant children and foreigner children) are more likely to commute abroad (2) the capacity to deal with distance and borders can be transmitted within the family, and (3) the Migration Capital Index is a relevant predictor of commuting behaviour: the higher the Migration Capital Index, the higher the probability to commute abroad.

Migrants commute more, and commuting abroad generates positives externalities within the EU. Policy makers might direct the flow of migrants toward cross-border departments to foster international migrants' integration and generate positive externalities.

3.2. Introduction

In 2015, 1,282,690 asylum applications of non-EU citizens were registered, and this number is more than five times higher than the 225,155 asylum applications registered in 2008 (EUROSTAT, 2021). These massive inflows of migrants place immense pressure on the integrative capacities of the EU's institutions, especially the labour market. Labour market participation is paramount for a successful integration of migrants (European Parliament, 2016). Mobile workers are less likely to be unemployed, due to their movements toward labor demanding areas. Thus, investigating migrants' mobility behaviour is a relevant matter regarding the integrative capacity of the EU.

Mobility can be defined as a movement between places, which can be either: (1) migration or (2) commuting (Parenti & Tealdi, 2021). No harmonized and universally accepted definition of migration exists (Pryor, 1981) (Anderson & Blinder, 2015). However, migration implies a shift in the usual place of residence whereas commuting does not. Cross-border commuting is defined as commuting behaviours between the country of usual residence and the workplace abroad.

A divide emerges in the literature. Economists have studied migrants' migration behaviours (as migration studies), whereas geographers have particularly focused on migrants' commuting behaviours (as commuting studies), but little documentation exists on migrants' cross-border commuting behaviours. Studies of migration behaviours highlighted that migrants are more likely to be engaged in international migration, specifically in circular migration (Constant & Zimmermann, 2011) and in onward migration (Nekby, 2006) (Hoon et al, 2020). Commuting studies assess commuting practices focusing on the commuting time and the commuting modes. Internal migrants are more likely to commute further than non-migrants in rural territories (Champion, 2009). Additionally, immigrants are more likely to rely on public transport and less likely to use a car than natives (Blumenberg, 2009) (Welsch et al, 2018), suggesting that migrants are more mobile than non-migrants. Regarding migrants' cross-border commuting behaviours (commuting behaviours for now on), the few references available on the subject suggest a similar pattern. Previous mobility experiences were associated with the willingness to commute abroad (Huber & Nowotny, 2013). In addition,

immigration was related with commuting behaviours, as immigrants were twice as likely to commute abroad as non-immigrants (Pigeron-Piroth et al, 2018).

Recently, in qualitative research, migration is considered as a capital (Flamm & Kaufmann, 2006) (Beck, 2007) (Delaunay & Fournier, 2014) (Kou & Bailey, 2014) (Moret, 2020). The so-called theory of the migration capital is based on several theoretical assumptions. 'Migration is a process rather than an isolated event' (Kou & Bailey, 2014, 113). Past migration experience shapes further migration decision. Migration experience can be accumulated across time, leading to lower migration costs through a learning process. Thus, there exists a "culture of migration" which intervenes in migration decision.

To examine this little studied area more closely, we derived the following research questions: (1) Are migrants more likely to commute abroad? (2) Is the ability to deal with distance and borders transmitted? (3) Can the MC predict commuting behaviour?

We propose to use the concept of migration capital (MC) (1) as a worker's ability to perceive abroad as a possible employment choice and (2) to project their workforce in another country while dealing with distance and borders, to better understand the association between migration and commuting behaviours. Based on the Bourdieusian triptych (Bourdieu, 1979) of field, capital, and habitus, and implying that social practices are linked to representations, a capital can be either (1) acquired or (2) inherited, leading us to design a bicephalous MC. On one hand, the Acquired migration capital (Acquired MC) consists of the worker's own experience of migration, accumulated across time and throughout mobility experiences. On the other hand, the Inherited migration capital (Inherited MC) corresponds to the migration experience accumulated within the familial history. For example, since all workers in this study dwell in France, having a mother born in Russia implies that she accomplished an international migration. Experiences that these mothers could have transmitted to their children might encourage them to regard Russia as a familiar country and to travel there often. Through their migration from Russia to France, these mothers have not only accumulated migration experience for themself, but increased the migration experience of the whole family, which will make each family member's movements easier within and across generations. Also, we postulate that the capacity to deal with distance and borders can be transmitted by the

family as a permanent predisposition in the form of a "taste for migration" that we propose to call the migration habitus. Our study aims to: (1) estimate migrants' likelihood to commute abroad, (2) ascertain the transmission of the capacity to deal with distance and borders and (3) predict the probability to commute abroad by MC endowment.

3.3. Methods

3.3.1. Study Population and Selection Criteria

The individual-level data from the French part of the European Union Labour force Survey (FLFS) run by the National Institute of Statistics and Economics Studies' *('Institut National de la Statistique et des Etudes Economiques'* - INSEE) was used. This repeated cross-sectional survey was conducted in a representative sample of the French population and provides a very large sample size (about 400 000 observations for each year before sample selection criteria were applied). We pooled the data for the years 2010-2018, a time schedule in which 3,812,743 subjects were interviewed. The 2010 survey introduced information about the presence of children in the household, whereas the 2018 one was the last survey available. The population is made up of all the members (aged 15 or older) in a given household. Households are identified through the comprehensive housing-tax registers and invited to participate in the survey by post. The sample of households is stratified in order to be representative; many criteria are used, the most important are the region and the spatial type (urban center, suburban rings, multi-polarized municipalities, rural municipalities). The questionnaire (INSEE, 2017) was administered face to face (for the first and the last interviews) and by telephone (for the others). As we are not aware of the number of contacted people who corresponded to our selection criteria, the response rate cannot be calculated. Nevertheless, the INSEE indicates a respondent rate of 80%, and there is no reason to think that ours is different.

Since the migration variables were adequately assessed (i.e. with only few missing values), we elaborate a selection process focus on commuters. We aim to compare migrants' commuting behaviour to that of their non-migrant peers. A sample of workers characterized by different workplace locations was extracted from the FLFS. Our sample fulfilled the following selection criteria: aged between 20 and 60 years, in employment,

and residing in France in one of the 12 cross-border departments: Ain, Alpes-Maritimes, Ardennes, Doubs, Jura, Meurthe-et-Moselle, Moselle, Nord, Bas-Rhin, Haut-Rhin, Haute-Savoie, and Territoire de Belfort. All departments in which at least 20 commuters lived and in which they represented at least 1% of the workforce were included in the analysis. Five commuting destinations were retained, namely Germany (DE), Belgium (BE), Switzerland (CH), Luxembourg (LU), and Monaco (MCO), as these countries attracted 99% of the French's cross-border workers (Mironova & Villaume, 2019). Workers were interviewed six times. The fact that the first wave was conducted as face-to-face, suggests a better quality of the data, and the existence of attrition in the follow-up of these participants lead us to retain the first interview for each participant. After retaining the first interview, only 777,930 workers remained.

The selection criteria applied to obtain the final sample (n=32,495), were:

Workers: settled in France, employees, aged between 20 and 60 years were retained. Farmers, artisans, merchant and company directors, self-employed workers, and workers in apprenticeships were dropped from the analysis.

We also excluded workers who did not provide information on their: country of employment, educational attainment, wage, place of birth, parents' place of birth, parents' nationality, sector of employment, the number of people employed at their local unit, occupational category, and fathers' occupational category.

Departments: neighboring departments to Germany, Belgium, Switzerland, Luxembourg, and Monaco, in which at least 20 commuters lived who represented at least one percent of the workforce were kept.

Data: The first interview was kept for each worker.

3.3.2. Data

Between 2010 and 2018, the number of commuters per year (e.g., 315 for 2012) has led us to combine the FLFS individual survey folders for years and migration variables. The FLFS is approved by the Institutional Review Board called 'Comité du Label de la Statistique Publique', which depends on the 'Conseil National de l'Information Statistique' (CNIL). The questionnaire of the survey has been previously published (INSEE, 2017) and only the relevant questions were drawn upon for the present study.

Two parameters were considered to describe the worker's situation: commuting behaviour and country of destination. A worker can decide either to work in France or to commute abroad for work. Commuters are referred to as workers who worked abroad, either in Belgium, Germany, Luxembourg, Switzerland, or Monaco, and dwelled in France. Seven questions assessing the migration experience of the workers were included in the FLFS. Following MC theory, migration experience was considered as a risk factor for commuting behaviour. The FLFS included information about workers' migration experience as well as their parents' migration experience.

Born abroad: Respondents were asked "Where were you born?" and were given the following response alternatives: (1) France or (2) abroad. A dichotomous variable was generated and coded as: (1) born abroad and (0) born in France.

Foreign nationality: Respondents were asked about their nationality and given a list of 28 nationalities in assessments before 2013 and 14 nationalities in assessments between 2013 and 2018. A binary variable was generated in order to distinguish (0) workers who had the French nationality from workers (1) who had a foreign nationality. Unspecified nationalities were coded as missing values.

Internal migration: Respondents were asked about their region of birth and housing. Having different birth and housing regions was considered as previous internal migration experience, since it implies the crossing of internal borders (here, region borders). We coded (1) for workers who had internal migration experience and (0) for those who did not have such experience. Missing regions of residence were coded as missing values. By construction, regions of birth were missing for workers born abroad. These missing values were kept in the analysis.

To obtain a complete picture of migration, studies need to include the linkage between internal migration and international migration (King & Skeldon, 2010) (Kou & Bailey, 2014). As we assume that migration is a process in which each migration experience leads to a higher probability of further movement, both international and internal migration are expected to increase a worker's likelihood to commute abroad for employment.

Mother- born abroad: Respondents were asked "Is your mother born in France or abroad?" and were presented the following response options: (1) France, (2) abroad, and

(3) do not know. We generated a dichotomous variable indicating workers with (1) a mother born abroad and (0) a mother born in France. (3) were coded as missing values.

Father- born abroad: Respondents were asked “Is your father born in France or abroad?” and were presented the following response options: (1) France, (2) abroad, and (3) do not know. We generated a dichotomous variable indicating workers with (1) a father born abroad and (0) a father born in France. (3) were coded as missing values.

Mother- foreign nationality: Respondents were asked “What was your mother's nationality at birth?” and were asked to select one of the following response categories: (1) France, (2) Northern Europe, (3) Southern Europe, (4) Eastern Europe, (5) Maghreb, (6) Rest of Africa, (7) Middle East, (8) Laos, Vietnam, Cambodia, (9) Rest of the world, and (10) Not filled out/unknown country. A dichotomous variable was generated, and responses (2), (3), (4), (5), (6), (7), (8), and (9) were coded as (1) mother with a foreign nationality and response (1) was coded as (0) mother with the French nationality. (10) were coded as missing values.

Father- foreign nationality: Respondents were asked “What was your father’s nationality at birth?” and were asked to select one of the following response categories: (1) France, (2) Northern Europe, (3) Southern Europe, (4) Eastern Europe, (5) Maghreb, (6) Rest of Africa, (7) Middle East, (8) Laos, Vietnam, Cambodia, (9) Rest of the world, and (10) Not filled out/unknown country. A dichotomous variable was generated, and responses (2), (3), (4), (5), (6), (7), (8), and (9) coded as (1) father with a foreign nationality and response (1) was coded (0) father with the French nationality. 10) were coded as missing values.

The study included two sets of covariates: the demographic background (Var.1-Var.8) and the labour status (Var.9-Var.13) of the workers. Consolidated variables are those composed by the respondents’ answers to several questions.

(Var.1) Sex: (2 categories: men, women) Literature pointed out that male workers more frequently commute abroad than female workers. Female gender was negatively associated with commuting behaviour (Gottholmseder & Theurl, 2007) (Huber & Nowotny, 2013) (Nowotny, 2014) (Pigeron-Piroth et al, 2018).

(Var.2) Age: (4 categories: 20-29, 30-39, 40-49, 50-60) The relationship between age and commuting behaviour is unclear in the literature, with some studies indicating that

workers aged 30-39 years have a higher likelihood to commute abroad (Pigeron-Piroth et al, 2018), whereas others found no significant association between age and commuting behaviour (Gottholmseder & Theurl, 2007) (Huber & Nowotny, 2013).

(Var.3) Education: (4 categories: no diploma, up to high school diploma, up to Bachelor's degree, Master's degree & above) The association between education and commuting behaviour is unclear in the literature. One, study found a significant and positive association, suggesting that the higher the level of education, the higher the likelihood to commute (Pigeron-Piroth et al, 2018). Another study found a U-shaped association between education and commuting behaviour, indicating that the likelihood to commute abroad is higher for both uneducated and highly educated workers (Huber & Nowotny, 2013). Other studies, in contrast, found no significant associations, suggesting that the likelihood to commute abroad is the same irrespective of age group membership (Gottholmseder & Theurl, 2007) (Nowotny, 2014).

(Var.4) Occupational category: (4 categories: white collar workers, intermediate professions, employees, blue collar workers) A significant association has been highlighted between occupational category and commuting behaviour, with blue-collar workers were more likely to commute than other workers (Pigeron-Piroth et al, 2018).

(Var.5) Father's occupational category: (6 categories: farmers; artisans, merchants, company directors; white collar workers; intermediate professions; employees; blue collar workers) At the end of the respondent's schooling.

(Var.6) Marital status: (3 categories: married, single, divorced, or widowed) Respondents, with response options of (1) single, (2) married or remarried, (3) widowed, and (4) divorced, were asked "What is your legal marital status?" Contradictory findings have emerged with regard to the association between marital status and commuting behavior. One study found a significant association between marital status (i.e., celibacy) and commuting behaviour (Huber & Nowotny, 2013), whereas another study found no significant association (Nowotny, 2014).

(Var.7) Children: (2 categories: yes, no) With yes or no as response options, respondents were asked "Do you have children in the household or in alternate care?" The association between children and commuting behaviour is unclear, with one study reporting a

negative association (Carpentier, 2012), and another finding no significant association (Gottholmseder & Theurl, 2007).

(Var.8) Departments: (12 categories: departments of residence) The French cross-border area is composed of 12 departments, namely, Ain, Alpes-Maritimes, Ardennes, Doubs, Jura, Meurthe-et-Moselle, Moselle, Nord, Bas-Rhin, Haut-Rhin, Haute-Savoie, and Territoire de Belfort. To take into account the different migration pattern existing between the different departments, a control for the department of residence was introduced.

(Var.9) Permanency of the job: (3 categories: permanent contract, temporary contract, interim contract)

(Var.10) Sector: (9 categories: agriculture, industry-construction, trade-transport-accommodation-catering, information-communication, finance-insurance, real estate, scientific activities-administrative services, public administration, other services). A single category for the industry and the construction sector was generated, since it has been shown that these sectors had the higher share of commuters [26]. Furthermore, a significant association between sector and commuting behaviour has been previously highlighted in the literature. Working in the industry sector was associated with commuting behaviour (Gottholmseder & Theurl, 2007) (Pigeron-Piroth et al, 2018) whereas working in the public sector was negatively associated with commuting behaviour (Gottholmseder & Theurl, 2007) (Nowotny, 2014) (Pigeron-Piroth et al, 2018).

(Var.11) Number of persons working at the local unit: (4 categories: 1 to 9 workers, 10 to 49 workers, 50 to 499 workers, 500 workers and more) Respondents were asked "How many employees are approximately on the site which employs you?" Large companies more often employ commuters than other companies (Buch et al, 2009), suggesting a positive association between the size of the company and commuting behaviour of workers.

(Var.12) Wage: (3 categories: up to €2,000 net income per month premiums included, between €2,001 and €4,000, €4,001 and more) Nominal wage. No study investigated the association between wage and commuting behaviour. However, relative deprivation was associated with the willingness to commute (Huber & Nowotny, 2013) and with commuting behaviour (Nowotny, 2014).

(Var.13) Full-time/part-time employment: (2 categories: full-time employment, part-time employment).

In summary, sex, age, education, occupational category, father's occupational category, departments, permanency of the job, sector, number of persons working at the local unit, wage, and full-time/part-time employment are consolidated variables. As missing values were dropped, all variables are fully informed for each worker in the analysis.

3.3.3. Statistical Analysis

The statistical analysis is divided into two parts. In the first part of our analysis, we tabulated the commuting behaviour by migration status (migrants *vs.* non-migrants). Then, binary logistic models were performed to estimate the likelihood of five groups of migrants (immigrants, foreigners, internal migrants, immigrant children, and foreigner children) to commute abroad, controlling for both demographic background and labour status variables. In the Model 1, only the row association between migration and commuting behaviour was estimated. However, differences in the commuting behaviour between migrants and non-migrants might be due to the demographic background of the workers, leading us to propose a more accurate model. The Model 2 introduced a set of variables (i.e., sex, age, education, occupational category, father's occupational category, marital status, children, and departments) as control variables, allowing us to control our estimates for the demographic background of the workers. As previously illustrated, literature has shown that the likelihood to commute abroad depends on the labour status of the participants. To deal with this issue of estimation bias, the Model 3 was generated and controlled the estimates for both demographic background and labour status variables. However, this modelling strategy might have overestimated the association between migration and commuting behaviour, while attributing to migration, an effect originating from the housing market. Indeed, the "*elastic migrant phenomenon*" defines an inflow of Europeans toward the French cross-border area, driven by economic grounds (Isel & Kuhn, 2016) (Pigeron-Piroth et al, 2018). The rising costs of housing forces them to relocate to the nearest, cheaper area. This is particularly the case for citizens of Luxembourg and Switzerland, causing them to be overrepresented in the neighboring French departments. To deal with this issue, coefficients were re-estimated after the

citizens of Belgium, Germany, Luxembourg, Switzerland, and Monaco were dropped from the neighboring French departments. For example, in the case of Luxembourg, all the workers with the Luxembourgish nationality were dropped from the French neighboring departments (i.e., Meurthe-et-Moselle and Moselle). Thus, the use of the Model 4 is assuming to limit, as far as possible, potential estimation bias and to provide relevant estimations.

For the second part of the analysis, we designed a Migration Capital Index (MC Index) to indicate workers' endowment in MC. The MC Index consisted of 6 items and included values between 0 and 6. Scores of the six items were accumulated for each participant. The MC Index was established as the addition of responses to the selected items and indicated the capacity to deal with distance and borders in order to find jobs: the higher the score, the higher this ability. A complementary factor analysis was conducted to ascertain the relevance of the MC Index, while investigating the internal consistency and the one-dimensionality of the index as recommended (Baumann et al, 2008). Factor analysis was used to evaluate the one-dimensionality of the MC Index, and this was done more precisely by using a principal component analysis as the extraction method (Costello & Osborne, 2005), while its internal consistency reliability was confirmed using the Cronbach's alpha coefficient. Acquired migration capital Index (Acquired MC Index) and Inherited migration capital Index (Inherited MC Index) were additional measures of respective previously acquired and inherited migration experiences. Using the obtained scores, mean endowment in MC was tabulated by commuting behaviour. Then, binary logistic modeling was performed in order to confirm that each unit of the MC Index is significantly associated with commuting behaviour. After the regressions, the "margin" command was used to predict the commuting behaviour, while computing the predicted probability to commute abroad by MC endowment.

Odds ratios (ORs) were estimated with a 5% risk of error (i.e., 95% confidence intervals [CI]) and used to measure the association between migration and commuting behaviour. Statistical analyses were performed using the software STATA 13.0. The significance's threshold was fixed at a p-value equal to 0.10. Commuting behaviour (i.e., do not commute *vs.* do commute) was considered as the dependent variable, whereas migration was considered as the independent variable. All the variables included in the logistic

regressions were significantly associated with commuting behaviour. During the analysis, migrants were systematically compared with their non-migrant counterparts. For example, immigrants were compared with their non-immigrant peers, taking non-immigrants as the reference group. As a robustness check, we ran our statistical analysis for the last interview. A similar pattern appears considering the first or the last interrogation, suggesting that our findings are highly robust. The co-authors of the current study recently published an article concerning commuters' health based on a similar methodology (Nonnenmacher et al, 2021).

3.4. Results

For the statistical analysis, 32,495 observations were retained.

3.4.1. First Part: Are Migrants More Likely to Commute Abroad?

Assumption 1: Migrants are more likely to commute abroad.
Assumption 2: The capacity to deal with distance and borders can be transmitted.

This first part focuses on five groups of migrants: immigrants, foreigners, internal migrants, immigrant children, and foreigner children. The commuting behaviour of these migrants was compared with the commuting behaviour of their non-migrant peers. The Table 1. reports the number of responses for each assessed variable in the FLFS included in our analysis.

Table 1. Migration variables. French Labour Force Survey (Census), 2010-2018

Variables	*n*
Country of birth	32,495
Nationality	32,495
Region of birth	29,211
Region of residence	32,495
Country of birth: mother	32,495
Country of birth: father	32,495
Nationality: mother	32,495
Nationality: father	32,495

Five groups of migrants were compiled from the variables included in the FLFS. Since no harmonized definition of migrants exists, we elaborated our own definition of migrants (see Table 2). Immigrants, internal migrants, and immigrant children constitute the reference groups for international migration, internal migration, and inherited migration experience, respectively.

Table 2. Definitions of migrants & non-migrants

Non-migrants	*Criteria*	%	*Migrants*	*Criteria*	%	*n*
Non-Immigrants (NI)	Born in France	90	Immigrants (I)	Born abroad	10	32,495
Non-Foreigners (NF)	French nationality	95	Foreigners (F)	Other nationality	5	32,495
Non-internal migrants (NIM)	Born in France Both parents are born in France Both parents have the French nationality Region of birth = region of residence	81	Internal migrants (IM)	Born in France Both parents are born in France Both parents have the French nationality Region of birth ≠ region of residence	19	24,507
Non-immigrant children (NIO)	Born in France Both parents are born in France	84	Immigrant children (IC)	Born in France At least one parent is born abroad	16	29,321
Non-foreigner children (NFO)	Born in France Both parents have the French nationality	88	Foreigner children (FC)	Born in France At least one parent has another nationality	12	29,321

3.4.2. Descriptives

Immigrants were, at the same time, uneducated and highly educated, blue collar workers and white collar workers, artisans, merchants, as well as the sons of company directors and white collar workers (see Table 3). Internal migrants have a privileged profile because they are highly educated, white collar workers and intermediate professions, working in valued and stable sectors (information and communication, finance and insurance, and public administration) and receiving high wages. Immigrant children, as the reference group for the inherited migration experience, have a less favorable profile, as they are women, uneducated and poorly educated, the sons of employees and blue collar workers, working on interim contracts and earning lower wages. Full tables are available in the Appendix (see Appendix, S1 Table 1).

Table 3. Demographic and labour status profile, by migration status. %

Variables	Non-immigrants	Immigrants	*p**	Non-internal migrants	Internal migrants	*p**	Non-immigrant children	Immigrant children	*p**
Sex: Men	51	56	***	51	52		52	49	***
Age: 20-29 years	19	13	***	19	18	***	19	19	***
Education: No diploma	7	19	***	8	5	***	7	9	**
Education: Master's degree & above	14	20	***	12	27	***	15	13	***
Occupational category: White collar workers	17	18	*	15	28	***	17	15	***
Occupational category: Blue collar workers	24	35	***	26	15	***	23	24	
Father's occupational category: White collar workers	12	15	***	11	22	***	13	10	***
Father's occupational category: Blue collar workers	44	43		45	28	***	42	57	***
Marital status: Married	46	62	***	46	45		46	47	***
Children: Yes	53	59	***	53	52	**	53	55	***
Department of residence: Alpes-Maritimes	8	20	***	4	18	***	7	15	***
Permanency of the job: Fix-term contract	8	11	***	8	9		8	9	
Sector: Industry & construction	24	27		25	20	***	24	24	
Sector: Scientific & technical activities	10	14	***	9	10		9	11	**
Number of persons employed at the local unit:0-9	17	19	**	18	16	***	17	18	
Wage:0-2000	64	62		66	54	***	17	18	
Wage:4,001+	5	9	***	4	9	***	5	5	
Part-time/full-time employment: Part-time	17	19	*	18	15	***	17	18	

p: significance p* ≤ 0.1 | p** ≤ 0.05 | p*** ≤ 0.01. Chi-square test.*

Immigrants, foreigners, internal migrants, immigrant children, and foreigner children commute abroad more than their non-migrant peers (see Table 4). Among migrants, foreigners and immigrants commute the most, whereas internal migrants commute the least. However, migrants' specific commuting behaviour might be due to their demographic background and labour status, requiring the application of a multivariate analysis.

Table 4. commuting behaviour by migration status. %

Commuting behaviour	Non-immigrants	Immigrants	*p**	Non-foreigners	Foreigners	*p**	Non-internal migrants	Internal migrants	*p**
Do not commute	91	77	***	90	71	***	92	89	***
Do commute	9	23		10	29		8	11	

Commuting behaviour	Non-immigrant children	Immigrant children	*p**	Non-foreigner children	Foreigner children	*p**
Do not commute	91	87	***	91	86	***
Do commute	9	13		9	14	

p: significance p* ≤ 0.1 | p** ≤ 0.05 | p*** ≤ 0.01. Chi-square test.*

3.4.3. Multivariate Analysis

Considering the Model 4, migration status is associated with commuting behaviour (see Table 5). Immigrants, foreigners, immigrant children, and foreigner children have a higher likelihood to commute than their non-migrant peers, suggesting that both acquired and inherited migration experiences matter for commuting abroad. This association was more marked for immigrants and foreigners than for immigrant children and foreigner children, suggesting that internationally acquired migration experience is more useful than international inherited migration experience. The association between MC and commuting behaviour for migrant children (immigrant and foreigner children) suggest two conclusions: (1) that the ability to deal with distance and borders can be transmitted from the parents to the children and (2) that the awareness of the possibility to move is as important as the movement itself in order to commute abroad.

No association between MC and commuting behaviour exists for internal migrants, suggesting that only international migration matters for commuting abroad.

Model 2 involves a reduction of the estimated coefficients whereas the use of the Model 3 involves an increase of theses coefficients, suggesting that demographic background variables are stronger drivers of commuting behaviour than labour status variables. Also, in Model 2, the association between migration status and commuting behaviour was not significant, suggesting that internal migrants' specific commuting behaviour stemmed from their demographic background profile. In Model 4, there is a major decrease of the coefficients, highlighting that the elastic migrant phenomenon generates an overestimation of the coefficients and needs to be considered as an estimation bias in future studies. The full regression tables are available in Appendix (see Appendix, Tables 2).

Table 5. Associations between migration and commuting behaviour.

Y = Do commute *Variables*	Model 1	95% CI	Model 2	95% CI	Model 3	95% CI	Model 4	95% CI
Immigrants								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	2.93***	2.64 – 3.24	2.67***	2.37 – 3.01	3.12***	2.72 – 3.57	2.02***	1.75 – 2.35
Foreigners								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	3.77***	3.32 – 4.29	3.30***	2.82 – 3.85	3.88***	3.26 – 4.61	1.85***	1.52 – 2.27
Internal migrants								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	1.43***	1.27 – 1.62	1.16**	1.01 – 1.33	1.16*	0.99 – 1.36	1.16*	0.99 – 1.36
Immigrant children								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	1.60***	1.43 – 1.79	1.46***	1.29 – 1.64	1.53***	1.33 – 1.75	1.52***	1.32 – 1.74
Foreigner children								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	1.69***	1.49 – 1.91	1.49***	1.30 – 1.70	1.56***	1.34 – 1.81	1.55***	1.33 – 1.80
N (Immigrants)	*32,473*		*32,473*		*32,473*		*32,110*	

p: significance p*≤ 0.10 | p**≤ 0.05 | p***≤ 0.01. Wald test. Ref: reference group.*

3.4.4. Second Part: Could the MC Predict the Commuting Behaviour?

Assumption 3: The higher the MC, the higher the probability to commute abroad.

From the variables available from the FLFS, a 6-items MC Index was generated (see Table 6). As internal migration was not associated with commuting behaviour, we did not include it when composing the MC Indexes. Furthermore, the factor analysis, confirms the mismatch of this item with the others.

Table 6. The composition of the MC Indexes.

Acquired MC Index. 2 items
1. Born abroad
2. Foreign nationality
Inherited MC Index. 4 items
1. Mother- born abroad
2. Father- born abroad
3. Mother- foreign nationality
4. Father- foreign nationality
MC Index. 6 items
1. Born abroad
2. Foreign nationality
3. Mother- born abroad
4. Father- born abroad
5. Mother- foreign nationality
6. Father- foreign nationality

3.4.5. Preliminary factor analysis: Internal validity and reliability of the MC

The factor analysis (using principal component analysis as the extraction method) ascertained the one-dimensionality of the MC Index, validating the use of an index with migration variables (see Appendix, S1 Table 3). The first factor explained 70% of the variance, compared to 13% for the second factor, and 8% for the third one. The first factor had an eigenvalue of 4.20, with eigenvalues of 0.77 and 0.47 for the second and third factors, respectively. Following the Kaiser's rule (i.e., to retain only factors with an eigenvalue greater than 1), only one factor was retained. The calculation of the Cronbach's alpha coefficient (i.e., $\boldsymbol{\alpha}$=0.91) reveals the high level of internal consistency of the MC Index, indicating that our items measure migration well as a group. Both Acquired MC and Inherited MC were one-dimensional, too: their first factor explained 83% and 82% of the variance, respectively, with eigenvalues of 1.66 and 3.30 for the first factor compared to 0.34 and 0.47 for the second factor. Both Acquired MC and Inherited MC displayed a high level of internal consistency (i.e., respectively $\boldsymbol{\alpha}$=0.77 and $\boldsymbol{\alpha}$=0.93, respectively). The results of this analysis led us to drop internal migration from the composition of the MC Indexes, because this item did not correlate with any other items of the index.

Commuters have a higher endowment in Acquired MC, Inherited MC, and MC than non-commuters (see Table 7). Standard deviation (Sd) is constantly higher among commuters, suggesting that greater disparities in migration experiences do exist among them compared with non-commuters. These descriptive results suggest that the MC could be a potential driver of commuting behaviour. However, this higher endowment in MC can be due to the demographic background and labour status characteristics of the commuters, thus requiring the application of a multivariate analysis.

Table 7: MC endowment, by commuting behaviour. Mean scores.

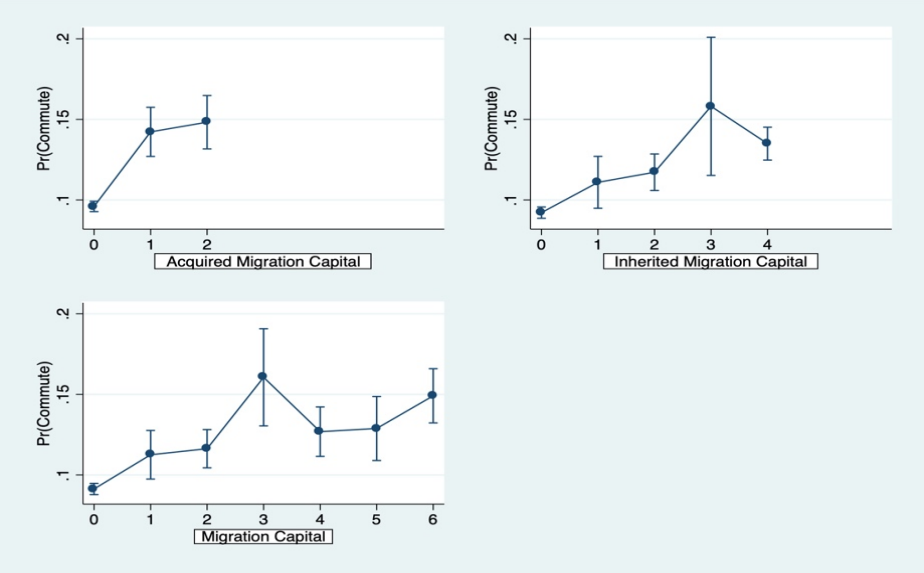
Commuting behaviour Types of MC	Do not commute	Sd	Do commute	Sd	p^*
Acquired MC's score (2 items)	0.14	0.47	0.34	0.69	***
Inherited MC's score (4 items)	0.68	1.36	1.18	1.67	***
MC's score (6 items)	0.82	1.70	1.52	2.22	***

p^*: significance $p^* \leq 0.1$ | $p^{**} \leq 0.05$ | $p^{***} \leq 0.01$. Student's t-test.

3.4.6. Commuting behaviour predictions: MC as explanatory variable

MC is significantly associated with commuting behaviour (see Appendix, Table 4). All units (i.e., 1,2,3,4,5,6) of the MC Index were significantly associated with commuting behaviour, indicating that the possession of the MC leads to a higher probability of commuting abroad. Considering the Model 4, the higher the MC and the higher the predicted probability to commute abroad, for all types of MC taken into consideration (see Figure 1). Indeed, a 3-score endowment for both Inherited MC, and MC could be considered as an outlier due to the large confidence intervals. These multivariate results suggest that MC is a relevant predictor of commuting behaviour.

Figure 1. Predicted probability to commute abroad, by types of MC. Model 4. 95% CI.



3.5. Discussion

Our research aimed to investigate migrants' commuting behaviour and to test the MC theory for commuters. Our key findings validated our three assumptions: (1) Migrants are more likely to commute abroad than non-migrants; this major finding is in line with previous studies that highlighted the greater mobile behaviour of migrants (Nekby, 2006) (Constant & Zimmermann, 2011) (Schündeln, 2014) (Champion, 2009) (Blumenberg,

2009) (Huber & Nowotny, 2013) (Welsch et al, 2018) (Pigeron-Piroth et al, 2018) (Hoon et al, 2020). (2) The capacity to deal with distance and borders can be transmitted to children by their parents. (3) The MC Index is a relevant predictor of commuting behaviour, the higher the MC Index, the higher the probability to commute abroad.

Others interesting findings should be mentioned: (1) Internal migration does not increase the probability to commute abroad. (2) Acquired migration experience is more valuable than inherited migration experience in individuals who commute abroad.

It is worth noting that immigrants' profiles (see Table 3) suggest conceiving migration as a bicephalous phenomenon, composed on one side by a golden migration stemming from the migration of highly qualified workers and on the other side by a steel migration stemming from the migration of poorly qualified workers. These descriptives challenge the common view of immigration as a monolithic phenomenon focused on individuals with poor status.

Ultimately, new research questions arise: (1) Why are migrants more likely to commute abroad than their non-migrant peers? (2) Why does internal migration not play a role in commuting abroad? (3) Is migration in and of itself a new type of capital?

3.5.1. Why are migrants more likely to commute abroad?

We argue that migrants are more mobile than non-migrants since they have more MC, which also leads to lower their mobility costs.

3.5.2. Mobility Costs

Mobility is a costly activity, generating direct and indirect costs. Migration is associated with: psychological, opportunity, temporal, information, and adjustment costs (Schwartz, 1973) (Levy & Wadycki, 1974).

Firstly, migrants are faced with direct mobility costs. Borders constitutes geographical and psychological obstacles to labor mobility. Mobility is associated with a psychological cost as it implies leaving a familiar environment, for instance, a neighborhood in the case of migration or a workplace in the case of commuting. Deep social ties into the community of origin entails to increase this psychological cost (Weisser, 2019). Since migrants have fewer social ties in the host country than their native peers, commuting

abroad might be less costly for them social-wise. For example, migrants usually do not have their family in their host country, leading them to be less rooted in the host country. Thus, leaving their work community in their country of residence in order to work abroad, will not decrease their sociability as much as is the case for their native peers. As a consequence, the weaker involvement in the host country's social life leads to higher expected net benefits from commuting abroad. In addition, psychologists might argue that once the psychological barrier to mobility has been suppressed, subsequent movement will be easier, leading migrants to deal with a lower psychological cost of mobility.

Behavioral economists have argued that mobility is perceived by migrants as an investment into uncertainty (Williams, 2012). Risk averse profiles are less likely to migrate (Heitmueller, 2005), suggesting that migrants could be less risk averse than non-migrants. In this case, migrants have a lower opportunity cost than non-migrants, since the net expected benefit from the change is higher. For example, risk taking workers will be more likely to take advantage of a professional opportunity abroad than risk averse workers, which might explain migrants' particular preference for commuting behaviour.

One is not born mobile, one becomes so, and some competencies are needed to move into the space. For example, public transport users need spatial guidance, to memorize the bus schedules or to direct themselves in the bus line (Chevrier & Juguet, 2003). International migrants need linguistics competencies to communicate in their host country, to accomplish the administrative procedures to obtain a residence permit, or to master the new technologies of communication to stay in touch with their family (Diminescu, 2020). The capacity to move into space is first and foremost an accumulation of experience that requires a "learning process", suggesting that mobility implies a temporal cost (Flamm & Kaufmann, 2006). Since migrants have already acquired migration experience in the past, each further mobility decision will be less costly the next time, leading them to be more likely to move again. Furthermore, once mobility has been chosen as a strategy, while overcoming the highest costs to move for the first time, shifting to a stationary strategy is more costly than continuing the mobility strategy. Thus, this migration path dependency led migrants to be more mobile than non-migrants.

Second, migrants face indirect mobility costs. In a context of incomplete information, migrants need to collect a wide range of information concerning the country of

destination (i.e., expected wage, expected rent, expected cost of life, etc.) to estimate the net benefit from migration. Information search is a costly process for migrants and a major component of migration costs (Porcher, 2020). Migrants face lower information cost for two reasons: (1) Migrants have already performed prior information searches in order to migrate the first time, and through a learning process, searching for information the second time is less costly than the first one, and (2) migrants benefit from a powerful source of information, the migrant networks, composed of individuals from the same country of origin. Migrant networks reduce information costs while sharing information with other members of their community (Zhao, 2003).

Dealing with distance and borders implies flexibility. While moving from their country of origin to their country of residence, migrants are facing an adjustment cost, by having to deal with new formal and informal institutions (North, 1991). The more straightforward example here is the language. Additionally, the working culture might be different. This is more particularly the case for French commuters working in Luxembourg, who have to deal with international teamwork situations. Thus, tolerance, openness, and adaptability could be playing a significant role in the selection of workers. In this respect, migrants could be at an advantage compared to non-migrants. Migrants tend to become more tolerant regarding social norms and values due to their increased exposure to a wide range of individuals with various lifestyles (Williams et al, 2014). Thus, migrants could be more adaptable than their native counterparts leading them to work abroad more often. However, if we argue that migrants have lower mobility costs than non-migrants, other explanations may as well contribute to this phenomenon.

3.5.3. Discrimination

The dual labour market theory (Piore, 2011) presupposes the existence of a stable, secure, and profitable segment monopolized by the local workforce and an unstable, precarious, and low-paid segment occupied by migrant workers. Natives try to monopolize valued and paid jobs while discriminating new enters in order to reduce the competition and to capture a rent. Within the EU, migrants face labour market discrimination. Some evidence of ethnic discrimination against immigrants has been found in Sweden (Rydgren, 2004), in Italy (Allasino et al, 2004), and in France (Meurs & Paillhé, 2010).

Discrimination has been highlighted as a major trigger of migrants' migration decision (Ahrens et al, 2016). In France, hiring discrimination is widely used by employers, especially against immigrant children, leading them to be more often unemployed rates and underrepresented in the public sector (OECD, 2008). Let us suppose a situation with two countries, a host country (A) and a working country (B). In the host country, discrimination occurs, leading migrants to receive lower wages than non-migrants for a same level of education (Wn > Wm). Due to the shortage of workers in the destination country (i.e., because of a higher economic growth and a limited local workforce), recruiters might select less based on ethnic considerations than in countries with low economic growth. Thus, no discrimination occurs in the country B (Wn = Wm). Now, let us denote the natives' commuting wage premium (CWPn), the wage premium obtained by natives when they decide to commute abroad, which is equal to the wage gap between the country A and country B for the identical job (CWPn = Wb-Wa). Migrants' commuting wage premium (CWPm) is equal to the wage gap between the country A and country B for the identical job, plus the wage gap between migrant workers and native workers in the host country (CWPm= (Wb-Wa) + (Wn-Wm)). As a consequence, the commuting premium is higher for migrants than for non-migrants, leading discrimination to generate a greater incentive to commute abroad for migrants.

3.5.4. Linguistic skills

Contrarily to the USA or China, the EU does not benefit from the existence of one *lingua franca* across the continent; rather is it composed of 24 official languages. Thus, moving from one country to another in order to work implies the knowledge of several languages. The share of French citizens that is able to hold a conversion in a foreign language is one of the smallest within the EU (European Commission, 2006). Switzerland and Luxembourg attract 70% of the French commuters (Mironova & Villaume, 2019) and are both multilinguistic countries. Switzerland has four official languages (i.e., German, Italian, Romance and French) whereas Luxembourg has three official languages (i.e., Luxembourgish, German, and French).

The lack of linguistic skills restricts the access to employment in the European labour market (Perchinig et al, 2018). As a consequence, workers who possesses the capacity to

speak different foreign languages, are more likely to be hired in these countries (Fehlen, 2005), and this could be the case for international migrants because they usually speak at least two languages, the one of their country of origin, and the one of their host countries.

3.5.5. Why does internal migration not play a role in commuting abroad?

Commuting abroad implies having to deal with international borders, while internal migrants only deal with the national one. Furthermore, moving within a country does not give internal migrants the opportunity to be in contact with a wide range of individuals and cultures, which does not improve their capacity of adjustment. Third, moving within a single country does not imply having to speak a different language. We can assume that internal migrants' linguistic skills are similar to the skills of non-migrants, thus implying a lower likelihood to be hired in a multilinguistic country.

3.5.6. Is migration in and of itself a new type of capital?

Migration can be considered as a capital, since the higher the MC Index, and the higher the probability to commute abroad. Theoretical consideration leads us to support this assumption, since the MC possesses four properties common to all forms of capital.

3.5.7. A cumulative property

Migrants can accumulate migration experience throughout their lifetime (Flamm & Kaufmann, 2006) (Kou & Bailey, 2014) (Moret, 2020). In this study, this accumulation is represented by the MC Index scale. The higher the score, the broader the previous migration experience. Our results indicate that a higher MC is associated with a greater likelihood to commute abroad.

3.5.8. A conversion property

Bourdieu (1987) emphasized capital conversion as a major driver of social mobility. For example, business bourgeois convert economic capital into cultural capital in order to maintain the position of their offspring in the social hierarchy. We can assume that the

conversion of MC into economic capital is used as a new strategy of upward social mobility. While working abroad, commuters are using their capacity to deal with space and borders to obtain a higher wage than non-commuters. It has been shown that commuters receive a higher wage than the non-commuters (3,383€ vs. 1,814€), regardless the country of destination taken into consideration (Nonnenmacher et al, 2021). In cross-border areas, such wage gaps might rearrange the local social hierarchy, since MC yields might outperform those of cultural capital. For example, poorly educated commuters toward Luxembourg might earn a higher wage than highly educated workers in France. The higher the gap, the higher the incentive to proceed to the conversion for endowed workers in MC and to invest in MC for unendowed workers.

3.5.9. An inequality generator property

Because commuters receive higher wages than non-commuters and that workers benefiting from MC are more likely to commute abroad, then the MC is generating inequalities among workers within cross-border territories. This property has already been highlighted in the literature (Moret, 2020), particulary by Beck (2007, 695) when he argued that "*the resource and capacity… to cross nation state boundaries or to instrument them for the accumulation of life chance, has become a key variable of social inequality in the globalized world"*. Transnational inequalities stem from the capacity to deal with distance and borders, establishing the MC as the new divide among the social classes.

3.5.10. A transmission property

Our findings highlighted that previous migration experience can be transmitted to the next generation by the parents through the transfer of the migration habitus. The higher the Inherited MC, the greater the likelihood to commute abroad. In doing so, MC has a similar transmission process as the cultural capital. The transmission is not happening through legal and financial transfers, as is the case for economic capital, but is hidden in the socialization of the children through the family history.

3.6. Strengths and Limitations

One strength point of our study is the sample size, which makes possible the analysis of the association between MC and commuting behaviour possible. Controlling the results with 13 demographic background and labour status variables reduces estimation biases. Furthermore, no subjects were included twice in our sample, since we only retained the data from each worker's first interview. Analyses of the data from the last wave led to very similar results, corroborating the robustness of our findings (see Appendix, Table 5 and Figure 1).

However, our MC Index is restricted to geographical movement and does not include other variables that could be related to the capacity to deal with space and borders like linguistic competencies or soft skills, which are of a prime importance to finding employment abroad. Furthermore, the FLFS does not provide information on workers' networks. As commuters use networking as their main channel of job search (Brosius, 2007), the absence of a control for workers' network density might have biased our estimates. Finally, Model 4 might have underestimated the association between migration and commuting behaviour, because European nationalities other than the Belgian, German, Swiss, and Monegasque were suppressed in this model, too. Indeed, after 2013, the variable for nationality shrunk from 28 nationalities to 14 nationalities, aggregating all Europeans nationalities (with the exception of the French, Spanish, Italian, and Portuguese nationalities) under an "other 28 EU nationalities" modality.

3.7. Conclusion

Our major finding that migrants are more likely to commute abroad has implications for migration policies within the EU, since commuting abroad generates both economic and social positive externalities. Commuting abroad increases the performance and the resilience of the European labour market while: providing a better match between workers and job vacancies, increasing the competition between workers, stimulating the rise of the average educational attainment level of the workforce, increasing the average productivity of the workforce, resolving labor shortages, and improving the size of the employed population and the demand for goods and services (Parenti & Tealdi, 2021). A mobile workforce is a *sine qua non* condition to an optimal currency area (Mundell,

1961). In the absence of monetary policies, commuting abroad acts as an equilibrium mechanism, helping EU member states to face asymmetric shocks (Heinz, 2006). As well, commuters contribute to smooth the per capita income between the EU members, reducing economic inequalities and fostering the economic harmonization within the EU. Through their everyday movement across borders, participation in the labour market and social life in the country of destination, commuters elaborate transnational networks that contribute to strengthen a sense of belonging to the EU. Policy makers might relocate migrant flows toward cross-border departments to enhance migrants' integration and to stimulate the emission of externalities within the EU.

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3.9. Appendix

3.9.1. Descriptives

Appendix Table 1: Descriptive values of demographic background and labour status variables by migrants' groups in %. Full Table

Variables	**Non-immigrants**	**Immigrants**	**p***	**Non-foreigners**	**Foreigners**	**p***	Non-internal migrants	Internal migrants	p*
Demographic background									
Sex									
Women	49	44	***	49	42	**	49	48	
Men	51	56		51	58		51	52	
Age									
20-29	19	13	***	18	16	***	19	18	
30-39	27	27		27	32	***	26	28	
40-49	29	31	*	29	32		28	29	
50-60	25	30	***	26	21	***	27	24	
Education									
No diploma	7	19	***	8	23	***	8	5	***
Up to high school diploma	53	45	***	53	41	***	56	42	***
Up to Bachelor's degree	25	16	***	25	14	***	25	27	**
Master's degree & above	14	20	***	15	22	***	12	27	***
Occupational category									
White collar workers	17	18	*	17	19		15	28	***
Intermediate professions	31	22	***	31	19	***	31	33	**
Employees	28	25	***	28	22	***	29	24	***
Blue collar workers	24	35	***	24	41	***	26	15	***
Father's occupational category									
Farmers	4	6	***	4	7	***	5	3	**
Artisans, merchants, company directors	11	13	***	11	13	***	10	12	*
White collar workers	12	15	***	13	15	**	11	22	***
Intermediate professions	18	11	***	18	10	***	18	21	***
Employees	10	11	**	10	10		10	12	**
Blue collar workers	44	43		44	44		45	28	***
Other without professional activities	1	1		1	1		1	1	
Marital status									
Married	46	62	***	47	60	***	46	45	
Single	44	27	***	43	30	***	44	44	
Divorced or widowed	10	11	**	10	10		10	11	
Children									
No	47	41	***	46	43		47	48	**
Yes	53	59		54	57		53	52	
Department of residence									
Ain 01	7	5	***	7	6	***	6	9	***
Alpes-Maritimes 06	8	20	***	9	19	***	4	18	***
Ardennes 08	2	2	**	2	2	*	3	2	*
Doubs 25	6	4	***	6	3	***	6	7	
Jura 39	3	1	***	3	1	***	3	5	
Meurthe-et-Moselle 54	8	6	***	8	6		9	5	***
Moselle 57	10	10		10	8	*	10	5	***
Nord 59	25	14	***	25	14	***	30	15	***
Bas-Rhin 67	12	14	***	12	14	***	13	9	***
Haut-Rhin 68	8	10		8	11		8	6	***
Haute-Savoie 74	9	13	***	9	15	***	7	18	***
Territoire de Belfort 90	1	1		1	1		1	1	
Labour status									

Permanency of the job									
Open ended contract	90	85	***	89	82	***	90	89	
Fix-term contract	8	11	***	8	13	***	8	9	
Interim	2	4	***	2	5	***	2	2	
Sector									
Agriculture	1	0		1	0		1	0	**
Industry & construction	24	27		24	31	**	25	20	***
Trade, transport, lodging & catering	22	22		22	22		22	20	***
Information & communication	2	3	**	2	3	***	2	3	***
Finance & insurance	4	3		3	3		3	4	*
Real estate	1	1		1	1		1	1	
Scientific & technical activities	10	14	***	10	16	***	9	10	
Public administration	33	26	***	33	19	***	33	37	***
Other services	3	5	***	3	6	***	3	4	
Number of persons employed at the local unit									
0-9	17	19	**	17	21	***	18	16	***
10-49	29	27	***	29	28		29	30	
50-499	37	37		37	36		36	37	
500+	17	16		17	15		16	17	
Wage									
0-2,000	64	62		64	63		66	54	***
2,001-4,000	31	29		31	27	***	30	37	***
4,001+	5	9	***	5	10	***	4	9	***
Part-time/full-time employment									
Part-time	17	19	*	18	19	**	18	15	***
Full-time	83	81		83	81		82	85	

Variables	**Non-immigrant children**	**Immigrant children**	**p***	**Non-foreigner children**	**Foreigner children**	**p***
Demographic background						
Sex						
Women	48	51	***	49	50	*
Men	52	49		51	50	
Age						
20-29	19	19		19	20	
30-39	27	28		27	27	
40-49	28	30	*	29	29	
50-60	26	23		26	24	
Education						
No diploma	7	9	**	7	9	***
Up to high school diploma	53	55	***	53	57	***
Up to Bachelor's degree	25	23	***	25	22	***
Master's degree & above	15	13	***	15	12	***
Occupational category						
White collar workers	17	15	***	18	13	***
Intermediate professions	31	30		31	29	**
Employees	28	31	***	28	31	***
Blue collar workers	23	24		23	27	***
Father's occupational category						
Farmers	4	1	***	4	1	***
Artisans, merchants, company directors	11	11		11	11	
White collar workers	13	10	***	13	6	***
Intermediate professions	19	14	***	19	11	***
Employees	11	7	***	11	5	***
Blue collar workers	42	57	***	41	66	***
Other without professional activities	1	1	*	1	1	
Marital status						
Married	46	47	***	46	47	**
Single	44	43	**	44	43	*

Divorced or widowed	10	10		10	10	
Children						
No	47	45	***	47	46	
Yes	53	55		53	54	
Department of residence						
Ain 01	7	6		7	5	
Alpes-Maritimes 06	7	15	***	8	11	***
Ardennes 08	3	2	**	3	2	**
Doubs 25	6	6	**	6	6	
Jura 39	3	2	***	3	2	**
Meurthe-et-Moselle 54	8	9		8	11	
Moselle 57	9	14	***	9	17	***
Nord 59	27	17	***	26	18	***
Bas-Rhin 67	13	10	***	13	10	***
Haut-Rhin 68	8	9	**	8	9	**
Haute-Savoie 74	9	9		9	9	
Territoire de Belfort 90	1	1		1	1	
Labour status						
Permanency of the job						
Open ended contract	90	88		90	88	
Fix-term contract	8	9		8	9	
Interim	2	3	**	2	4	***
Sector						
Agriculture	1	0	***	1	0	***
Industry & construction	24	24		24	26	
Trade, transport, lodging & catering	22	23	**	22	24	***
Information & communication	2	2		2	2	
Finance & insurance	4	3		4	3	
Real estate	1	1		1	1	
Scientific & technical activities	9	11	**	10	11	
Public administration	34	31	**	34	30	***
Other services	3	4		3	3	
Number of persons employed at the local unit						
0-9	17	18		17	18	
10-49	30	28	**	30	28	*
50-499	37	37		36	37	
500+	17	18		17	18	
Wage						
0-2,000	64	66	**	64	66	***
2,001-4,000	31	29	*	31	29	**
4,001+	5	5		5	4	
Part-time/full-time employment						
Part-time	17	18		17	18	
Full-time	83	82		83	82	

p: significance p* ≤ 0.1 | p** ≤ 0.05 | p*** ≤ 0.01. Chi-square test.*

3.9.2. Multivariate Analysis

Appendix Tables 2: Associations between migration status and commuting behaviour. Full Tables.

Migration outcomes Model 1	Immigrants	95% CI	Foreigners	95% CI	Internal migrants	95% CI	Immigrant children	95% CI	Foreigner children	95% CI
Migration status										
Non-migrants	*Ref*		*Ref*		*Ref*		*Ref*		*Ref*	
Migrants	2.93***	2.64 – 3.24	3.77***	3.32 – 4.29	1.43***	1.27 – 1.62	1.60***	1.43 – 1.79	1.69***	1.49 – 1.91

Model 1: commuting behaviour
p: significance p*≤ 0.1 | p**≤ 0.05 | p***≤ 0.01. Wald test.*

Migration outcomes Model 2	Immigrants	95% CI	Foreigners	95% CI	Internal migrants	95% CI	Immigrant children	95% CI	Foreigner children	95% CI
Migration status										
Non-migrants	*Ref*		*Ref*		*Ref*		*Ref*		*Ref*	
Migrants	2.67***	2.36 – 3.01	3.30***	2.82 – 3.85	1.16**	1.01 – 1.33	1.46***	1.29 – 1.64	1.49***	1.30 – 1.70
Sex										
Women	Ref		Ref		Ref		Ref		Ref	
Men	1.52***	1.38 - 1.68	1.52***	1.38 – 1.68	1.67***	1.46 – 1.89	1.66***	1.48 – 1.86	1.66***	1.48 – 1.86
Age										
20-29	1.24***	1.06 – 1.45	1.17*	1.00 – 1.37	1.43***	1.17 – 1.74	1.30***	1.09 – 1.54	1.30***	1.09 – 1.55
30-39	1.44***	1.27 – 1.65	1.37***	1.20 – 1.56	1.63***	1.38 – 1.94	1.51***	1.30 – 1.76	1.52***	1.31 – 1.77
40-49	1.44***	1.28 – 1.61	1.38***	1.23 – 1.55	1.43***	1.23 – 1.66	1.45***	1.27 – 1.66	1.46***	1.28 – 1.67
50-60	Ref		Ref		Ref		Ref		Ref	
Education										
No diploma	Ref		Ref		Ref		Ref		Ref	
Up to high school diploma	1.29***	1.10 – 1.51	1.30***	1.11 – 1.52	1.47***	1.16 – 1.85	1.37***	1.13 – 1.66	1.37**	1.13 – 1.66
Up to Bachelor's degree	1.37***	1.13 – 1.66	1.39***	1.14 – 1.69	1.51***	1.14 – 2.00	1.51***	1.20 – 1.91	1.51***	1.19 – 1.91
Master's degree & above	1.69***	1.35 – 2.11	1.71***	1.36 – 2.15	2.04***	1.48 – 2.81	2.02***	1.54 – 2.66	2.01***	1.53 – 2.63
Occupational category										
White collar workers	0.90	0.78 – 1.04	0.89	0.77 – 1.03	0.88	0.73 – 1.06	0.93	0.78 – 1.10	0.93	0.79 – 1.10
Intermediate professions	Ref		Ref		Ref		Ref		Ref	
Employees	0.80**	0.69 – 0.91	0.80***	0.70 – 0.92	0.82**	0.69 – 0.99	0.84**	0.71 – 0.99	0.84**	0.71 – 0.98
Blue collar workers	1.44***	1.25 – 1.65	1.44***	1.25 – 1.65	1.69***	1.41 – 2.01	1.79***	1.53 – 2.10	1.79***	1.53 – 2.10
Occupational category: father										
Farmers	0.95	0.75 - 1.21	0.94	0.74 – 1.19	0.99	0.75 – 1.32	1.05	0.81 – 1.37	1.03	0.79 – 1.34
Artisans, merchants, company directors	1.19*	1.00 – 1.43	1.20**	1.01 – 1.44	1.33**	1.06 – 1.68	1.28**	1.04 – 1.57	1.27**	1.04 – 1.56
White collar workers	0.88	0.75 – 1.04	0.90	0.76 – 1.06	0.90	0.73 – 1.10	0.95	0.79 – 1.14	0.95	0.79 – 1.15
Intermediate professions	Ref		Ref		Ref		Ref		Ref	
Employees	0.88	0.74 – 1.04	0.89	0.75 – 1.06	0.77**	0.62 – 0.96	0.85	0.69 – 1.04	0.85	0.69 – 1.04
Blue collar workers	1.12*	0.98 – 1.27	1.13*	0.99 – 1.28	1.12	0.95 – 1.31	1.13*	0.98 – 1.31	1.12	0.97 – 1.29
Other without professional activities	0.62	0.30 – 1.30	0.62	0.29 – 1.29	0.61	0.25 – 1.50	0.57	0.26 – 1.26	0.57	0.25 – 1.27
Marital status										
Married	1.13**	1.02 – 1.27	1.15**	1.03 – 1.29	1.22***	1.06 – 1.40	1.16**	1.03 – 1.32	1.16**	1.03 – 1.31
Single	Ref		Ref		Ref		Ref		Ref	
Divorced or widowed	1.34***	1.15 – 1.04	1.35***	1.16 – 1.58	1.46***	1.20 – 1.78	1.46***	1.22 – 1.73	1.45***	1.22 – 1.73
Children										
No	Ref		Ref		Ref		Ref		Ref	
Yes	0.94	0.85 – 1.04	0.96	0.87 – 1.06	1.02	0.90 – 1.16	1.03	0.92 – 1.15	1.03	0.92 – 1.15
Department of residence										
Ain 01	Ref		Ref		Ref		Ref		Ref	
Alpes-Maritimes 06	1.99***	1.53 – 2.59	2.11***	1.62 – 2.74	2.23***	1.40 – 3.56	1.90***	1.31 – 2.74	1.96***	1.36 – 2.83
Ardennes 08	0.75	0.53 – 1.08	0.75	0.53 – 1.08	0.87	0.49 – 1.54	0.69	0.42 – 1.12	0.68	0.42 – 1.11
Doubs 25	3.78***	2.90 – 4.91	3.85***	2.96 – 5.01	6.94***	4.51 – 10.67	5.47***	3.89 – 7.70	5.42***	3.85 – 7.63
Jura 39	1.18	0.80 – 1.73	1.18	0.80 – 1.73	2.16***	1.27 – 3.68	1.75**	1.12 – 2.75	1.74**	1.11 – 2.73
Meurthe-et-Moselle 54	3.26***	2.54 – 4.19	3.27***	2.54 – 4.20	4.56***	2.98 – 6.97	4.35***	3.13 – 6.06	4.30***	3.09 – 5.99
Moselle 57	2.79***	2.16 – 3.61	2.87***	2.22 – 3.71	4.68***	3.02 – 7.25	3.99***	2.84 – 5.59	3.93***	2.80 – 5.51

Nord 59	0.56***	0.43 – 0.73	0.57***	0.44 – 0.74	0.75	0.49 – 1.16	0.74*	0.52 – 1.05	0.73*	0.52 – 1.03
Bas-Rhin 67	0.80	0.61 – 1.06	0.82	0.62 – 1.08	1.56**	1.00 – 2.43	1.18	0.83 – 1.68	1.17	0.82 – 1.67
Haut-Rhin 68	3.64***	2.83 – 4.68	3.68***	2.87 – 4.74	7.29***	4.78 – 11.13	5.32***	3.81 – 7.43	5.31***	3.81 – 7.41
Haute-Savoir 74	7.12***	5.54 – 9.16	7.28***	5.66 – 9.36	12.99***	8.49 – 19.88	10.92***	7.82 – 15.26	10.88***	7.79 – 15.20
Territoire de Belfort 90	3.27***	2.27 – 4.71	3.28***	2.28 – 4.72	6.46***	3.88 – 10.76	5.00***	3.27 – 7.65	4.97***	3.25 – 7.59

p: significance p*≤ 0.1 | p**≤ 0.05 | p***≤ 0.01. Wald test.*
Model 2: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments.

Migration outcomes Model 3	Immigrants	95% CI	Foreigners	95% CI	Internal migrants	95% CI	Immigrant children	95% CI	Foreigner children	95% CI
Migration status										
Non-migrants	*Ref*		*Ref*		*Ref*		*Ref*		*Ref*	
Migrants	3.12***	2.72 – 3.57	3.88***	3.26 – 4.61	1.16*	0.99 – 1.36	1.53***	1.33 – 1.75	1.56***	1.34 – 1.81
Sex										
Women	Ref		Ref		Ref		Ref		Ref	
Men	0.82***	0.72 - 0.92	0.82***	0.72 – 0.92	0.83**	0.71 – 0.98	0.85**	0.74 – 0.97	0.84**	0.74 – 0.97
Age										
20-29	2.69***	2.24 – 3.24	2.55***	2.12 – 3.06	3.18***	2.49 – 4.05	2.77***	2.24 – 3.41	2.77***	2.25 – 3.42
30-39	2.18***	1.88 – 2.52	2.06***	1.78 – 2.38	2.49***	2.05 – 3.02	2.25***	1.90 – 2.67	2.27***	1.92 – 2.69
40-49	1.73***	1.51 – 1.97	1.64***	1.44 – 1.87	1.69***	1.42 – 2.02	1.72***	1.48 – 2.01	1.73***	1.49 – 2.02
50-60	Ref		Ref		Ref		Ref		Ref	
Education										
No diploma	Ref		Ref		Ref		Ref		Ref	
Up to high school diploma	0.90	0.76 – 1.06	0.91	0.77 – 1.08	0.97	0.77 – 1.23	1.00	0.82 – 1.22	0.99	0.81 – 1.21
Up to Bachelor's degree	0.75***	0.61 – 0.92	0.76***	0.61 – 0.93	0.76*	0.57 – 1.01	0.83	0.65 – 1.06	0.82	0.64 – 1.05
Master's degree & above	0.75**	0.59 – 0.96	0.76**	0.59 – 0.97	0.87	0.62 – 1.21	0.92	0.69 – 1.22	0.92	0.69 – 1.22
Occupational category										
White collar workers	0.29***	0.24 – 0.35	0.29***	0.24 – 0.35	0.28***	0.22 – 0.35	0.30***	0.24 – 0.37	0.30***	0.24 – 0.37
Intermediate professions	Ref		Ref		Ref		Ref		Ref	
Employees	1.71***	1.44 – 2.02	1.72***	1.45 – 2.03	1.88***	1.52 – 2.32	1.80***	1.48 – 2.18	1.79***	1.48 – 2.17
Blue collar workers	2.38***	2.03 – 2.79	2.40***	2.04 – 2.81	2.72***	2.22 – 3.31	2.78***	2.32 – 3.33	2.78***	2.32 – 3.32
Occupational category: father										
Farmers	1.14	0.89 – 1.46	1.10	0.86 – 1.41	1.09	0.81 – 1.47	1.15	0.87 – 1.52	1.12	0.85 – 1.49
Artisans, merchants, company directors	1.22**	1.01 – 1.48	1.23**	1.02 – 1.49	1.41***	1.10 – 1.80	1.33**	1.06 – 1.66	1.32**	1.06 – 1.65
White collar workers	0.88	0.73 – 1.05	0.88	0.73 – 1.05	0.89	0.71 – 1.11	0.95	0.78 – 1.16	0.95	0.78 – 1.16
Intermediate professions	Ref		Ref		Ref		Ref		Ref	
Employees	0.88	0.72 – 1.09	0.90	0.73 – 1.11	0.78*	0.60 – 1.02	0.88	0.69 – 1.12	0.88	0.69 – 1.12
Blue collar workers	1.20**	1.04 – 1.39	1.20**	1.04 – 1.38	1.16	0.97 – 1.38	1.22**	1.05 – 1.43	1.21**	1.03 – 1.41
Other without professional activities	1.05	0.54 – 2.04	1.05	0.54 – 2.03	1.37	0.58 – 3.23	1.08	0.49 – 2.39	1.09	0.50 – 2.40
Marital status										
Married	0.95	0.84 – 1.08	0.97	0.86 – 1.10	0.96	0.82 – 1.12	0.93	0.81 – 1.06	0.92	0.81 – 1.06
Single	Ref		Ref		Ref		Ref		Ref	
Divorced or widowed	1.23**	1.04 – 1.46	1.25***	1.06 – 1.48	1.34***	1.07 – 1.67	1.33***	1.11 – 1.61	1.33***	1.10 – 1.61
Children										
No	Ref		Ref		Ref		Ref		Ref	
Yes	0.83***	0.75 – 0.93	0.85***	0.76 – 0.95	0.90	0.78 – 1.04	0.89*	0.79 – 1.01	0.90*	0.79 – 1.02
Department of residence										
Ain 01	Ref		Ref		Ref		Ref		Ref	
Alpes-Maritimes 06	2.38***	1.79 – 3.18	2.55***	1.91 – 3.40	2.59***	1.57 – 4.25	2.20***	1.48 – 3.27	2.29***	1.55 – 3.40
Ardennes 08	0.88	0.59 – 1.32	0.87	0.58 – 1.29	0.93	0.51 – 1.71	0.73	0.43 – 1.24	0.73	0.43 – 1.23
Doubs 25	3.01***	2.30 – 3.95	3.04***	2.32 – 3.98	5.21***	3.37 – 8.06	4.21***	2.97 – 5.96	4.16***	2.94 – 5.90
Jura 39	1.40	0.93 – 2.11	1.39	0.93 – 2.09	2.51***	1.43 – 4.40	2.00***	1.24 – 3.22	1.97***	1.22 – 3.19

Meurthe-et-Moselle 54	4.18***	3.19 – 5.48	4.13***	3.15 – 5.41	5.41***	3.46 – 8.46	5.20***	3.66 – 7.38	5.13***	3.62 – 7.29
Moselle 57	3.09***	2.35 – 4.06	3.12***	2.37 – 4.09	4.88***	3.11 – 7.64	4.14***	2.91 – 5.90	4.07***	2.86 – 5.80
Nord 59	0.75**	0.57 – 0.99	0.74**	0.56 – 0.98	0.99	0.63 – 1.56	0.95	0.66 – 1.37	0.94	0.65 – 1.35
Bas-Rhin 67	0.87	0.65 – 1.17	0.88	0.66 – 1.19	1.64**	1.04 – 2.59	1.25	0.86 – 1.82	1.24	0.86 – 1.80
Haut-Rhin 68	3.38***	2.60 – 4.41	3.41***	2.62 – 4.44	6.71***	4.33 – 10.39	4.79***	3.39 – 6.79	4.77***	3.37 – 6.75
Haute-Savoir 74	5.57***	4.28 – 7.25	5.63***	4.33 – 7.32	10.12***	6.54 – 15.65	8.41***	5.94 – 11.91	8.40***	5.94 – 11.88
Territoire de Belfort 90	3.33***	2.32 – 4.78	3.30***	2.31 – 4.71	6.49***	3.90 – 10.80	4.93***	3.23 – 7.53	4.88***	3.20 – 7.45
Permanency of the job										
Open ended contract	0.99	0.79 – 1.24	0.99	0.78 – 1.24	0.92	0.68 – 1.24	0.89	0.68 – 1.16	0.89	0.68 – 1.16
Short term contract	Ref		Ref		Ref		Ref		Ref	
Interim	1.41*	0.97 – 2.03	1.37*	0.94 – 1.98	1.70**	1.04 – 2.78	1.45*	0.95 – 2.21	1.43*	0.94 – 2.18
Sector										
Agriculture	0.69	0.32 – 1.50	0.69	0.32 – 1.49	1.09	0.49 – 2.46	1.00	0.45 – 2.19	0.99	0.45 – 2.18
Industry & construction	3.26***	2.79 – 3.81	3.18***	2.72 – 3.72	4.02***	3.27 – 4.94	3.78***	3.16 – 4.53	3.79***	3.16 – 4.53
Trade, transport, lodging & catering	3.12***	2.66 – 3.66	3.09***	2.64 – 3.63	3.59***	2.90 – 4.45	3.49***	2.90 – 4.21	3.50***	2.90 - 4.22
Information & communication	3.40***	2.49 – 4.65	3.43***	2.52 – 4.67	4.77***	3.26 – 6.98	4.52***	3.19 – 6.40	4.57***	3.24 – 6.45
Finance & insurance	3.26***	2.49 – 4.27	3.25***	2.48 – 4.24	3.34***	2.35 – 4.75	3.72***	2.76 – 5.02	3.73***	2.77 – 5.03
Real estate	2.20***	1.37 – 3.52	2.27***	1.43 – 3.61	2.53	1.34 – 4.81	2.52*	1.42 – 4.47	2.56***	1.43 – 4.58
Scientific & technical activities	3.14***	2.59 – 3.81	3.14***	2.59 – 3.81	3.33***	2.54 – 4.36	3.45***	2.75 – 4.33	3.47***	2.76 – 4.36
Public administration	Ref		Ref		Ref				Ref	
Other services	3.21***	2.42 – 4.25	3.15***	2.37 – 4.17	3.89***	2.75 – 5.51	4.02***	2.90 – 5.57	4.02***	2.89 – 5.59
Number of persons employed at the local unit										
0-9	Ref		Ref		Ref		Ref		Ref	
10-49	1.25***	1.07 – 1.47	1.27***	1.08 – 1.48	1.29**	1.05 – 1.60	1.30***	1.08 – 1.57	1.31***	1.09 – 1.58
50-499	1.49***	1.27 – 1.74	1.51***	1.29 – 1.76	1.64***	1.33 – 2.01	1.64***	1.37 – 1.97	1.64***	1.37 – 1.97
≥500	1.61***	1.34 – 1.93	1.62***	1.35 – 1.94	1.75***	1.38 – 2.22	1.73***	1.40 – 2.13	1.73***	1.40 – 2.14
Wage										
0-2,000	Ref		Ref		Ref		Ref		Ref	
2,001-4,000	13.67***	11.84 – 15.80	13.74***	11.89 – 15.88	15.53***	12.81 – 18.83	14.66***	12.43 – 17.29	14.63***	12.41 – 17.25
≥4,001	128.14***	102.48 – 160.23	129.06***	103.21 – 161.38	161.60***	121.33 – 215.24	142.86***	111.16 – 183.61	143.04***	111.29 – 183.84
Part-time/full-time employment										
Full-time	Ref		Ref		Ref		Ref		Ref	
Part-time	2.83***	2.46 – 3.25	2.84***	2.46 – 3.27	3.21***	2.64 – 3.89	3.02***	2.56 – 3.55	3.01***	2.56 – 3.55

p: significance p*≤ 0.1 | p**≤ 0.05 | p***≤ 0.01. Wald test.*
Model 3: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment.

Migration outcomes Model 4	Immigrants	95% CI	Foreigners	95% CI	Internal migrants	95% CI	Immigrant children	95% CI	Foreigner children	95% CI
Migration status										
Non-migrants	*Ref*		*Ref*		*Ref*		*Ref*		*Ref*	
Migrants	2.02***	1.75 – 2.35	1.85***	1.52 – 2.27	1.16*	0.99 – 1.36	1.52***	1.32 – 1.74	1.55***	1.33 – 1.80
Sex										
Women	Ref		Ref		Ref		Ref		Ref	
Men	0.83***	0.73 – 0.94	0.83**	0.73 – 0.94	0.83**	0.71 – 0.98	0.85**	0.74 – 0.97	0.85**	0.74 – 0.97
Age										
20-29	2.82***	2.34 – 3.41	2.75***	2.27 – 3.32	3.18***	2.49 – 4.05	2.76***	2.24 – 3.41	2.77***	2.24 – 3.42
30-39	2.19***	1.88 – 2.55	2.14***	1.83 – 2.49	2.49***	2.05 – 3.02	2.25***	1.90 – 2.67	2.27***	1.92 – 2.69
40-49	1.72***	1.50 – 1.98	1.68***	1.47 – 1.93	1.69***	1.42– 2.02	1.72***	1.48 – 2.01	1.73***	1.49 – 2.02
50-60	Ref		Ref		Ref		Ref		Ref	
Education										
No diploma	Ref		Ref		Ref		Ref		Ref	
Up to high school diploma	0.84**	0.71 – 1.00	0.82**	0.69 – 0.97	0.97	0.77 – 1.23	1.00	0.82 – 1.22	0.99	0.81 – 1.21
Up to Bachelor's degree	0.72***	0.58 – 0.89	0.70***	0.57 – 0.87	0.76*	0.57 – 1.01	0.83	0.65 – 1.06	0.82	0.64 – 1.05
Master's degree & above	0.76**	0.59 – 0.98	0.75**	0.58 – 0.97	0.87	0.62 – 1.21	0.91	0.69 – 1.22	0.91	0.68 – 1.21
Occupational category										
White collar workers	0.28***	0.23 – 0.34	0.28***	0.23 – 0.34	0.28***	0.22 – 0.35	0.30***	0.24 – 0.37	0.30***	0.24 – 0.37
Intermediate professions	Ref		Ref		Ref		Ref		Ref	
Employees	1.81***	1.52 – 2.15	1.81***	1.53 – 2.16	1.88***	1.52 – 2.32	1.80***	1.49 – 2.19	1.80***	1.48 – 2.18
Blue collar workers	2.61***	2.21 – 3.07	2.64***	2.24 – 3.12	2.72***	2.22 – 3.31	2.79***	2.33 – 3.34	2.78***	2.32 – 3.33
Occupational category: father										
Farmers	1.23	0.96 - 1.58	1.23	0.95 – 1.58	1.09	0.81 – 1.47	1.15	0.87 – 1.52	1.12	0.85 – 1.48
Artisans, merchants, company directors	1.28**	1.05 – 1.56	1.30**	1.06 – 1.58	1.41***	1.10 – 1.80	1.33**	1.06 – 1.66	1.32**	1.06 – 1.65
White collar workers	0.88	0.73 – 1.06	0.88	0.73 – 1.06	0.89	0.71 – 1.11	0.95	0.78 – 1.16	0.95	0.78 – 1.16
Intermediate professions	Ref		Ref		Ref		Ref		Ref	
Employees	0.87	0.70 – 1.08	0.89	0.71 – 1.10	0.78*	0.60 – 1.02	0.88	0.69 – 1.12	0.88	0.69 – 1.12
Blue collar workers	1.24***	1.07 – 1.43	1.25***	1.08 – 1.44	1.16	0.97 – 1.38	1.22**	1.04 – 1.43	1.20**	1.03 – 1.41
Other without professional activities	0.87	0.41 – 1.88	0.88	0.41 – 1.90	1.37	0.58 – 3.23	1.08	0.49 – 2.39	1.09	0.50 – 2.40
Marital status										
Married	0.97	0.85 – 1.09	0.99	0.88 – 1.13	0.96	0.82 – 1.12	0.93	0.81 – 1.06	0.93	0.81 – 1.06
Single	Ref		Ref		Ref		Ref		Ref	
Divorced or widowed	1.28***	1.08 – 1.53	1.31***	1.10 – 1.56	1.34***	1.07 – 1.67	1.34***	1.11 – 1.61	1.33***	1.10 – 1.61
Children										
No	Ref		Ref		Ref		Ref		Ref	
Yes	0.87**	0.78 – 0.98	0.88**	0.78 – 0.98	0.90	0.78 – 1.04	0.89*	0.79 – 1.01	0.90*	0.79 – 1.02
Department of residence										
Ain 01	Ref		Ref		Ref		Ref		Ref	
Alpes-Maritimes 06	3.06***	2.27 – 4.17	3.25***	2.40 – 4.41	2.59***	1.57 – 4.25	2.20***	1.49 – 3.27	2.29***	1.55 – 3.40
Ardennes 08	0.63**	0.39 – 1.00	0.61**	0.39 – 0.98	0.93	0.51 – 1.71	0.71	0.42 – 1.20	0.71	0.42 – 1.20
Doubs 25	3.36***	2.52 – 4.48	3.32***	2.49 – 4.44	5.21***	3.37 – 8.06	4.21***	2.97 – 5.97	4.16***	2.94 – 5.90
Jura 39	1.59**	1.04 – 2.42	1.56**	1.02 – 2.37	2.51***	1.43 – 4.40	2.00***	1.24 – 3.22	1.97***	1.22 – 3.19

Meurthe-et-Moselle 54	4.62***	3.46 – 6.18	4.54***	3.40 – 6.07	5.41***	3.46 – 8.46	5.20***	3.66 – 7.39	5.14***	3.62 – 7.29
Moselle 57	3.25***	2.42 – 4.36	3.24***	2.42 – 4.34	4.88***	3.11 – 7.64	4.14***	2.91 – 5.90	4.08***	2.86 – 5.80
Nord 59	0.77*	0.57 – 1.05	0.76*	0.56 – 1.03	0.99	0.63 – 1.56	0.95	0.66 – 1.36	0.93	0.65 – 1.34
Bas-Rhin 67	0.91	0.66 – 1.24	0.91	0.67 – 1.25	1.64**	1.04 – 2.59	1.25	0.86 – 1.82	1.24	0.85 – 1.80
Haut-Rhin 68	3.67***	2.76 – 4.88	3.68***	2.77 – 4.89	6.71***	4.33 – 10.39	4.79***	3.39 – 6.79	4.77***	3.37 – 6.75
Haute-Savoir 74	6.31***	4.75 – 8.39	6.37***	4.80 – 8.46	10.12***	6.54 – 15.65	8.42***	5.95 – 11.92	8.41***	5.94 – 11.89
Territoire de Belfort 90	3.68***	2.53 – 5.36	3.61***	2.49 – 5.24	6.49***	3.90 – 10.80	4.93***	3.23 – 7.53	4.88***	3.20 – 7.45
Permanency of the job										
Open ended contract	0.91	0.72 – 1.15	0.89	0.71 – 1.13	0.92	0.68 – 1.24	0.90	0.69 – 1.18	0.90	0.69 – 1.17
Short term contract	Ref		Ref		Ref		Ref		Ref	
Interim	1.38*	0.95 – 2.01	1.35	0.93 – 1.96	1.70**	1.04 – 2.78	1.46*	0.95 – 2.23	1.44*	0.94 – 2.20
Sector										
Agriculture	0.80	0.37 – 1.73	0.78	0.36 – 1.70	1.09	0.49 – 2.46	1.00	0.46 – 2.20	1.00	0.45 – 2.20
Industry & construction	3.58***	3.04 – 4.22	3.54***	3.01 – 4.17	4.02***	3.27 – 4.94	3.80***	3.17 – 4.55	3.80***	3.17 – 4.56
Trade, transport, lodging & catering	3.47***	2.93 – 4.11	3.46***	2.92 – 4.09	3.59***	2.90 – 4.45	3.51***	2.91 – 4.23	3.51***	2.91 - 4.24
Information & communication	3.78***	2.73 – 5.23	3.80***	2.75 – 5.26	4.77***	3.26 – 6.98	4.54***	3.20 – 6.43	4.59***	3.26 – 6.48
Finance & insurance	3.57***	2.71 – 4.70	3.55***	2.70 – 4.67	3.34***	2.35 – 4.75	3.74***	2.77 – 5.04	3.75***	2.78 – 5.05
Real estate	2.69***	1.66 – 4.35	2.76***	1.72 – 4.44	2.53***	1.34 – 4.81	2.53***	1.42 – 4.49	2.58***	1.44 – 4.60
Scientific & technical activities	3.48***	2.84 – 4.27	3.50***	2.86 – 4.29	3.33***	2.54 – 4.36	3.47***	2.76 – 4.35	3.49***	2.78 – 4.39
Public administration	Ref		Ref		Ref		Ref		Ref	
Other services	3.73***	2.80 – 4.96	3.73***	2.81 – 4.96	3.89***	2.75 – 5.51	4.04***	2.92 – 5.61	4.04***	2.91 – 5.62
Number of persons employed at the local unit										
0-9	Ref		Ref		Ref		Ref		Ref	
10-49	1.26***	1.07 – 1.49	1.26***	1.07 – 1.49	1.29**	1.05 – 1.60	1.30***	1.08 – 1.57	1.31***	1.09 – 1.58
50-499	1.54***	1.31 – 1.81	1.54***	1.32 – 1.81	1.64***	1.33 – 2.01	1.64***	1.36 – 1.97	1.64***	1.37 – 1.97
≥500	1.67***	1.38 – 2.01	1.66***	1.38 – 2.01	1.75***	1.38 – 2.22	1.73***	1.40 – 2.14	1.73***	1.40 – 2.14
Wage										
0-2,000	Ref		Ref		Ref		Ref		Ref	
2,001-4,000	14.11***	12.16 – 16.37	14.02***	12.08 – 16.26	15.53***	12.81 – 18.83	14.66***	12.43 – 17.30	14.63***	12.40 – 15.26
≥4,001	138.68***	110.10 – 174.68	138.49***	110.01 – 174.35	161.60***	121.81 – 215.24	142.93***	111.19 – 183.72	143.10***	111.32 – 183.95
Part-time/full-time employment										
Full-time	Ref		Ref		Ref		Ref		Ref	
Part-time	2.76***	2.38 – 3.20	2.77***	2.39 – 3.21	3.21***	2.64 – 3.89	3.01***	2.55 – 3.55	3.01***	2.55 – 3.54

p: significance p*≤ 0.1 | p**≤ 0.05 | p***≤ 0.01. Wald test.*

Model 4: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment & controlled for the elastic migration phenomenon.

Appendix Table 3. Preliminary factor analysis: migration capital dimensionality and internal consistency

	Eigenvalues	Contribution	Cronbach's alpha (α)
Acquired Migration Capital			0.77
Component 1	1.66	0.83	
Component 2	0.34	0.17	
Inherited Migration Capital			0.93
Component 1	3.30	0.82	
Component 2	0.47	0.12	
Component 3	0.16	0.04	
Component 4	0.07	0.02	
Migration Capital			0.91
Component 1	4.20	0.70	
Component 2	0.77	0.13	
Component 3	0.47	0.08	
Component 4	0.33	0.05	
Component 5	0.15	0.02	
Component 6	0.07	0.01	

Appendix Table 4. Association between the migration capital and commuting behaviour.

Y=Commute abroad	Model 3	95% CI	Model 4	95% CI
Acquired Migration Capital Index				
0	*Ref*		*Ref*	
1	2.02***	1.67 – 2.44	1.93***	1.59 – 2.34
2	4.32***	3.62 – 5.15	2.07***	1.69 – 2.54
Inherited Migration Capital Index				
0	*Ref*		*Ref*	
1	1.37**	1.07 – 1.74	1.35**	1.06 – 1.72
2	1.56***	1.32 – 1.85	1.48***	1.24 – 1.76
3	2.90***	1.81 – 4.64	2.48***	1.52 – 4.04
4	2.67***	2.34 – 3.05	1.88***	1.62 – 2.17
Migration Capital Index				
0	*Ref*		*Ref*	
1	1.43**	1.14 – 1.79	1.40***	1.12 – 1.76
2	1.53***	1.28 – 1.83	1.48***	1.24 – 1.77
3	2.71***	1.93 – 3.80	2.59***	1.84 – 3.64
4	1.82***	1.48 – 2.24	1.71***	1.38 – 2.12
5	1.92***	1.48 – 2.50	1.76***	1.34 – 2.30
6	4.54***	3.79 – 5.44	2.27***	1.84 – 2.79

p: significance p*≤ 0.1, p***≤ 0.05, p***≤ 0.01. Wald test.*

Model 3: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment.

Model 4: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment & controlled for the elastic migration phenomenon.

3.9.3. Robustness check

Appendix Table 5. Association between the migration capital and commuting behaviour. Last interrogation.

Y= Commute abroad	Model 3	95% CI	Model 4	95% CI
Acquired Migration Capital Index				
0	*Ref*		*Ref*	
1	2.09***	1.71 – 2.56	1.94***	1.58 – 2.39
2	5.84***	4.85 – 7.03	2.12***	1.66 – 2.70
Inherited Migration Capital Index				
0	*Ref*		*Ref*	
1	1.27*	0.96 – 1.68	1.27*	0.96 – 1.68
2	1.84***	1.52 – 2.21	1.70***	1.40 – 2.06
3	2.06**	1.17 – 3.62	1.53	0.83 – 2.81
4	2.67***	2.32 – 3.08	1.62***	1.38 – 1.90
Migration Capital Index				
0	*Ref*		*Ref*	
1	1.40**	1.08 – 1.81	1.37**	1.06 – 1.79
2	1.75***	1.43 – 2.13	1.69***	1.38 – 2.07
3	2.40***	1.64 – 3.52	2.11***	1.43 – 3.13
4	1.50***	1.20 – 1.88	1.35**	1.07 – 1.71
5	1.76***	1.33 – 2.31	1.53***	1.16 – 2.03
6	6.21***	5.11 – 7.55	2.32***	1.80 – 2.98

p: significance p*≤ 0.10; p**≤ 0.05; p***≤ 0.01. Wald test.*
Model 3: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment.
Model 4: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment & controlled for the elastic migration phenomenon.

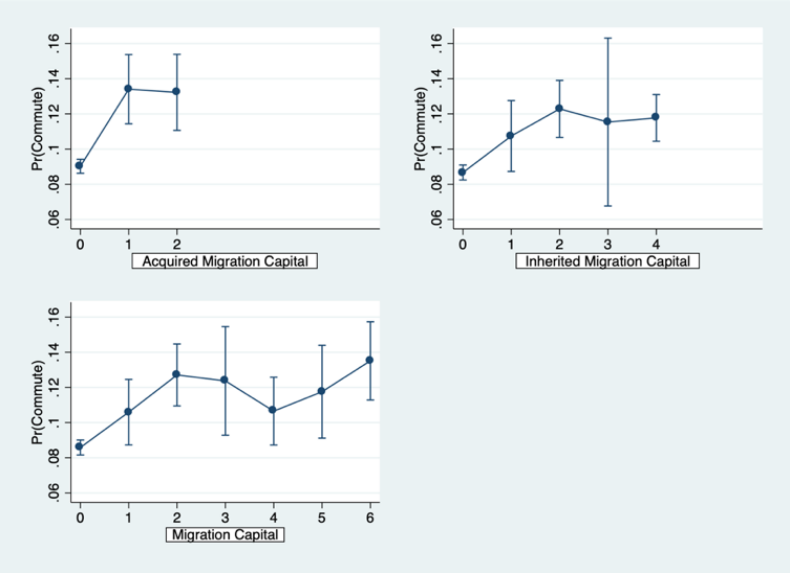
Appendix Table 6. Associations between migration and commuting behaviour. Last Interrogation.

Y = Commute abroad Variables	Model 1	95% CI	Model 2	95% CI	Model 3	95% CI	Model 4	95% CI
Immigrants								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	3.17***	2.77 – 3.63	2.78***	2.37 – 3.25	3.32***	2.77 – 3.99	1.92***	1.57 – 2.35
Foreigners								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	4.28***	3.63 – 5.04	3.75***	3.07 – 4.59	4.50***	3.56 – 4.69	1.64***	1.24 – 2.16
Internal migrants								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	1.33***	1.12 – 1.57	1.09	0.90 – 1.32	1.14	0.94 – 1.40	1.14	0.94 – 1.40
Immigrant children								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	1.61***	1.38 – 1.87	1.42***	1.21 – 1.67	1.51***	1.26 – 1.83	1.50***	1.25 – 1.81
Foreigner children								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	1.71***	1.45 – 2.02	1.48***	1.24 – 1.77	1.60***	1.30 – 1.98	1.59***	1.29 – 1.96
n (Immigrants)	*22,039*		*22,039*		*22,039*		*21,786*	

p: significance p*≤ 0.10; p**≤ 0.05; p***≤ 0.01 Wald test.*
Model 1: commuting behaviour.

Model 2: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments.
Model 3: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment.
Model 4: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment & controlled for the elastic migration phenomenon.

Appendix Figure 1. Predicted probability to commute abroad, by migration capital endowment. Model 4. Last interrogation



Model 4: commuting behaviour, sex, age, education, occupational category, father's occupational category, marital status, children, departments, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment & controlled for the elastic migration phenomenon.

4. Cross-Border Mobility in European Countries: Associations Between Cross-Border Worker Status and Health Outcomes

4.1. Abstract

Mobility of workers living in one country and working in a different country has increased in the European Union. Exposed to commuting factors, cross-border workers (CBWs) constitute a potential high-risk population. But the relationships between health and commuting abroad are under-documented. Our aims were to: (1) measure the prevalence of the perceived health status and the physical health outcomes (activity limitation, chronic diseases, disability and no leisure activities), (2) analyse their associations with commuting status as well as (3) with income and health index among CBWs.

Based on the '*Enquête Emploi*', the French cross-sectional survey segment of the European Labour Force Survey (EU LFS), the population was composed of 2,546,802 workers. Selection criteria for the samples were aged between 20 and 60 years and living in the French cross-border departments of Germany, Belgium, Switzerland and Luxembourg. The Health Index is an additional measure obtained with five health variables. A logistic model was used to estimate the odds ratios of each group of CBWs, taking non-cross border workers (NCBWs) as the reference group, controlling by demographic background and labour status variables.

A sample of 22,828 observations (2,456 CBWs *vs.* 20,372 NCBWs) was retained. The CBW status is negatively associated with chronic diseases and disability. A marginal improvement of the health index is correlated with a wage premium for both NCBWs and

CBWs. Commuters to Luxembourg have the best health outcomes, whereas commuters to Germany the worst.

CBWs are healthier and have more income. Interpretations suggest (1) a healthy cross-border phenomenon steming from a social selection and a positive association between income and the health index is confirmed; (2) the existence of major health disparities among CBWs; and (3) the rejection of the spillover phenomenon assumption for CBWs. The newly founded European Labour Authority (ELA) should take into account health policies as a promising way to support the cross-border mobility within the European Union.

4.2. Introduction

Between 2017 and 2018, the number of cross-border workers (CBWs) increased from 1.4 million to 1.5 million workers in the European Union (EU) (European Commission, 2019), making cross-border mobility a phenomenon of growing interest. Since freedom of movement for workers has been defined as the cornerstone of the EU, commuting abroad became a preoccupation of and major challenge for the states such as transport (Bike2Work EU's project of 2014-2017) (ESPN 2019) but also for the European Public Health and Social Policy a major challenge. Commuters have less time to participate in activities that are beneficial for their health such as sport, meditation or socializing (Hansson et al, 2011). The link between CBWs and health was mainly addressed regarding the commuters' access to the healthcare system (Bell et al, 2014).

CBWs are experiencing a specific and common lifestyle, while commuting more than the rest of the workforce (Schmitz, 2012). Commuting may affect workers' health, and projections indicate that more and more workers will be commuting abroad in the future (AGAPE, 2018). Therefore, CBWs represent a potential high-risk population combining several drawbacks which may impact their health. European Social Policy might be soon confronted with a declining health status of workers leading to a rise of health expenditures. In this perspective, an increased understanding of cross-border health issues is a matter of prime importance. Consequently, our main research question is: do health disparities between Cross-Border Workers (CBWs) and Non-Cross-Border Workers (NCWBs) exist?

Scientific works have tried to capture the complex relationship between commuting and health by mainly focusing on the understanding of the commuting effects on workers' health (Chatterjee et al, 2020). Commuting deteriorates commuters' health through two separate channels, a quantitative one related to commuting time and a qualitative one related to the commuters' ways of commuting.

A long commute is associated with a higher mortality risk (Sandow et al, 2014), greater exposure to pollution (Taino et al, 2016), increased stress (Evans et al, 2002), exhaustion (Kageyama et al, 1998), sleep disorders (Walsleben et al, 1999) and lower satisfaction felt during socialising (Kroesen, 2014) and leisure (Wheatley, 2014). For example, in

France, the mean duration of one-way commuting time between the place of residence and the workplace increased from 38.3 minutes in 2005 to 44.9 minutes in 2015 (EUROSTAT, 2019).

Secondly, modes of commuting generate specific health problems. Physical activity has been more often observed among pedestrians (Audrey et al, 2014), cyclists (Donaire-Gonzalez et al, 2015) and public transport users (McDonald et al, 2010) than by car users. Pedestrians, cyclists and public transport users have a lower body mass index (BMI) than car drivers (Flint & Cummins, 2016) (Dons et al, 2018). In contrast, high stress was found among car drivers and low stress among active commuters i.e., pedestrians and cyclists (Gatersleben & Uzzell, 2007) (Legrain et al, 2015). In addition, active commuters reported higher satisfaction's levels than car drivers and public transport users (Friman et al, 2017). Passive commuting i.e., car and public transports, is associated with a low perceived health among workers (Hansson et al, 2011). Self-perceived health is a widely used indicator in the literature (Hansson et al, 2011) (Porto et al, 2016).

Commuting is not the only factor that affects CBW's health. Higher incomes allow people to buy more or better goods (e.g. organic food), or to participate in sports or leisure activities with positive health benefits (Macinko et al, 2003). An income hypothesis can be suggested here and would imply that each additional euro of income would raise individual health. Between income and self-perceived health, a positive association was highlighted (Li & Zhu, 2006). In contrast, a negative relationship exists between income and BMI (Joliffe, 2011) (Murasko, 2013) and also between income and health problems such as asthma, hearing problems and dental symptoms (Nakamura, 2014). In the same vein, low income is correlated with low self-perceived health (Wang et al, 2005), more activity limitation (Fuller-Thomson & Gadalla, 2008), more chronic diseases (Bombard et al, 2012), more disability (Thorpe et al, 2013) and lower participation in sports (Breuer et al, 2011).

As each member state of the UE maintains its own social security national institutions, information about CBWs remains piecemeal (Belkacem et al, 2006). *De facto,* widespread international datasets commonly used to analyse workers' health, such as the European Working Conditions Survey (EWCS), the European Health Interview Survey (EHIS) or the EU Statistics on Income and Living Conditions (EU-SILC), are unusable in

this case owing to the impossibility to identify CBWs. Since 1950, the labour survey ('*Enquête Emploi*') driven by the National Institute of Statistics and Economics Studies *('Institut National de la Statistique et des Etudes Economiques'* - INSEE) constitutes the main source of information on the French labour market and workforce (Amossé, 2013). Based on the European Union Labour Force Survey (EU LFS), the labour survey section '*Enquête Emploi*' was the only dataset allowing researchers to identify and to better understand the commuting behaviours of CBWs.

The relationships between commuting abroad for work, health outcomes and income are under-documented. Research works are still needed that aim to identify if some groups are at more risk for ill health than others (Hansson et al, 2011). Our study aims to: (1) measure the prevalence for the perceived health status and the physical health factors (such as activity limitation, chronic diseases, disability and no leisure activities), (2) analyse their associations with commuting status as well as (3) with income and health index among CBWs.

4.3. Methods

4.3.1. Study Population and Selection Criteria

Between 2013 and 2018, 2,546,802 persons were surveyed in a repeated-cross sectional survey conducted with a representative sample of the French population. The population is made up of all the members (aged 15 or more) in a given household. Households are identified through the comprehensive housing-tax registers and invited to participate in the survey by post. The sample of households is stratified in order to be representative; many criteria are used, the most important are the region and the spatial type (urban center, suburban rings, multi-polarised municipalities, rural municipalities). The questionnaire (INSEE, 2017) was administered face to face (for the first and the final measurement) and by telephone (for all other measurements). Since we cannot determine the number of people contacted who fulfilled our selection criteria in this dataset, the response rate cannot be calculated. Nevertheless, the INSEE indicates a response rate of 80%, and we have no reason to believe that our response rate is different.

A sample of workers characterised by different workplace locations was extracted from the labour survey. Our sample fulfilled the following selection criteria: aged between 20 and 60 years, employed workers according to the International Labour Office (ILO) definition and residing in the French territory within the French cross-border departments (see Figure 1: The French cross-border region.). The French state is decomposed into three administrative districts: the *'Communes'* (town), the *'Départements'* (county) and the *'Régions'* (states) (UK regions) (there are 34,970 *Communes*, 101 *Départements (called departments from now on)* and 13 *Régions)*. Using the '*Enquête Emploi*' dataset, we retained areas in which CBWs are concentrated (i.e. nearby the border), while calculating the number and the share of CBWs per departments. All departments in which at least 50 CBWs lived and in which CBWs represent at least 1% of the workforce were included in the analyses. Four commute destinations were retained, namely Germany (DE), Belgium (BE), Switzerland (CH) and Luxembourg (LU), since these countries attracted 92% of the French's CBWs (Mironova & Villaume, 2019). To ensure the consistency and the replicability of the results, the first interrogation of each worker was retained whereas the last interrogation was used to ascertain the robustness of our findings. The first wave led to a larger sample than the sixth one, due to attrition (N1= 22,828 *vs.* N6= 19,506), leading us to favour the former over the latter. The selection criteria applied in order to obtain the final sample (n=22,828) were:

Workers: who were currently in employment according to the ILO definition and settled in France, farmers and all workers who didn't inform their wages were dropped and employees and individuals aged between 20 and 60 were retained.

Departments: departments in which at least 50 CBWs lived and in which their represented at least one percent of the workforce and neighbouring departments with Germany, Belgium, Switzerland and Luxembourg were kept.

Data: Only the first interrogation was kept for each worker and missing values for the number of persons working at the local unit, overtime, sector and education were dropped.

4.3.2. Data

Since 2013, the survey integrated information about workers' health, and the module assessing this is composed of four questions (see health variables). Between 2013 and 2018, the number of CBWs per year (e.g. 404 for 2015) leads to combine the labour survey individual folders for years and the health questions. The labour survey benefits from the approval of the Institutional Review Board called *'Comité du Label de la Statistique Publique'*, which depends on the *'Conseil National de l'Information Statistique'* (CNIL). The questionnaire of the mother study has been previously published (INSEE, 2017) and only the relevant questions were kept. Two parameters were considered to describe the worker's situation, his commuting status and his country of destination. A worker can decide either to work in France or to commute abroad. CBWs are referred as workers that are currently working abroad, either in Belgium, Germany, Luxembourg or Switzerland and presently dwelling in France. Four questions assessing health outcomes were included in the labour survey and one question not directly linked to health issues was used to generate a variable relating to leisure activity participation.

Low perceived health: This subjective scale included one item: 'How do you rate your overall health?' and responses options were: (1) very good, (2) good, (3) fair, (4) poor, and (5) very poor, (6) refusal and (7) do not know. For the statistical analyses, the score was dichotomised: (3), (4) and (5) were coded 'low self-perceived health' following the recommended cut-off scores (Macinko et al, 2003) (Li & Zhu, 2006). (6) and (7) were coded as missing values.

Activity limitation: 'Have you experienced restrictions in performing activities that people typically do because of a health problem for at least six months?'. Response options were: (1) yes heavily restricted, (2) yes, limited but not strongly, (3) no, not limited at all, (4) refusal and (5) do not know. Responses were coded: (1) and (2) 'limitations due to health reasons' and response (3) was coded as 'no limitations due to health reasons'. (4) and (5) were coded as missing values.

Chronic diseases: 'Do you have an illness or health problem that is chronic or of a lasting nature?' Responses options were: (1) yes, (2) no, (3) refusal and (4) do not know. Responses were coded: 1) 'having a chronic disease' *vs.* 2) 'no chronic disease'. Responses 3) and 4) were coded as missing values.

Disability: 'Is your disability or loss of autonomy recognised by the administration?' Response options were: (1) yes, (2) demand under review, (3) no, (4) refusal and (5) do not know. Responses were coded: (1) and (2) 'handicapped' *vs.* (3) 'not handicapped'. Responses (4) and (5) were coded as missing values.

No leisure activities: 'During the past three months, did you take sports lessons or courses related to cultural or leisure activities?' Response options were (1) yes and (2) no. Responses were coded: (2) 'no physical or cultural activities' *vs.* (1) 'physical or cultural activities'.

The study included two sets of covariates: the demographic background (Var.1-Var.10) and the labour status (Var.11-Var.17) of the workers (see Table 1). Consolidated variables are those composed by the respondents' answers to several questions.

Table 1. Covariates: demographic background and labour status variables

Demographic background
(Var.1) ***Sex***: (2 categories: men *vs*. women)
(Var.2) ***Age***: (4 categories: 20-29, 30-39, 40-49, 50-60)
(Var.3) ***Education***: (3 categories: up to secondary school, up to Bachelor's degree, Master's degree & above)
(Var.4) ***Occupational category***: (4 categories: white collar workers, intermediate professions, employees, blue collar workers)
(Var.5) ***Father's occupational category***: (7 categories: not filled out; farmers; artisans, merchants, company directors; white collar workers; intermediate professions; employees; blue collar workers) Assessed at the end of the respondent's own schooling.
(Var.6) ***Born abroad***: (2 categories: born in France *vs.* born abroad) Respondents were asked 'Where were you born?'. Responses options were 1) in France and 2) not in France.
(Var.7) ***Cohabiting***: (2 categories: living together with someone *vs.* living alone) Respondents were asked 'Are you living together with someone in one household?'. Response options were (1) yes and (2) no. The variable cohabiting was preferred to the marital status i.e., the legal recognition of cohabitation, because it allows us to capture all the workers that beneficiated from a lower mortality rate (Bouhia, 2007) and not only those having the legal recognition of their situations.
(Var.8) ***Children***: (2 categories: has a child(ren) *vs.* does not have child(ren)) Respondents were asked 'Do you have children in the household or in alternate care?'. Response options were (1) yes and (2) no.
(Var.9) ***Departments:*** (11 categories: departments of residence (see Figure 1: The French cross-border regions))
(Var.10) ***Urban area:*** (2 categories: place of residence located in an urban area with fewer than 200,000 inhabitants *vs.* with 200,000 inhabitants or more)
(Var.11) ***Permanency of the job***: (3 categories: permanent contract, temporary contract, interim contract)
Labour status
(Var.12) ***Sector:*** (10 categories: not filled out; agriculture; industry-construction; trade-transport-accommodation and catering; information and communication; finance and insurance; real estate; scientific activities and administrative services; public administration; other services)
(Var.13) ***Number of persons working at the local unit***: (5 categories: not filled out, 1 to 9 workers, 10 to 49 workers, 50 to 499 workers, 500 workers and more). Respondents were asked 'How many employees are approximately on the site which employs you?'.

(Var.14) ***Wage***: (3 categories: up to 2,000 net € per month, premiums included, between 2,001 and 4,000€, 4,001€ and higher) Nominal wage.
(Var.15) ***Full-time/part-time employment***: (2 categories: full-time employment *vs.* part-time employment)
(Var.16) ***Overtime***: (2 categories: overtime *vs.* no overtime) Respondents were asked 'How many extra hours do you usually work per week in your professional job?'.
(Var.17) ***Night work***: (2 categories: night work *vs.* no night work). Respondents were asked 'Did you work during the night (between midnight and 5 a.m.) during the four precedent weeks?'.

Sex, age, education, occupational category, father's occupational category, departments, urban area, permanency of the job, sector, number of persons working at the local unit, wage and full-time/part-time employment are consolidated variables. As missing values were dropped, all variables are fully informed for each worker.

4.3.3. Statistical Analysis

To distinguish CBW from NCBW, a dichotomous variable was generated as well as four binary variables, one for each country of destination. Example, the variable for Germany was coded as: 1) is working in Germany and 0) is working in France but lives in the same department, as CBW working in Germany. Consequently, from this coding, each group of NCBWs is defined by a single combination of departments. For example, commuters to Germany (DE CBWs) and their non-commuter counterparts (DE NCBWs) dwelled in Moselle, Bas-Rhin and Haut-Rhin. However, a given department can host the commuters and their non-commuter counterparts toward different countries. For example, both commuters toward Belgium and Luxembourg and their non-commuter counterparts dwelled in Moselle. This allows considering the local health features, while taking the closest possible counterparts of the CBWs. A summary of the place of residence by commuting status and country of destination is provided (see Additional files, Table A1). To preselect the covariates, chi-square tests were used for qualitative variables and Student's t-tests for the quantitative ones, including those which were significant ($p<0.10$) for at least one of the health outcomes. The covariates were selected based on the previously described theoretical frameworks and introduced in three steps. A logistic model was estimated for each health variables and covariates were introduced in order to predict the probability of CBWs to report a health issue compared to NCBWs.

In a first step, only the commuting status was introduced in the model (unadjusted model). In a second step, the demographic background of the workers was introduced in the adjusted model. In a third step, the labour status of the workers was introduced in the fully adjusted model. All the outcome variables were coded with the aim to model the probability of being in ill health according to the commuting status. An odds-ratio greater than one can also be understood as verification of ill health for CBWs compared to NCBWs, whereas an odds-ratio smaller than one indicated a better health in the group of CBWs compared to the reference group of NCBWs.

The Health Index (5 items) was an additional measure obtained with the score of four physical health variables and the perceived health score and calculated with values between 0 and 5: 'the higher the score, the healthier the worker'. For each item, one point was assigned if the answer indicated a high health state and no point if the answer indicated a poor health. For example, the absence of disability was considered as an indication of a good health state. For the perceived health, one point was assigned if the respondents estimated their health as 'very good' or 'good', whereas a zero score was assigned if the answer was 'fair', 'poor' or 'very poor'. For each worker, scores of the five items were aggregated. A linear model was used to investigate the relationship between income and health index. An interaction between the commuting status and the health index was introduced in the linear model to predict which wage is needed to reach a certain unit of the health index. Binary logistic regression modelling was used to determine associations between the commuting status and each of the five health outcomes. Odds ratios were estimated with a 5% risk of error i.e., 95% confidence intervals (CI). Covariates were added to the model to provide adjusted and fully adjusted associations for CBWs as a whole, as well as for CBWs of the different country destinations. All statistical analyses were performed using the software STATA 13.0.

4.4. Results

4.4.1. Descriptives

For the analysis, 22,828 observations (2,456 CBWs vs. 20,372 NCBWs) were retained. The sample consisted of 8 groups of workers from 4 countries of destination: for

example, CBWs working in Germany (n=233) and NCBWs working in France but living in the same departments as the CBWs to Germany (n=6,895) (see Appendix, Table 1). CBWs were more often men, blue collar workers, born abroad, employed under permanent contract, in the industry and the construction, in large companies, working at night and higher wages than the NCBWs (see Table 2). Commuters to Germany were of a special interest. Male, low-skilled and blue collar workers were overrepresented. They were the oldest group of CBWs, more often employed in full-time jobs, in the industry and construction sector, in large companies and worked overtime more than other CBWs.

Table 2. Demographic background and labour status by commuting status and countries of destination. (%, mean years and Euros)

	DE NCBWs	DE CBWs	p[1]	BE NCBWs	BE CBWs	p[1]	CH NCBWs	CH CBWs	p[1]	LU NCBWs	LU CBWs	p[1]	Total NCBWs	Total CBWs	p[1]
Adustment variables : Demographic background															
Sex : Male (%)	51	66	**	51	64	*	49	64	***	51	67	***	**51**	**65**	***
Age (Mean years)	41	46	***	40	39	NS	41	40	NS	41	39	***	**41**	**41**	**NS**
Education: Up to secondary education (%)	64	70	NS	59	71	***	65	57	***	63	66	NS	**62**	**62**	**NS**
Occupational category: Blue collar (%)	28	47	**	23	55	***	27	31	NS	26	38	**	**25**	**37**	***
Father's occupational category: Blue collar (%)	43	49	NS	42	51	**	39	38	NS	45	51	NS	**41**	**43**	**NS**
Born abroad (%)	11	26	***	6	19	***	9	18	***	9	13	**	**8**	**18**	***
Cohabiting (%)	67	76	NS	69	72	NS	71	71	**	67	68	NS	**69**	**71**	**NS**
Children (%)	49	41	NS	52	61	**	53	53	*	50	55	NS	**52**	**53**	**NS**
Urban area (%)	39	18	***	51	43	**	10	6	***	42	20	***	**34**	**14**	***
Full adjustment variables: Labour status															
Permanency of the job: Permanent contract (%)	87	89	NS	85	84	NS	88	94	***	86	90	*	**87**	**92**	***
Sector: Industry & construction (%)	24	57	***	19	47	***	27	39	***	21	34	***	**23**	**40**	***
Number of persons working at the local unit: >= 500 workers (%)	17	33	***	17	16	*	12	22	***	14	21	***	**15**	**22**	***
Wage (Mean €)	1 ,817	2,789	***	1,808	2,153	***	1,791	4 ,027	***	1,835	2,558	***	**1,814**	**3,383**	***
Full-time/part-time employment: Full-time employment (%)	82	90	**	81	90	**	82	77	**	81	86	**	**82**	**82**	**NS**
Overtime (%)	26	34	***	25	19	NS	28	31	NS	26	23	NS	**26**	**28**	**NS**
Night work : yes (%)	12	15	NS	11	22	NS	10	11	NS	13	20	**	**11**	**14**	*
N	**6,895**	**233**		**8,304**	**279**		**6,941**	**1,316**		**3,828**	**607**		**20,372**	**2 ,456**	

p[1]: significance p ≤ 0.1 | p** ≤ 0.05 | p*** ≤ 0.01; chi-square test for qualitative variables and Student's t-test for quantitative variables; significance level of the difference between the total NCBWs and the total CBWs. Aggregation of contingency tables 2x2 with 1 degree of freedom, except for age and wage.*
DE NCBWs : Non-commuters toward Germany. Are working and dwelling in France.
DE CBWs : Cross-border workers toward Germany. Are working in Germany and dwelling in France.
BE NCBWs: Non-commuters toward Belgium. Are working and dwelling in France.
BE CBWs : Cross-border workers toward Belgium. Are working in Belgium and dwelling in France.
CH NCBWs: Non-commuters toward Switzerland. Are working and dwelling in France.
CH CBWs : Cross-border workers toward Switzerland. Are working in Switzerland and dwelling in France.
LU NCBWs: Non-commuters toward Luxembourg. Are working and dwelling in France.
LU CBWs : Cross-border workers toward Luxembourg. Are working in Luxembourg and dwelling in France.

CBWs declared less often than NCBWs: low self-perceived health, activity limitation, chronic diseases and disability (see Table 3). CBWs do not differ from NCBWs regarding no leisure activities. Distinguishing characteristics of commuters to Germany were a higher prevalence of low perceived health, limitations, chronic diseases and with the lower prevalence of no leisure activities. In contrast, commuters to Switzerland reported the lowest prevalence of low perceived health, activity limitation and disability, whereas commuters to Luxembourg had the lowest prevalence of activity limitation and chronic diseases and the highest prevalence of no leisure activities. Commuters toward Belgium declared the lowest prevalence of disability as well. Commuters toward Germany and Belgium have no health outcomes significantly different from their NCBW counterparts, at the opposite of commuters toward Luxembourg and Switzerland.

Table 3. Descriptive values of health outcomes by countries of destination. (%).

	DE NCBWs	**DE CBWs**	**p[1]**	**BE NCBWs**	**BE CBWs**	**p[1]**	**CH NCBWs**	**CH CBWs**	**p[1]**
Low perceived health	18	22	NS	17	15	NS	16	12	***
Activity limitation	13	17	NS	13	11	NS	13	9	***
Chronic diseases	24	33	NS	23	19	NS	23	19	*
Disability	5	3	NS	5	2	NS	5	2	***
No leisure activities	85	81	NS	83	88	NS	83	82	NS
	LU NCBWs	**LU CBWs**	**p[1]**	**Total NCBWs**	**Total CBWs**	**p[1]**			
Low perceived health	17	13	***	**17**	**13**	***			
Activity limitation	14	9	***	**13**	**10**	***			
Chronic diseases	26	17	***	**23**	**20**	***			
Disability	5	3	***	**5**	**2**	***			
No leisure activities	86	89	*	**83**	**84**	**NS**			

p[1]: significance p ≤ 0.1 | p** ≤ 0.05 | p*** ≤ 0.01 chi-square test for the difference between total NCBWs and total CBWs. Aggregation of contingency tables 2x2 with 1 degree of freedom.*

From the annual Health at a Glance reports, published by the OECD and covering the periods of the survey, the high perceived health indicators of the countries and the OECD indicators were reported to compare them with the different prevalence rates obtained by each group (see Appendix, Table 2). CBWs expressed a higher perceived health than the population of their country of destination. We observed that all frequencies of the CBW groups are higher than the EU states' indicators and the OECD indicators. Considering the latter, 65% of the German citizens expressed a high perceived health against 78% for CBWs toward Germany. The same pattern was found for Belgium, Switzerland and Luxembourg with respectively 74% against 85%, 81% against 88%, 72% against 87%. Furthermore, Germans citizens reported the lowest share of high perceived health whereas Swiss citizens had the highest one with respectively 65% and 81%, which is consistent with our precedents results. Belgians and Luxembourgers citizens being in an intermediate position between these two extreme cases with respectively 74% and 72%.

4.4.2. Multivariate Analysis

For the fully adjusted model, the commuting status is significantly associated with health outcomes (see Table 4). We found a lower probability of CBW to report chronic diseases and disability compared to NCBW. These results suggest that CBWs are healthier than their NCBWs counterparts. However, no association was found between the commuting status and low perceived health, activity limitation and reporting no leisure activity. The full regression tables are available (see Appendix, Table 3). Commuters to Germany were the only group of CBWs for which a negative association between the commuting status and no leisure activities i.e., the only workers who did not agree with the statement of no leisure activities, was found. Furthermore, they were the only group of CBWs for which a positive association with health outcomes was found. They had a higher likelihood to express chronic diseases than their NCBW counterparts, ascertaining their poorer health state previously observed. Commuters to Luxembourg were less likely to report activity limitation, chronic diseases and disability compared to their NCBW counterparts, suggesting that they were the healthiest group of CBWs in our sample. A negative association was found between the commuting status and disability for both commuters

toward Belgium and Switzerland. After controlling for both demographic background and labour status variables it turned out that the better health outcomes of the commuters toward Switzerland were not significant, suggesting that their better health state might be due to these confounders, most probably to their higher wages.

Table 4. Associations between CBW status and health outcomes.

NBCWs = reference group value 1										
Model of regression	**DE CBWs**	**p[1]**	**BE CBWs**	**p[1]**	**CH CBWs**	**p[1]**	**LU CBWs**	**p[1]**	**Total CBWs**	**p[1]**
Unadjusted										
Low perceived health	1.31 (0.934-1.846)	NS	0.89 (0.615-1.292)	NS	0.70 (0.576-0.845)	***	0.69 (0.532-0.907)	***	**0.75 (0.660-0.858)**	***
Activity limitation	1.32 (0.912-1.903)	NS	0.79 (0.492-1.254)	NS	0.65 (0.515-0.825)	***	0.65 (0.481-0.870)	***	**0.73 (0.622-0.850)**	***
Chronic diseases	1.52 (1.128-2.039)	***	0.81 (0.583-1.132)	NS	0.79 (0.668-0.944)	***	0.60 (0.471-0.753)	***	**0.82 (0.731-0.925)**	***
Disability	0.58 (0.279-1.201)	NS	0.37 (0.159-0.861)	**	0.33 (0.197-0.547)	***	0.50 (0.313-0.811)	***	**0.40 (0.299-0.537)**	***
No leisure activities	0.73 (0.513-1.044)	*	1.44 (0.976-2.123)	*	0.94 (0.766-1.140)	NS	1.43 (1.068-1.912)	**	**1.06 (0.917-1.221)**	**NS**
Adjusted										
Low perceived health	1.10 (0.772-1.576)	NS	0.82 (0.550-1.209)	NS	0.74 (0.602-0.905)	***	0.72 (0.540-0.954)	**	**0.78 (0.675-0.893)**	***
Activity limitation	1.04 (0.713-1.511)	NS	0.75 (0.456-1.228)	NS	0.71 (0.552-0.900)	***	0.64 (0.463-0.894)	***	**0.74 (0.626-0.871)**	***
Chronic diseases	1.39 (1.020-1.886)	**	0.84 (0.592-1.180)	NS	0.80 (0.667-0.960)	**	0.66 (0.516-0.840)	***	**0.81 (0.713-0.914)**	***
Disability	0.45 (0.217-0.947)	**	0.32 (0.135-0.747)	***	0.33 (0.199-0.550)	***	0.49 (0.296-0.818)	***	**0.39 (0.290-0.529)**	***
No leisure activities	0.53 (0.358-0.782)	***	1.19 (0.798-1.766)	NS	0.87 (0.701-1.071)	NS	1.21 (0.892-1.634)	NS	**0.95 (0.816-1.102)**	**NS**
Fully adjusted										
Low perceived health	1.18 (0.815-1.710)	NS	0.91 (0.606-1.361)	NS	0.90 (0.678-1.187)	NS	0.89 (0.658-1.215)	NS	**0.89 (0.756-1.045)**	**NS**
Activity limitation	1.12 (0.756-1.660)	NS	0.83 (0.499-1.383)	NS	0.81 (0.602-1.085)	NS	0.67 (0.465-0.955)	**	**0.85 (0.710-1.012)**	*
Chronic diseases	1.42 (1.035-1.953)	**	0.90 (0.634-1.287)	NS	0.95 (0.752-1.209)	NS	0.71 (0.543-0.924)	**	**0.87 (0.752-0.996)**	**
Disability	0.53 (0.248-1.137)	NS	0.37 (0.156-0.876)	**	0.52 (0.273-0.978)	**	0.54 (0.303-0.969)	**	**0.48 (0.342-0.672)**	***
No leisure activities	0.53 (0.355-0.791)	***	1.23 (0.822-1.841)	NS	0.92 (0.716-1.190)	NS	1.20 (0.872-1.658)	NS	**0.97 (0.822-1.133)**	**NS**
N	**233**		**279**		**1,316**		**607**		**2,456**	

p[1]: significance p≤ 0.1 | p**≤ 0.05 | p***≤ 0.01; Wald test.*
Unadjusted: commuting status.
Adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area.
Fully adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment, overtime, night work.

For the whole sample of workers, a higher income is associated with a higher health index, since a wage premium of 104 euros (€) led to a marginal improvement in the

health index (see Appendix, Table 4). Specifically, by group of workers, a marginal improvement in the health index is correlated with a wage premium of 81€ for NCBWs and 161€ for CBWs. This positive association between health index and wage is highly significant for each group of workers. Since only 25 CBWs had a health index equal to 0 and the wide confident intervals, the prediction for this level of the health index might be considered as an outlier, confirming the positive relationship between wage and health index for both CBWs and CBWs.

4.5. Discussion

Our research aimed to highlight health disparities between CBWs and NCBWs and in the specific CBW group. Our key findings are: (1) CBWs are healthier than NCBWs. (2) Stronger health disparities were found in the different CBWs' groups from different work destinations with commuters to Luxembourg exhibiting the best health outcomes and those toward Germany the worst. (3) Based on these data, the spillover phenomenon assumption must be rejected. Our main findings between commuting status and higher health outcomes are in contrast to findings of previous studies (Kageyama et al, 1998) (Walsleben, 1999) (Evans et al, 2002) (Gatersleben & Uzzell, 2007) (Hansson et al, 2011) (Legrain et al, 2015). Importantly, our study pointed out a CBW paradox, because being a commuter constitutes a risk-free factor that protected workers against ill health. How is that possible?

4.5.1. The Healthy Cross-Border Worker Phenomenon

The health gap between CBWs and NCBWs might be explained by the fact that CBWs perceived higher wages than NCBWs, since higher incomes have been associated with better health outcomes in the literature. Compared to NCBWs, CBWs have a better access to health-friendly consumption or activities (like purchasing organic food, seeking alternative medicine and participating in expensive sports). For both NCBWs and CBWs, the positive association between wage and health index is confirmed in our analysis. In the absence of CBWs' self-selection or employers' selection, we should expect that commuting will worsen CBWs' health, but that their higher incomes will improve their

health compared to NCBWs. We assumed that CBWs report a lower perceived health status, higher limitation of activities, a higher number of chronic diseases and disability, and less leisure activities than NCBWs. Nevertheless, even after controlling our results for wages, CBWs are still in better health than NCBWs, with our data exhibiting high estimated coefficients. Thus, this health gap can only be interpreted by the existence of a social selection processes.

4.5.2. Social Selection on the Labour Market

The social selection of the workers can originate from either the side of the workers or the employers. The so-called healthy worker effect, a well-known phenomenon in epidemiology (Li & Sung, 1999), was first observed among workers compared to the whole population (McMichael et al, 1974). The healthy commuter theory (Hansson et al, 2011) argues that only the healthiest workers will undertake longer commutes whereas those affected by ill health will choose to reduce their commuting time in order to minimise stress, tiredness and dissatisfaction resulting from commuting. Our study emphasises this phenomenon among CBWs too, suggesting that only the healthiest workers make the decision to work in a neighbouring country. This could explain why, even after being affected by the negative consequences of commuting, they still report a better health state than NCBWs. That could be the case if the positive dynamic resulting from the self-selection process is stronger than the negative one of commuting on workers' health. In this respect, our findings are consistent with the healthy commuter theory (Hansson et al, 2011).

Likewise, health may play a role in the selection of CBWs by recruiters during the matching process in the country of destination. Because hiring can be considered as an investment into uncertainty, recruiters want to minimise risks during the hiring procedure. Recruiters anticipate that commuting is gruelling and consider health as a longevity capital upon the cross-border labour market. Another argument could be that due to the higher labour cost in the destination countries, employers might have more productivity expectations leading them to examine the candidates' health status more closely. This could be especially the case in demanding business areas (like the industry, construction or catering), in which French commuters are overrepresented. Sociologists will argue that

recruiters might be more demanding health-wise with CBWs because they are not considered to be a part of the national community in the country of destination but simply a production factor. Therefore, we can presume that recruiters carefully analyse minor health signals that candidates involuntarily share, and, for example, exclude candidates who exhibit difficulties in sitting down, a livid skin colour, tiredness, overweight (Campos-Vazquez & Gonzalez, 2020) or physical disabilities (McMahon et al, 2008).

CBWs compare two possible situations: (1) working in their country of residence (less commuting and lower wages) or (2) working abroad (more commuting and higher wages). Let us suppose that the net gain from cross-border mobility (G) is equal to the wage gap between the country of destination and the country of residence (W), minus the temporal and health consequences of the mobility (C). Then, workers with a poorer health status than the average will face higher mobility cost and, thus, will obtain a smaller net gain from their mobility. For example, handicapped workers in wheelchairs will need more time to commute the same distance as non-disabled workers, leading to a higher mobility cost and finally to a smaller net profit. In other words, disability might be interpreted as a disincentive to commute abroad. In this respect, health is defined as a major driver of the cross-border mobility. We can assume that workers have the capacity to estimate their resilience regarding a particular professional context, and this estimation might be a parameter in the decision to work abroad. Such an ability has already been observed among workers. For example, candidates for shiftwork had more compatible sleep behaviours than those who applied for day work (Knutsson, 2003).

4.5.3. Unequal Cross-Border Workers

Secondly, major health disparities arose within the groups of CBWs, regarding the country of destination. Our analyses revealed that commuters to Luxembourg are the healthiest workers in our sample whereas those to Germany are the commuters with the poorest health state. How can we explain health disparities among CBWs?

Let us contextualise our findings concerning the main health disparities that arose within the groups of CBWs regarding the countries of destination. Commuters to Germany single out themselves since they are the only group of CBWs reporting less no leisure

activities than the NCBWs. Physical activity is higher in Germany than in France (EUROSTAT, 2018), which could indicate the existence of stronger sport-friendly norms in German society. A possible explanation might be that CBWs are socialised into the countries of destination, appropriating themselves some of the local norms and values operative in the foreign societies. This socialisation is even more possible knowing that three-quarters of the French workers commuting to Germany are living in the Alsace (see Figure 1: The French cross-border regions), a French area strongly influenced by German culture as is apparent in the dialect, the cuisine, the architecture, or even in the names of the villages (Alsace was a *Reichland* (Imperial territory) from 1871 to 1918 and occupied by the Nazis from 1940 to 1944). Commuters to Germany might have more chronic diseases since they are the oldest group of CBWs, are more employed in the industry and the construction or are more often working overtime. However, since associations were controlled for these variables, no explanation has been found. Commuters to Luxembourg might be the healthiest CBWs because they are the younger group of CBWs. However, as a control was introduced in the model for age, no explanation has been found.

We must remark that when we controlled for demographic background variables, estimated odds-ratios (OR) decreased slightly, indicating that health inequalities between workers had less to do with workers' demographic background. The introduction of the labour status entailed a major reduction of the OR for all health outcomes, which may indicate the important contribution of the labour status in health inequalities among workers.

Finally, to start this paper we assumed that CBWs are enduring indirect consequences of their specific lifestyle on their health. Because CBWs commute longer than NCBWs to their place of employment, we expected that their professional lifestyle reduces their free time. As a consequence, the supplementary time spent in traffic cannot be invested in health-friendly activities (such as sport, meditation, socialising) leading them to report more no leisure activities than the NCBWs. Although a spillover phenomenon has been highlighted for commuters (Hansson et al, 2011), our results lead us to reject such an assumption for the CBWs.

4.6. Strengths and Limitations

One strength point of our study is the large sample size, which makes the analysis of the association between commuting status and health factors possible. More importantly, our study design avoids possible bias resulting from different demographic background and labour statuses, which may explain morbidity differences between workers (Li & Sung, 1999). Controlling results with 17 demographic background and labour status variables may seriously reduce these biases in the statistical analysis. Furthermore, no subjects were included twice in our sample, since we only retained the first interrogation of each worker. The use of the labour survey excludes the risk of representative bias, considering that only a representative part of the population was investigated. The demographic background of the commuters in our sample is consistent with the commuter profiles found in other studies (Belkacem et al, 2006) (Isel & Kuhn, 2016).

Controlling for demographic background variables, like department and urban area, aid to avoid a local selection bias. Indeed, some areas might have better health conditions than other areas, due to an easier access to health care or a higher diagnostic quality (resulting from newer equipment or better medical training) explaining health differences between workers (Meijers, 1989). Our results confirmed that indicators of labour status (permanency of the job, sector, number of persons working at the local unit, wage, full-time/part-time employment, overtime and night work) need to be considered in the analysis as a main source of health inequalities among workers. For example, it has been shown that workers in large companies have better access to health care, which can constitute a protective factor against diseases (Wilcosky & Wing, 1987). Furthermore, adjusting for overtime or night work allows separating the association between commuting status and health from other work-related choices (Hansson et al, 2011).

As a validation process of the relevance of our exposure variable, the commuting status, we summarised (see Appendix, Table 5) the coefficients significance and the mean coefficient values in order to determine which variables are the most associated with health outcomes (except no leisure activities) for the fully adjusted model. We only retained variables for which the significant summation is greater than two, meaning that coefficients are significant for at least two health variables, and we only displayed the mean coefficient values for these retained variables. As expected, age is positively associated with health limitations and is the variable the more strongly associated with

health outcomes. A healthy worker portrait can be outlined from these results: CBW, young, educated, not blue collar, cohabiting, having children, in interim, working in the industry & construction, in trade, transport, lodging & catering, in scientific and technical activities, not working in local unit of more than 50 workers, earning a high wage, working full-time and at night and no overtime. Our results stressed the importance of the commuting status in health inequalities among workers, since this variable had an estimated coefficient of the same magnitude as education and wage. The commuting status is to be considered of similar importance as other 'heavy variables' like major demographic background and labour status variables. Furthermore, consistent results with our findings were found when workers' last interrogation was retained for the statistical analysis (see Appendix, Table 6).

One of the limitations of our study is probably its 'French focus'. Even if our study might have an international scope because of the spread of French workers in four different countries, our findings cannot be generalised without complementary studies on this topic from other countries. As well, the dataset did not include the lifestyle history of the workers, like smoking or drinking alcohol, which are associated with poorer health outcomes. Finally, our estimates might have underestimated the health gap between the two groups, since a control for wage was introduced in the regression.

4.7. Conclusion

As a consequence, the newly founded European Labour Authority (ELA) should take into account health policies as a promising way to support the cross-border mobility among countries of the European Union.

Firstly, our study highlighted a free rider phenomenon among European countries. Some countries are using the healthiest workforce of the surrounding countries, without having to bear health expenditures of other workers, or for the inactive part of the population stayed behind the border. The countries where CBWs are employed only compensate the health expenditures of the CBWs. As CBWs and their employers pay their social contribution in the country of employment, this should represent a deadweight loss for the country of residence, since healthy workers should pay for those who are in poorer

health. The creation of a European social security system might solve this issue, thus making the benefits of a healthy and mobile workforce shared by all European countries

Secondly, the European principle of free movement of workers grants EU citizens the 'right to work in another member state' (European Union, 2020) whereas in reality, only the healthiest workers commute to other countries. Health disparities among individuals have created a differentiated access to the cross-border labour market, leading to the generation of economic inequalities within the EU. This situation is questioning the *isonomia* principle of the European law, which might feed the anti-EU feeling across the population, in a tense context marked by the awakening of populism and the disruption of EU values. As a consequence, to reduce economic inequalities, a health policy aiming to compensate health disparities is recommended. Several potential pathways are practicable: (1) An awareness campaign about cross-border mobility targeting sick people might be useful to increase the cross-border flows of workers among the EU. This campaign could be reinforced by a support programme provided by the national employment agencies. (2) The establishment of a labour organisation more compatible with the 'sickness career' (Twaddle, 1981) for workers in ill health. (3) Decreasing the mobility cost of sick workers will increase the net benefit of the commuting decision as described above, and thus generate more incentives to commute. Specifically, building new car parks, establishing special traffic lanes, or the creation of a free mobility programme in the public transport system for sick workers could be efficient in this respect.

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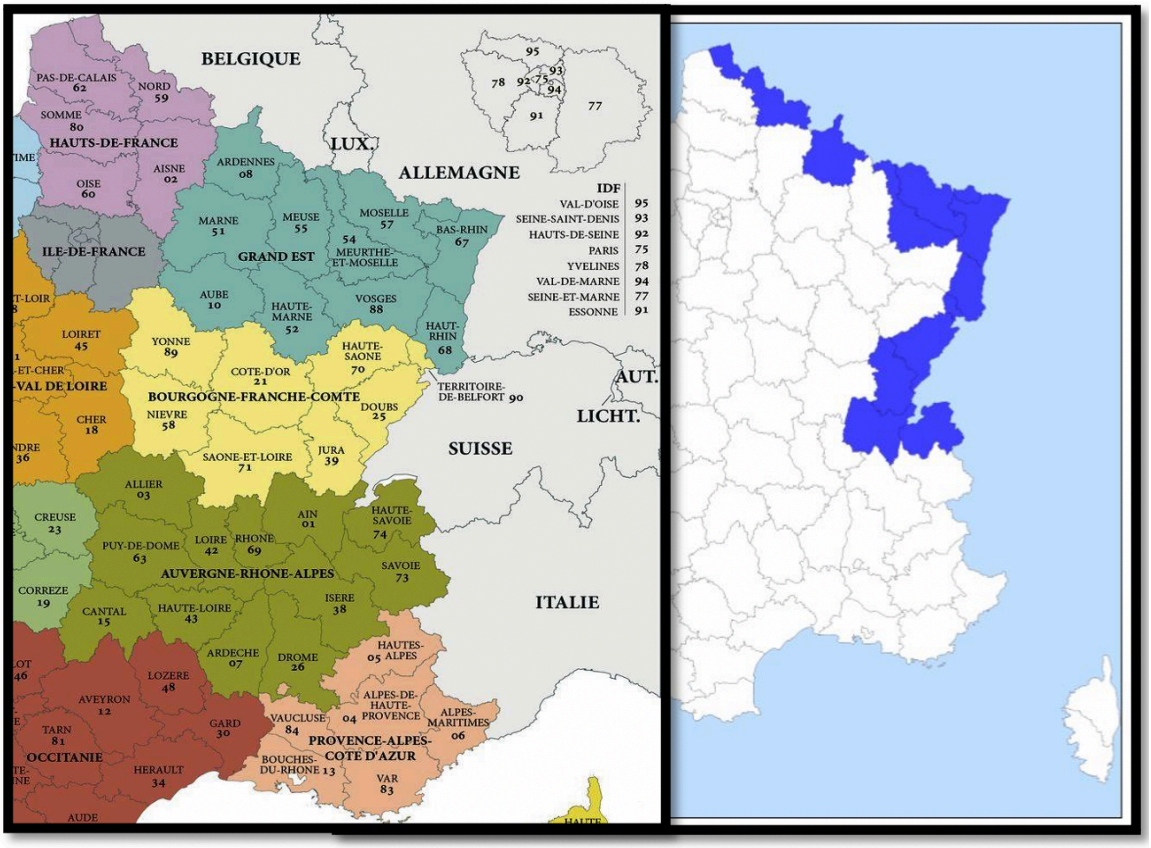
4.9. Appendix

4.9.1. Descriptives

Appendix Figure 1: The French cross-border region



Source: Document compiled by the authors with the help of the websites: http://www.Lion1906.com and https://www.cartes-2-france.com/cartographie/carte-france/x2-carte-france-regions-hd.jpg

The French cross-border region is composed of 11 departments: Ain, Ardennes, Doubs, Jura, Meurthe-et-Moselle, Moselle, Nord, Bas-Rhin, Haut-Rhin, Haute-Savoie and Territoire de Belfort. Of the commuters to Germany, 57 lived in Moselle, 143 in the Bas-Rhin, and 33 in the Haut-Rhin. Of those commuting to Belgium, 43 resided in the Ardennes, 31 in Meurthe-et-Moselle and 205 in Nord. Of the commuters to Switzerland, 70 lived in Ain, 250 in Doubs, 52 in Jura, 337 in Haut-Rhin, 554 in Haute-Savoie and 53 in Territoire de Belfort. Of the commuters to Luxembourg, 320 resided in Meurthe-et-

Moselle and 287 in Moselle. The departments Meuse and Aisne did not fit the selection criteria and were therefore not included in the analyses.

Appendix Table 1: Workers' departments of residence by commuting status and country of destination. %.

	DE NCBWs	DE CBWs	BE NCBWs	BE CBWs	CH NCBWs	CH CBWs	LU NCBWs	LU CBWs	Total NCBWs	Total CBWs
Ain (01)					19	5			7	3
Ardennes (08)			11	15					4	2
Doubs (25)					20	19			7	10
Jura (39)					11	4			4	2
Meurthe-et-Moselle (54)			19	11			42	53	8	14
Moselle (57)	32	24					58	47	11	14
Nord (59)			70	74					29	8
Bas-Rhin (67)	42	61							14	6
Haut-Rhin (68)	26	14			25	26			9	15
Haute-Savoie (74)					20	42			7	23
Territoire-de-Belfort (90)					4	4			1	2
N	6,895	233	8,304	279	6,941	1,316	5,868	849	20,372	2,456

Appendix Table 2: Good/very good perceived health status and countries' indicators in 2013, 2015, and 2017.

Good and very good	**DE NCBWs**	**DE CBWs**	**BE NCBWs**	**BE CBWs**	**CH NCBWs**	**CH CBWs**	**LU NCBWs**	**LU CBWs**	**Total NCBWs**	**Total CBWs**
High perceived health	82	78	83	85	84	88	83	87	**83**	**87**
	DE	**DE**	**BE**	**BE**	**CH**	**CH**	**LU**	**LU**	**France**	**OCDE**
Indicators 2017*	65		74		81		72		**67**	**69**
Indicators 2015*	65		75		79		70		**68**	**68**
Indicators 2013 *	65		74		80		71			

**Health at Glance reports: 2015, 2017, 2019; OECD (2015, 2017, 2019), Health at a Glance 2015, 2017, 2019: OECD Indicators, OECD Publishing, Paris.*
[http://dx.doi.org/10.1787/health_glance-2015en; http://dx.doi.org/10.1787/health_glance-2017-en; https://doi.org/10.1787/4dd50c09-en]

4.9.2. Multivariate Analysis

Appendix Tables 3: Associations between health limitations and demographic background and labour status variables.

Low perceived health	Unadjusted		Adjusted		Fully adjusted	
Variables	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Commuting status						
NCBW	Ref		Ref		Ref	
CBW	0.75***	0.66 – 0.86	0.78***	0.68 – 0.89	0.89	0.76 – 1.05
Sex						
Women			Ref		Ref	
Men			0.87***	0.80 – 0.96	1.01	0.92 – 1.11
Age						
20-29			Ref		Ref	
30-39			1.77***	1.49 – 2.11	1.81***	1.52 – 2.16
40-49			2.91***	2.48 – 3.42	3.04***	2.56 – 3.60
50-60			4.49***	3.86 – 5.23	4.78***	4.06 – 5.63
Education						
Up to secondary school			Ref		Ref	
Up to Bachelor's degree			0.72***	0.64 – 0.81	0.74***	0.65 – 0.83
Master's degree & above			0.69***	0.56 – 0.85	0.72***	0.59 – 0.89
Occupational category						
Blue collar workers			1.36***	1.21 – 1.53	1.29***	1.13 – 1.46
Employees			1.18***	1.05 – 1.33	1.09	0.97 – 1.24
Intermediate professions			Ref		Ref	
White collar workers			0.85*	0.72 – 1.01	0.95	0.81 – 1.13
Father's occupational category						
Not field out			1.12	0.95 – 1.33	1.12	0.95 – 1.33
Farmers			0.89	0.71 – 1.13	0.88	0.70 – 1.11
Artisans, merchants, company directors			0.91	0.77 – 1.09	0.92	0.78 – 1.10
White collar workers			0.96	0.80 – 1.16	0.95	0.79 – 1.14
Intermediate professions			Ref		Ref	
Employees			0.95	0.79 – 1.13	0.95	0.80 – 1.14
Blue collar workers			0.93	0.83 - 1.06	0.93	0.82 - 1.05
Born abroad						
Born in France			Ref		Ref	
Not born in France			1.18***	1.04 – 1.35	1.17**	1.03 – 1.33
Cohabiting						
Alone			Ref		Ref	
Couple			0.85***	0.77 – 0.93	0.84***	0.77 – 0.93
Children						
No children			Ref		Ref	
Children			0.91**	0.83 – 0.99	0.90**	0.82 – 0.98
Department						
Ain 01			Ref		Ref	
Meurthe-et-Moselle 54			1.14	0.93 – 1.40	1.14	0.93 – 1.41
Moselle 57			1.11	0.91 – 1.35	1.13	0.92 – 1.37
Haut-Rhin 68			1.10	0.89 – 1.35	1.13	0.91 – 1.39
Haute-Savoie 74			1.02	0.82 – 1.27	1.05	0.84 – 1.30
Territoire de Belfort 90			1.38*	0.99 – 1.92	1.38*	0.99 – 1.93
Urban area						
Rural area			Ref		Ref	
Urban area			1.07	0.97 – 1.19	1.06	0.96 – 1.18
Permanency of the job						
Open ended contract					Ref	
Fix-term contract					0.95	0.81 – 1.12
Interim					0.95	0.71 – 1.26
Sector					0.67	0.33 – 1.38
Not filled out					1.10	0.71 – 1.71
Agriculture					1.00	0.88 – 1.14
Industry & construction					1.02	0.90 – 1.15
Trade, transport, lodging & catering					1.16	0.79 – 1.71
Information & communication					0.97	0.75 – 1.24
Finance & insurance					0.77	0.52 – 1.13
Real estate					0.99	0.84 – 1.17
Scientific & technical activities					Ref	
Public administration					0.96	0.74 – 1.24

Other services		
Number of persons working at the local unit		
Not filled out	1.09	0.89 – 1.33
1-9	Ref	
10-49	1.16**	1.01 – 1.32
50-499	1.19**	1.04 – 1.36
500+	1.10	0.94 – 1.28
Wage		
0-2,000	Ref	
2,001-4,000	0.80***	0.71 – 0.90
4,001+	0.59***	0.44 – 0.80
Full-time/part-time employment		
Part-time	Ref	
Full-time	0.64***	0.57 – 0.71
Overtime		
No overtime	Ref	
Overtime	1.24***	1.13 – 1.37
Night work		
No	Ref	
Yes	0.94	0.82 – 1.08

p^1: significance p≤ 0.1 | p**≤ 0.05 | p***≤ 0.01 Wald test*
Unadjusted: commuting status.
Adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area.
Fully adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment, overtime, night work.

Activity limitation	Unadjusted		Adjusted		Fully adjusted	
Variables	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Commuting status						
NCBW	Ref		Ref		Ref	
CBW	0.73***	0.62 – 0.85	0.74***	0.63 – 0.87	0.85*	0.71 – 1.01
Sex						
Women			Ref		Ref	
Men			0.87***	0.79 – 0.96	1.03	0.92 – 1.15
Age						
20-29			Ref		Ref	
30-39			1.77***	1.46 – 2.14	1.77***	1.46 – 2.16
40-49			2.71***	2.28 – 3.23	2.71***	2.26 – 3.25
50-60			4.03***	3.41 – 4.75	4.04***	3.39 – 4.81
Education						
Up to secondary school			Ref		Ref	
Up to Bachelor's degree			0.75***	0.66 – 0.86	0.75***	0.65 – 0.85
Master's degree & above			0.68***	0.55 – 0.85	0.68***	0.55 – 0.85
Occupational category						
Blue collar workers			1.36***	1.20 – 1.55	1.37***	1.19 – 1.58
Employees			1.20***	1.05 – 1.36	1.12*	0.98 – 1.28
Intermediate professions			Ref		Ref	
White collar workers			0.73***	0.61 – 0.88	0.82**	0.68 – 0.98
Father's occupational category						
Not field out			1.25**	1.04 – 1.50	1.25**	1.04 – 1.51
Farmers			0.93	0.73 – 1.19	0.93	0.73 – 1.19
Artisans, merchants, company directors			1.10	0.91 – 1.34	1.12	0.92 – 1.36
White collar workers			1.09	0.89 – 1.33	1.07	0.87 – 1.30
Intermediate professions			Ref		Ref	
Employees			1.09	0.90 – 1.32	1.10	0.90 – 1.33
Blue collar workers			1.02	0.89 - 1.18	1.01	0.88 - 1.16
Born abroad						
Born in France			Ref		Ref	
Not born in France			0.89	0.76 – 1.05	0.89	0.76 – 1.05
Cohabiting						
Alone			Ref		Ref	
Couple			0.90**	0.80 – 1.00	0.90*	0.81 – 1.00
Children						
No children			Ref		Ref	
Children			0.89**	0.80 – 0.98	0.88**	0.79 – 0.97
Department						
Ain 01			Ref		Ref	
Meurthe-et-Moselle 54			1.02	0.81 – 1.29	1.01	0.80 – 1.28
Moselle 57			1.03	0.83 – 1.28	1.04	0.84 – 1.30
Haut-Rhin 68			0.98	0.77 – 1.23	0.99	0.78 – 1.25
Haute-Savoie 74			0.98	0.77 – 1.24	1.01	0.80 – 1.29
Territoire de Belfort 90			0.76	0.50 – 1.16	0.74	0.48 – 1.12
Urban area						
Rural area			Ref		Ref	
Urban area			0.96	0.86 – 1.07	0.94	0.85 – 1.05
Permanency of the job						
Open ended contract					Ref	
Fix-term contract					1.05	0.87 – 1.26
Interim					0.62***	0.44 – 0.89
Sector					0.96	0.43 – 2.12
Not field out					1.12	0.69 – 1.82
Agriculture					0.90	0.79 – 1.04
Industry & construction					0.83***	0.72 – 0.94
Trade, transport, lodging & catering					0.88	0.55 – 1.41
Information & communication					0.96	0.73 – 1.26
Finance & insurance					0.65*	0.39 – 1.06
Real estate					0.87	0.72 – 1.04
Scientific & technical activities					Ref	Ref
Public administration					0.92	0.70 – 1.22

Other services		
Number of persons working at the local unit		
Not field out	1.00	0.79 – 1.26
1-9	Ref	
10-49	1.15*	0.99 – 1.34
50-499	1.38***	1.19 – 1.60
500+	1.28***	1.07 – 1.52
Wage		
0-2,000	Ref	
2,001-4,000	0.84***	0.74 – 0.95
4,001+	0.58***	0.43 – 0.79
Full-time/part-time employment		
Part-time	Ref	
Full-time	0.65***	0.58 – 0.73
Overtime		
No overtime	Ref	
Overtime	1.22***	1.09 – 1.35
Night work		
No	Ref	
Yes	0.82**	0.70 – 0.96

p^1: significance p≤ 0.1 | p**≤ 0.05 | p***≤ 0.01 Wald test*
Unadjusted: commuting status.
Adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area.
Fully adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment, overtime, night work.

Chronic diseases	Unadjusted		Adjusted		Fully adjusted	
Variables	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Commuting status						
NCBW	Ref		Ref		Ref	
CBW	0.82***	0.73 – 0.93	0.81***	0.71 – 0.91	0.87**	0.75 – 1.00
Sex						
Women			Ref		Ref	
Men			0.90***	0.83 – 0.97	0.99	0.91 – 1.08
Age						
20-29			Ref		Ref	
30-39			1.63***	1.42 – 1.88	1.65***	1.43 – 1.91
40-49			2.32***	2.03 – 2.65	2.35***	2.05 – 2.71
50-60			3.41***	3.00 – 3.88	3.48***	3.04 – 3.99
Education						
Up to secondary school			Ref		Ref	
Up to Bachelor's degree			0.84***	0.76 – 0.92	0.83***	0.75 – 0.92
Master's degree & above			0.82**	0.69 – 0.98	0.81**	0.68 – 0.96
Occupational category						
Blue collar workers			1.07	0.96 – 1.19	1.12*	1.00 – 1.26
Employees			1.01	0.91 – 1.12	0.98	0.88 – 1.09
Intermediate professions			Ref		Ref	
White collar workers			0.86**	0.75 – 0.98	0.91	0.79 – 1.04
Father's occupational category						
Not field out			1.11	0.96 – 1.29	1.12	0.96 – 1.30
Farmers			0.90	0.74 – 1.10	0.91	0.75 – 1.12
Artisans, merchants, company directors			1.02	0.88 – 1.20	1.04	0.89 – 1.22
White collar workers			0.93	0.80 – 1.09	0.92	0.79 – 1.08
Intermediate professions			Ref		Ref	
Employees			1.03	0.88 – 1.21	1.04	0.88 – 1.21
Blue collar workers			1.00	0.90 – 1.12	1.00	0.89 – 1.12
Born abroad						
Born in France			Ref		Ref	
Not born in France			1.02	0.89 – 1.15	1.02	0.90 – 1.16
Cohabiting						
Alone			Ref		Ref	
Couple			0.94	0.86 – 1.02	0.94	0.86 – 1.03
Children						
No children			Ref		Ref	
Children			0.92*	0.85 – 1.00	0.91**	0.84 – 0.99
Department						
Ain 01			Ref		Ref	
Meurthe-et-Moselle 54			1.15	0.95 – 1.38	1.14	0.95 – 1.38
Moselle 57			1.37***	1.15 – 1.63	1.39***	1.16 – 1.66
Haut-Rhin 68			1.18*	0.98 – 1.42	1.20*	0.99 – 1.45
Haute-Savoie 74			1.21*	0.99 – 1.47	1.23**	1.01 – 1.50
Territoire de Belfort 90			0.96	0.69 – 1.33	0.95	0.68 – 1.31
Urban area						
Rural area			Ref		Ref	
Urban area			1.04	0.96 – 1.14	1.03	0.94 – 1.12
Permanency of the job						
Open ended contract					Ref	
Fix-term contract					1.09	0.95 – 1.26
Interim					0.69***	0.52 – 0.92
Sector					0.52*	0.26 – 1.05
Not field out					0.61**	0.40 – 0.94
Agriculture					0.84***	0.75 – 0.94
Industry & construction					0.83***	0.75 – 0.93
Trade, transport, lodging & catering					0.88	0.66 – 1.18
Information & communication					0.81*	0.65 – 1.02
Finance & insurance					0.73*	0.52 – 1.03
Real estate					0.83**	0.71 – 0.96
Scientific & technical activities					Ref	
Public administration					1.04	0.84 – 1.30

Other services		
Number of persons working at the local unit		
Not field out	1.08	0.90 – 1.30
1-9	Ref	
10-49	1.08	0.96 – 1.22
50-499	1.22***	1.08 – 1.37
500+	1.15*	1.00 – 1.32
Wage		
0-2,000	Ref	
2,001-4,000	0.89**	0.81 – 0.98
4,001+	0.84	0.67 – 1.06
Full-time/part-time employment		
Part-time	Ref	
Full-time	0.78***	0.71 – 0.86
Overtime		
No overtime	Ref	
Overtime	1.30***	1.19 – 1.41
Night work		
No	Ref	
Yes	0.95	0.84 – 1.07

p^1: significance p≤ 0.1 | p**≤ 0.05 | p***≤ 0.01 Wald test*
Unadjusted: commuting status.
Adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area.
Fully adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment, overtime, night work.

Disability	Unadjusted		Adjusted		Fully adjusted	
Variables	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Commuting status						
NCBW	Ref		Ref		Ref	
CBW	0.40***	0.30 – 0.54	0.39***	0.29 – 0.53	0.48***	0.34 – 0.67
Sex						
Women			Ref		Ref	
Men			1.09	0.93 – 1.28	1.58***	1.31 – 1.91
Age						
20-29			Ref		Ref	
30-39			2.13***	1.55 – 2.93	2.19***	1.60 – 2.99
40-49			4.25***	3.14 – 5.76	4.27***	3.16 – 5.78
50-60			4.18***	3.12 – 5.60	4.06***	3.03 – 5.45
Education						
Up to secondary school			Ref		Ref	
Up to Bachelor's degree			0.63***	0.51 – 0.78	0.60***	0.48 – 0.75
Master's degree & above			0.57***	0.39 – 0.83	0.54***	0.37 – 0.79
Occupational category						
Blue collar workers			1.63***	1.34 – 1.99	1.80***	1.44 – 2.25
Employees			1.36***	1.11 – 1.67	1.16	0.94 – 1.43
Intermediate professions			Ref		Ref	
White collar workers			0.67***	0.50 – 0.91	0.75*	0.55 – 1.01
Father's occupational category						
Not field out			1.21	0.91 – 1.60	1.17	0.88 – 1.55
Farmers			0.78	0.53 – 1.17	0.77	0.52 – 1.15
Artisans, merchants, company directors			0.95	0.71 – 1.28	0.98	0.73 – 1.32
White collar workers			1.01	0.73 – 1.38	0.95	0.69 – 1.31
Intermediate professions			Ref		Ref	
Employees			0.91	0.67 – 1.23	0.91	0.67 – 1.24
Blue collar workers			0.99	0.79 – 1.24	0.96	0.77 – 1.20
Born abroad						
Born in France			Ref		Ref	
Not born in France			0.86	0.68 – 1.09	0.84	0.65 – 1.07
Cohabiting						
Alone			Ref		Ref	
Couple			0.76***	0.66 – 0.88	0.78***	0.67 – 0.91
Children						
No children			Ref		Ref	
Children			0.74***	0.64 – 0.86	0.74***	0.63 – 0.86
Department						
Ain 01			Ref		Ref	
Meurthe-et-Moselle 54			1.46*	0.99 – 2.18	1.40*	0.94 – 2.08
Moselle 57			1.36*	0.96 – 1.94	1.33	0.93 – 1.91
Haut-Rhin 68			1.17	0.80 – 1.71	1.18	0.81 – 1.72
Haute-Savoie 74			1.30	0.88 – 1.93	1.32	0.89 – 1.96
Territoire de Belfort 90			1.17	0.62 – 2.21	1.11	0.59 – 2.11
Urban area						
Rural area			Ref		Ref	
Urban area			1.06	0.90 – 1.26	1.02	0.86 – 1.21
Permanency of the job						
Open ended contract					Ref	
Fix-term contract					1.16	0.92 – 1.46
Interim					0.51**	0.28 – 0.93
Sector						0.11 – 2.29
Not field out					0.49	0.43 – 1.83
Agriculture					0.89	0.52 – 0.80
Industry & construction					0.64***	0.46 – 0.71
Trade, transport, lodging & catering					0.57***	0.42 – 1.34
Information & communication					0.75	0.71 – 1.68
Finance & insurance					1.09	0.44 – 1.54
Real estate					0.83	0.44 – 0.80
Scientific & technical activities					0.59***	
Public administration					Ref	0.42 – 0.97

Other services	0.64**	
Number of persons working at the local unit		
Not field out	1.66***	1.15 – 2.41
1-9	Ref	
10-49	1.24*	0.96 – 1.60
50-499	1.67***	1.30 – 2.14
500+	1.50***	1.13 – 2.00
Wage		
0-2,000	Ref	
2,001-4,000	0.84	0.68 – 1.04
4,001+	0.52**	0.29 – 0.94
Full-time/part-time employment		
Part-time	Ref	
Full-time	0.45***	0.37 – 0.54
Overtime		
No overtime	Ref	
Overtime	1.06	0.90 – 1.25
Night work		
No	Ref	
Yes	0.60***	0.46 – 0.78

p^1: significance p≤ 0.1 | p**≤ 0.05 | p***≤ 0.01 Wald test*
Unadjusted: commuting status.
Adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area.
Fully adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment, overtime, night work.

No leisure activities	Unadjusted		Adjusted		Fully adjusted	
Variables	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Commuting status						
NCBW	Ref		Ref		Ref	
CBW	1.06	0.92 – 1.22	0.95	0.82 – 1.10	0.97	0.82 – 1.13
Sex						
Women			Ref		Ref	
Men			1.68***	1.52 – 1.85	1.69***	1.51 – 1.89
Age						
20-29			Ref		Ref	
30-39			1.22***	1.05 – 1.42	1.28***	1.10 – 1.49
40-49			1.34***	1.17 – 1.54	1.41***	1.22 – 1.64
50-60			1.45***	1.27 – 1.67	1.55***	1.34 – 1.80
Education						
Up to secondary school			Ref		Ref	
Up to Bachelor's degree			0.58***	0.52 – 0.65	0.60***	0.54 – 0.68
Master's degree & above			0.57***	0.49 – 0.67	0.59***	0.50 – 0.69
Occupational category						
Blue collar workers			1.60***	1.38 – 1.86	1.50***	1.28 – 1.75
Employees			1.27***	1.12 – 1.43	1.21***	1.07 – 1.37
Intermediate professions			Ref		Ref	
White collar workers			0.89*	0.77 – 1.01	0.89	0.77 – 1.03
Father's occupational category						
Not field out			1.22**	1.01 – 1.48	1.20*	0.99 – 1.45
Farmers			0.84	0.65 – 1.08	0.83	0.64 – 1.07
Artisans, merchants, company directors			0.89	0.74 – 1.06	0.89	0.74 – 1.07
White collar workers			0.82**	0.70 – 0.97	0.82**	0.70 – 0.96
Intermediate professions			Ref		Ref	
Employees			0.97	0.80 – 1.17	0.97	0.80 – 1.17
Blue collar workers			1.20***	1.05 - 1.37	1.19**	1.04 - 1.36
Born abroad						
Born in France			Ref		Ref	
Not born in France			1.40***	1.18 – 1.67	1.36***	1.14 – 1.61
Cohabiting						
Alone			Ref		Ref	
Couple			1.11*	1.00 – 1.23	1.12**	1.01 – 1.25
Children						
No children			Ref		Ref	
Children			1.04	0.94 – 1.14	1.04	0.94 – 1.15
Department						
Ain 01			Ref		Ref	
Meurthe-et-Moselle 54			1.35***	1.07 – 1.69	1.34**	1.07 – 1.68
Moselle 57			1.61***	1.29 – 2.01	1.58***	1.26 – 1.97
Haut-Rhin 68			1.25*	0.99 – 1.56	1.24*	0.99 – 1.56
Haute-Savoie 74			0.97	0.78 – 1.22	0.98	0.78 – 1.23
Territoire de Belfort 90			1.62**	1.05 – 2.50	1.63**	1.06 – 2.51
Urban area						
Rural area			Ref		Ref	
Urban area			0.95	0.85 – 1.06	0.94	0.84 – 1.05
Permanency of the job						
Open ended contract					Ref	
Fix-term contract					1.11	0.94 – 1.31
Interim					1.00	0.67 – 1.48
Sector						0.93 – 7.58
Not field out					2.66*	0.92 – 3.01
Agriculture					1.66*	0.93 – 1.24
Industry & construction					1.07	1.14 – 1.49
Trade, transport, lodging & catering					1.30***	0.68 – 1.23
Information & communication					0.92	0.92 – 1.44
Finance & insurance					1.15	0.77 – 1.66
Real estate					1.13	1.01 – 1.45
Scientific & technical activities					1.21**	
Public administration					Ref	0.93 – 1.45

Other services	1.16	
Number of persons working at the local unit		
Not field out	1.81***	1.41 – 2.32
1-9	Ref	
10-49	1.11	0.97 – 1.27
50-499	1.25***	1.09 – 1.43
500+	1.27***	1.07 – 1.50
Wage		
0-2,000	Ref	
2,001-4,000	0.90*	0.80 – 1.02
4,001+	0.91	0.73 – 1.15
Full-time/part-time employment		
Part-time	Ref	
Full-time	0.97	0.86 – 1.09
Overtime		
No overtime	Ref	
Overtime	0.92	0.83 – 1.02
Night work		
No		
Yes	0.99	0.84 – 1.18

p^1: significance p≤ 0.1 | p**≤ 0.05 | p***≤ 0.01 Wald test*
Unadjusted: commuting status.
Adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area.
Fully adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment, overtime, night work.

Appendix Table 4: Predicted wages in €, by health index units.

Health index	0= low	p^1	1	p^1	2	p^1	3	p^1	4	p^1	5=high	p^1	Marginal increase	p^1
NCBWs	1,369	***	1,569	***	1,800	***	1,808	***	1,826	***	1,957	***	81	***
CBWs	3,358	***	2,954	***	3,059	***	3,349	***	3,375	***	3,790	***	161	***
Total	1,592	***	1,725	***	1,941	***	1,981	***	1,999	***	2,163	***	104	***

*p^1: significance p***< 0.01; Student's t-test*

Appendix Table 5: Associations between health limitations and demographic background and labour status variables: summary table

Health outcomes Fully adjusted model	Low perceived health	Activity limitation	Chronic diseases	Disability	Significance summation	Mean coefficient value
Commuting status						
NCBW	Ref	Ref	Ref	Ref		
CBW	-	-	-*	-*	2	0.77
Sex						
Women	Ref	Ref	Ref	Ref		
Men	+	+	-	+*	1	
Age						
20-29	Ref	Ref	Ref	Ref		
30-39	+*	+*	+*	+*	4	1.86
40-49	+*	+*	+*	+*	4	3.09
50-60	+*	+*	+*	+*	4	4.09
Education						
Up to secondary school	Ref	Ref	Ref	Ref		
Up to Bachelor's degree	-*	-*	-*	-*	4	0.73
Master's degree & above	-*	-*	-*	-*	4	0.69
Occupational category						
Blue collar workers	+*	+*	+	+*	3	1.40
Employees	+	+	-	+	0	
Intermediate professions	Ref	Ref	Ref	Ref		
White collar workers	-	-*	-	-	1	
Father's occupational category						
Not field out	+	+*	+	+	1	
Farmers	-	-	-	-	0	
Artisans, merchants, company directors	-	+	+	-	0	
White collar workers	-	+	-	-	0	
Intermediate professions	Ref	Ref	Ref	Ref		
Employees	-	+	+	-	0	
Blue collar workers	-	+	=	-	0	
Born abroad						
Born in France	Ref	Ref	Ref	Ref		
Not born in France	+*	-	+	-	1	
Cohabiting						
Alone	Ref	Ref	Ref	Ref		
Couple	-*	-*	-	-*	3	0.87
Children						
No children	Ref	Ref	Ref	Ref		
Children	-*	-*	-*	-*	4	0.86
Department						
Ain 01	Ref	Ref	Ref	Ref		
Meurthe-et-Moselle 54	+	+	+	+	0	
Moselle 57	+	+	+*	+	1	
Haut-Rhin 68	+	-	+	+	0	
Haute-Savoie 74	+	+	+*	+	1	
Territoire de Belfort 90	+	-	-	+	0	
Urban area						
Rural area	Ref	Ref	Ref	Ref		
Urban area	+	-	+	+	0	
Permanency of the job						
Open ended contract	Ref	Ref	Ref	Ref		
Fix-term contract	-	+	+	+	0	
Interim	-	-*	-*	-*	3	0.69
Sector						
Not field out	-	-	-	-	0	
Agriculture	+	+	-*	-	1	
Industry & construction	+	-	-*	-*	2	0.85
Trade, transport, lodging & catering	+	+*	-*	-*	3	0.81
Information & communication	+	-	-	-	0	
Finance & insurance	-	-	-	+	0	
Real estate	-	-	-	-	0	
Scientific & technical activities	-	-	-*	-*	2	0.82
Public administration	Ref	Ref	Ref	Ref		
Other services	-	-	+	-*	1	

Number of persons working at the local unit					1	
Not field out	+	+	+	+*		
1-9	Ref	Ref	Ref	Ref	1	
10-49	+*	+	+	+	4	1.37
50-499	+*	+*	+*	+*	2	1.26
500+	+	+*	+	+*		
Wage						
0-2,000	Ref	Ref	Ref	Ref		
2,001-4,000	-*	-*	-*	-	3	0.84
4,001+	-*	-*	-	-*	3	0.63
Full-time/part-time employment						
Part-time	Ref	Ref	Ref	Ref		
Full-time	-*	-*	-*	-*	4	0.63
Overtime						
No overtime	Ref	Ref	Ref	Ref		
Overtime	+*	+*	+*	-	3	1.20
Night work						
No	Ref	Ref	Ref	Ref		
Yes	-	-*	-*	-*	3	0.83

* *CI excludes the value 1*

4.9.3. Robustness check

Appendix Table 6: Associations between commuting status and health outcomes. (Last interrogation)

NBCWs = reference group value 1 Model of regression	DE CBWs	p[1]	BE CBWs	p[1]	CH CBWs	p[1]	LU CBWs	p[1]	Total CBWs	p[1]
Unadjusted										
Low perceived health	0.91 (0.59 - 1.41)	NS	0.61 (0.40 – 0.94)	**	0.65 (0.49 – 0.85)	***	0.70 (0.49 – 0.99)	**	**0.66 (0.55 – 0.79)**	***
Activity limitation	0.60 (0.32 – 1.11)	NS	0.60 (0.35 – 1.02)	*	0.57 (0.42 – 0.78)	***	0.73 (0.49 – 1.08)	NS	**0.63 (0.51 – 0.78)**	***
Chronic diseases	1.19 (0.82 – 1.73)	NS	0.55 (0.37 – 0.83)	***	0.74 (0.59 – 0.91)	***	0.77 (0.58 – 1.02)	*	**0.78 (0.67 – 0.90)**	***
Disability	0.09 (0.01 – 0.63)	**	0.57 (0.25 – 1.30)	NS	0.32 (0.13 – 0.76)	***	0.59 (0.33 – 1.05)	*	**0.42 (0.27 – 0.65)**	***
No leisure activities	0.83 (0.54 – 1.27)	NS	1.51 (0.94 – 2.43)	*	1.00 (0.80 – 1.26)	NS	1.71 (1.13 – 2.58)	**	**1.18 (0.99 – 1.39)**	*
Adjusted										
Low perceived health	0.67 (0.43 – 1.05)	*	0.58 (0.37 – 0.91)	**	0.63 (0.48 – 0.83)	***	0.68 (0.47 – 0.98)	**	**0.66 (0.54 – 0.79)**	***
Activity limitation	0.46 (0.25 – 0.85)	**	0.59 (0.34 – 1.01)	*	0.55 (0.40 – 0.75)	***	0.74 (0.49 – 1.10)	NS	**0.59 (0.48 – 0.74)**	***
Chronic diseases	0.95 (0.65 – 1.39)	NS	0.57 (0.37 – 0.86)	***	0.76 (0.61 – 0.95)	**	0.87 (0.65 – 1.17)	NS	**0.78 (0.67 – 0.90)**	***
Disability	0.07 (0.01 – 0.50)	***	0.50 (0.21 – 1.16)	NS	0.32 (0.13 – 0.82)	**	0.55 (0.29 – 1.02)	*	**0.41 (0.25 – 0.65)**	***
No leisure activities	0.62 (0.39 – 0.98)	**	1.32 (0.82 – 2.12)	NS	0.95 (0.75 – 1.20)	NS	1.40 (0.91 – 2.15)	NS	**1.06 (0.89 – 1.26)**	**NS**
Fully adjusted										
Low perceived health	0.72 (0.46 – 1.13)	NS	0.63 (0.40 – 1.01)	*	0.76 (0.55 – 1.04)	*	0.79 (0.54 – 1.15)	NS	**0.76 (0.62 – 0.92)**	***
Activity limitation	0.54 (0.29 – 1.02)	*	0.68 (0.39 – 1.17)	NS	0.54 (0.36 – 0.80)	***	1.06 (0.69 – 1.64)	NS	**0.69 (0.55 – 0.87)**	***
Chronic diseases	0.98 (0.67 –1.44)	NS	0.59 (0.38 –0.89)	**	0.70 (0.53 – 0.92)	***	0.98 (0.71 – 1.35)	NS	**0.79 (0.67 – 0.93)**	***
Disability	0.09 (0.01 – 0.62)	**	0.63 (0.27 – 1.48)	NS	0.33 (0.17 – 0.64)	***	0.82 (0.41 – 1.65)	NS	**0.50 (0.33 – 0.76)**	***
No leisure activities	0.55 (0.34 – 0.87)	**	1.36 (0.85 – 2.19)	NS	1.14 (0.86 – 1.50)	NS	1.39 (0.89 – 2.19)	NS	**1.16 (0.96 – 1.40)**	**NS**
N	**175**		**219**		**1,120**		**500**		**2,037**	

p[1]: significance p≤ 0.1 | p**≤ 0.05 | p***≤ 0.01; Wald test.*
Unadjusted: commuting status
Adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area
Fully adjusted: commuting status, sex, age, education, occupational category, father's occupational category, born abroad, cohabiting, children, departments, urban area, permanency of the job, sector, number of people employed at the local unit, wage, full-time/part-time employment, overtime, night work

5. Conclusion

5.1. Synthesis and discussion of the results

Cross-border mobility is a phenomenon of growing interest since more and more workers will cross borders in the future to find employment abroad. Labour mobility generates positive externalities within the EU such as resolving labour shortage, increasing the competition between workers and strengthening a sense of belonging to the UE. Furthermore, cross-border mobility raises questions regarding social security and might thus be the subject of litigation between EU-member states. Hence, cross-border mobility deserves specific attention from researchers and public authorities.

This work underscores that cross-border mobility stems in the first instance from the individual will. Our research revealed that 39% of the French cross-border workers motivate their decision to commute abroad with financial reasons, such as the desire to earn a higher wage or to benefit from the Luxembourgish' tax system. Moreover, 39% of the French cross-border workers mentioned professional motivations to justify their commuting. These can take many forms such as the willingness to find a job, getting access to better job opportunities or better work conditions, professional development, having an enjoyable job, accumulating professional experience abroad, to be employed in a renowned firm or because of the geographical proximity. Another 22% of the participants reported personal reasons motivating their choice to commute abroad. Those workers emphasised the need for work-life balance, intellectual challenge, to apply their academic research in the private sector, to feel safe in their workplace, of working in a city and to do the job they wanted to do. As a consequence, most of the workers commute abroad for financial and professional reasons. However, personal motivations matter as well, especially for the younger generations of workers, and should not be underestimated as a valuable reason to cross the border.

Furthermore, this research has highlighted that the motivations of the workers vary according to their demographic background and labour status profiles. Women more

often justify their decision to commute abroad with financial motivations than men. Whereas men expressed various motivations. Workers aged 30-39 reported more often than workers from any other age groups the importance of financial benefits. Highly educated workers brought personal reasons out whereas educated and poorly educated placed more emphasis on professional and financial motivations. White collar workers more often reported personal motivations than other workers. Intermediate professions highlighted the importance of professional motivations in their mobility. Blue collar workers and employees mentioned financial motivations more often than other workers. These findings suggest that the lower the social class, the more financial motivations are important when it comes to crossing the borders.

A complementary model of cross-border labour supply was formulated on the basis of our empirical findings. Interviews with the cross-border workers have highlighted a preference for the proximity, since they prefer to work in their country of residence and that commuting is perceived as a constraint because of the transport. Furthermore, cross-border workers expressed needs during the interviews such as financial security, professional development and personal development. Thus, cross-border workers arbitrate between (1) working in their country of residence and (2) working abroad. If the commuting grants financial security, the decision is made to commute. However, the labour supply would be highly volatile in this case, since a rise of the wages in the country of residence will generate the return of these workers. If not, the decision is made to work in the country of residence since the commuting cost is not compensated with financial benefits. After having achieved financial security, workers seek professional development. If professional development is not achieved, the decision is made to continue to commute, since commuting costs are compensated by financial benefits. However, the labour supply will still be highly sensitive to any rise of the wage in the country of residence. If workers achieved professional development while commuting abroad, their labour supply will be less volatile to any rise of the salary in their country of residence. Finally, if workers achieve personal development, the cross-border labour supply will be less volatile and the rooting of the workers on the foreign labour market will be lasting. An additional finding might be mentioned. A ticket to cross-border

mobility exists and can be estimated at 500€, suggesting that the commuting cost between France and Luxembourg is equal to this amount.

Moreover, this work highlights that cross-border mobility is also driven by predispositions, since whatever their willingness to be engaged in cross-border mobility some individuals are more likely to commute abroad than others.

Firstly, workers' migration experience fosters cross-border mobility by lowering commuting costs. We brought into light that migrants and their children commute more than their non-migrant peers. The multivariate analysis confirmed this singular behaviour, by ascertaining that migrants and their children are more likely to be engaged in cross-border mobility. For example, we highlighted that immigrants are twice as likely to commute as non-immigrants. However, the association between migration and cross-border mobility did not hold for internal migrants, indicating that previous internal migration experience does not lead to a greater likelihood to be engaged in cross-border mobility. As a consequence, our findings suggest that only previous experience of international migration matter in order to commute abroad. Importantly, we outlined that migrant children (both immigrant children and foreigner children), who did not migrate themselves are as well more likely to commute compared with their non migrant counterparts. This implies that the capacity to deal with distance and borders can be transmitted from the parents to their children and that knowing that mobility is possible and knowing how to move matter equally. However, we established that the association between migration and cross-border mobility is greater for migrants than for their children, suggesting that the acquired experience of migration is more useful in order to commute abroad than the inherited experience of migration.

Furthermore, we underlined the relevance of the concept of migration capital as an indicator of previous migration experience. Cross-border workers have a higher endowment in migration capital than non cross-border workers. The multivariate analysis confirmed the association between migration capital and cross-border mobility. We also emphasized that the higher the endowment in migration capital and the higher the predicted probability to be engaged in cross-border mobility. This finding holds for both acquired migration capital and inherited migration capital.

We enlightened that migrants are more likely to commute abroad since they face lower mobility costs. As well, working abroad can constitute a strategy aiming to escape discrimination occurring in the country of residence. In addition, migrants have broader linguistic skills than natives, leading them to be more attractive for employers on multilinguistic labour markets.

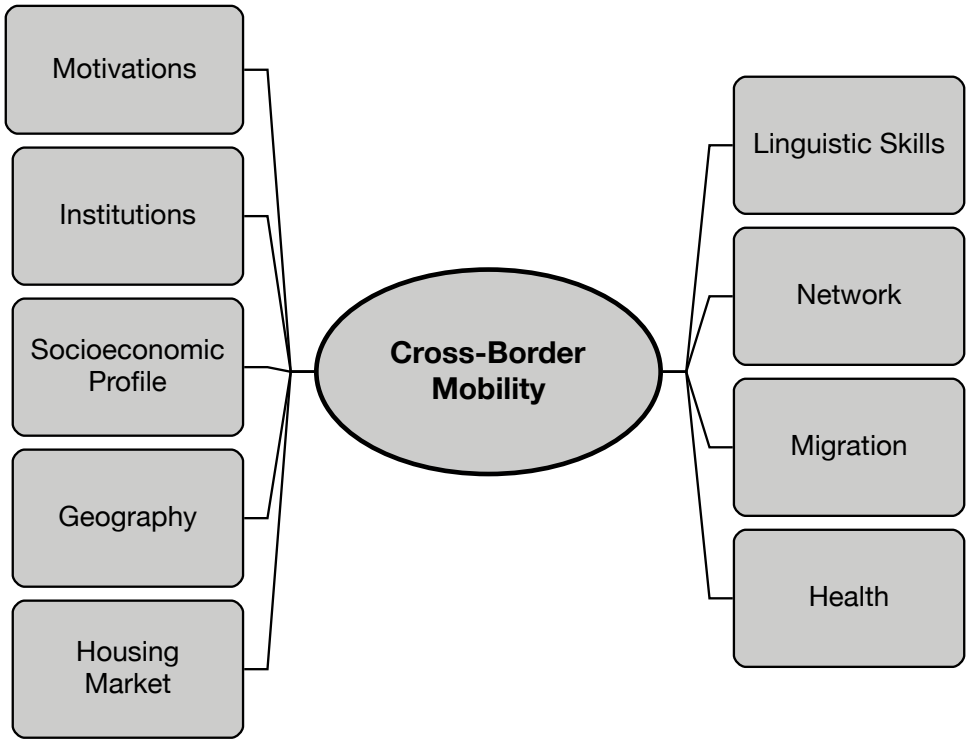
We argued as well that migration can be conceived as a new type of capital, since the migration capital own specific properties shared by all types of capitals. The migration capital can be accumulated. Workers increase their capital by migrating during their lifetime. The migration capital can be converted. Cross-border workers convert part of their migration capital in economic capital when they commute abroad. The migration capital leads to inequality. Workers having the capacity to deal with distance and borders can extract a higher wage from the labour market than workers who do not have this ability. The migration capital can be transmitted. Migrants transmit to their children the awareness that migration is a possibility and share their migration experience.

Secondly, workers' health state determines their possibility to commute abroad. Our study highlighted the better health state of the cross-border workers. Cross-border workers had a lower prevalence of low self-perceived health, activity limitation, chronic diseases and disability than non cross-border workers. Commuters to Germany stated the poorer health state whereas commuters to Switzerland and Luxembourg reported the better health state. OECD indicators corroborated our findings since cross-border workers reported a better perceived health than the population of their country of destination and German and Swiss citizens reported respectively the lowest and the highest share of high perceived health.

The use of the multivariate analysis ascertained the association between cross-border mobility and health outcomes. On the whole, cross-border workers were less likely to report chronic diseases and disability than their non commuter counterparts, suggesting the better health state of the cross-border workers. The poor health state of the commuters toward Germany was confirmed, since they were the only group of cross-border workers having a higher likelihood to report chronic diseases than non commuters. The better health state of commuters towards Luxembourg is ascertained since they were less likely

to report activity limitation, chronic diseases and disability than non commuters. However, the better health state of the commuters toward Switzerland turned out not to be significant after controlling for the demographic background and labour status of the workers, suggesting the major role of their higher wages in explaining their better health. Also, wage is associated with cross-border workers' health, since a higher income is associated with a better health state. For example, a salary bonus of 104€ led to a marginal improvement of the health index. We explained the better health state of the cross-border workers by the existence of a process of social selection of the workers which might occur on the foreign labour market. As well, it can be assumed that only the healthiest workers decide to commute abroad and manage to handle this exhausting lifestyle over time. The following figure (See Figure 1) summarizes the main drivers of cross-border mobility mentioned in the literature supplemented by our findings.

Figure 1: The main drivers of cross-border mobility



Source: Figure generated by the author with NVivo

5.2. Limitations

This work explored the driving forces of cross-border mobility and aimed to contribute to the field of the border studies by placing the spotlight on factors that have so far remained under documented in the literature. Nonetheless, some limitations might be mentioned.

In the qualitative part, several methods of data collection used might lead to challenges. The convenience sampling method did not provide a representative sample of the French cross-border workers, implying that our results cannot be generalized on a global scale (Bryman, 2012). Furthermore, the heterogeneity of places and situations in the data collection caused a deficit of harmonization in the dataset, which in turn led to missing values.

The quantitative part is based on large sample sizes, with respectively 32,495 and 22,828 observations for the third and fourth parts. However, significant variables that might affect workers' capacity to deal with distance and borders were omitted in the analysis. For example, the Enquête Emploi does not provide information about workers' linguistic skills, soft skills or network. Doing so, we might have overestimated the association between the migration capital and cross-border mobility. At the opposite, this association might have been underestimated since other Europeans such as the targeted Belgians, Germans, Luxembourgers, Swiss and Monegasques were dropped as well in the Model 4 due to formatting of some modalities in the Enquête Emploi.

Furthermore, the Enquête Emploi does not include some important variables that are negatively associated with health outcomes such as smoking or drinking habits. As well, since a control for wage was introduced in the model, health disparities between cross-border workers and non cross-border workers might have been underestimated.

On the whole, the generalization of our qualitative and quantitative findings might be restricted by the French focus adopted in this work. Complementary studies investigating cross-border workers' motivations, migration capital and health in different European countries should be carried out in order to corroborate or contradict our findings.

5.3. Moving forward

This work shed a new light on the drivers of cross-border mobility in Europe, while introducing in border studies concepts originating from other fields such as migration studies or public health. These new elements brought to the scientific debate make it possible to raise new opportunities for research but also further possibilities of intervention for public authorities.

In the second part, we ascertained that cross-border workers are motivated by financial, professional and personal reasons and proposed a theoretical model of cross-border mobility decision-making. At the sight of the existing consensus in the literature, we consider that cross-border workers' motivations are well known and that researchers interested in cross-border mobility issues should devote their time to other research topics. For example, the question of the volatility of the cross-border workforce remains unexplored. The Covid-19 crisis has revealed a lack of solidarity within the EU, taking the form of a competition for the capture of the workforce between member states.

In this context, the understanding of the professional trajectories of the cross-border workers between bordering countries is a challenging topic. Are there professional back-and-forth movements between two bordering countries? Can professional trajectories be 'zigzag' shaped in border areas? What shape does this zigzag path take over the life cycles? In economics, Ando & Modigliani (1963) provided one of the most discussed models of saving behaviour. The authors basically argued that three periods of saving can be distinguished. At the beginning of his professional life, the economic agent has low income and dissaves to consume (to pay his studies for example). In the second part of his life, his work allows him to obtain high income and to save money. In the last part of his life, the retirement implies a loss of income and the economic agent needs to dissave in order to maintain his standard of living. Is there existing such a model for workers' career path in cross-border areas? Indeed, it can be assumed that women living in border areas are more likely to use this zigzag career path. Childcare is a gendered activity, and the arrival of a child affects the professional careers of women more than men, since the former spend more time in childcare than the latter (Bianchi et al, 2012). At the beginning of their life, women are more likely to work abroad since they are looking for an

employment, maximizing their wage and broadening their job opportunities. Once the first child is born, children's education replaces work as a priority. As commuting reduces the time spend with children, women might relocate their workforce in their country of residence and search for a job located near their home. When children take their autonomy and leave the parental home, women can devote to their professional activity the time they previously devoted to childcare. For example, women are urged to commute again at the end of their professional life in order to benefit from the more advantageous retirement system abroad. All these questions lead us to go beyond the purely static approach adopted in this work, while examining the dynamic of cross-border trajectories across lifetime. Such an analysis encounters many difficulties, since longitudinal data would be needed in order to follow workers' professional mobility in the long run. Social security data are one of the main sources of information and identification about cross-border workers. Since each shift from one labour market to another leads to the disappearance of the worker from the social security data of a country and that social security data are not harmonized at the European level, it is not possible to follow the same worker from one country to another. The Enquête Emploi would fail as well in identifying zigzag careers as each worker is followed for 3 years, an observation window too short to follow the life cycles of workers. One solution could be to use French tax data to identify zigzag careers since cross-border workers are still obliged to make a tax declaration to the French authorities even if they are subject to the Luxembourgish fiscal status.

The third part ascertained the relevance of the migration experience in shaping workers' trajectories toward cross-border mobility and proposed the concept of migration capital to quantify this experience. However, the suitability of the migration capital has only been tested in the French context. This is why, evaluating the relevance of this concept in other European countries is needed in order to support these preliminary findings. The Labour Force Survey (LFS) could be used to identify the cross-border workers dwelling in several European countries and to test if a similar pattern appears. The LFS includes the needed variables such as the country of the place of work, the country of residence, the nationality of the workers, their country of birth, the nationality of the father, the

nationality of the mother, the country of birth of the father and the country of birth of the mother (European Commission, 2020). Complementary information about migrants' professional trajectories could be found in the ad hoc module of 2008 entitled 'Labour market situation of migrants and their immediate descendants'.

The fourth part brought into light for the first time to our knowledge, the better health state of the cross-border workers, which we called the 'healthy cross-border worker phenomenon'. However, as previously explained, this work only explores the French context of cross-border mobility, as such, other studies investigating cross-border workers' health state on other populations are needed in order to corroborate our main findings. Furthermore, if cross-border workers are healthier than non cross-border workers it could be partly because of better working conditions, since working conditions are a main driver of health disparities between workers (Burgard & Ly, 2013). Job strain, job insecurity, atypical work, night work and shift work are key variables used by researchers in order to ascertain the working conditions of the workers. Job strain is associated with insomnia (Nomura et al, 2009), coronary heart disease (Kivimaki et al, 2002) and psychiatric morbidity (Stansfeld & Candy, 2006). Job insecurity is associated with a poor mental and physical health (Sverke et al, 2002). Atypical work is associated with poor mental health (Pirani, 2017) and poor sleep quality (Lin et al, 2012). Night work is associated with sleep deprivation, stress, eating habits disturbance, chronic fatigue, anxiety, depression, cardiovascular problems and colorectal cancer (Costa, 1996) (Schernhammer et al, 2003) (Books et al, 2020). On the other hand, shift work is also worsening workers' health (Costa, 2010). Shift work is associated with sleep disorders (Costa, 2010), an increased risk of accident at the workplace (Hanecke et al, 1998) (Philip & Akerstedt, 2006), gastrointestinal disorders (Costa, 2010) (Knutsson, 2003), obesity (Lowden et al, 2010), diabetes (Mirokawa et al, 2005), cardiovascular diseases (Knutsson, 2003) and cancer (Kolstadt, 2008). Considering the data, the LFS constitutes a relevant source of information. This dataset includes information on atypical work, shift work, evening work, night work, Saturday's work and Sunday's work (European Commission, 2020). To our knowledge, no study has specifically addressed this issue yet. Cross-border workers' health is for the moment widely neglected by researchers and

many avenues for research remained unexplored. If the European Surveys on Working Conditions constitute the major dataset about workers' working conditions, its use does not allow the identification of cross-border workers, making it inoperable for such a study.

Another stimulating research track would be to investigate the effect of cross-border mobility on workers' health. This work demonstrated the better health state of the cross-border workers in a static perspective. However, if we postulate that commuting is gruelling then commuting abroad could more or less quickly deteriorate workers' health. We can assume that cross-border workers enter into the cross-border labour market with a health stock, which is decreasing depending on the time spent in commuting abroad.

This dynamic perspective of investigation cross-border workers' health would need longitudinal data. The Enquête Emploi could fit, but the observation window might probably be too short to observe a decline of the health of the workers.

Our findings also open perspectives in terms of public policy to improve the management of the flows of cross-border workers in Europe. Countries trying to attract workers should consider cross-border workers' needs and provide them professionals and personal benefits to retain this mobile workforce. Countries with a high share of unemployment should use the ability of migrants to deal easily with distance and borders in order to decrease unemployment among migrants, by redirecting migrant flows in bordering territories. For the UE, our work suggests that migration has positive externalities within the union. EU-member states should be encouraged to relocate international migrants in bordering territories in order to promote economic and social exchanges between countries. Furthermore, the healthy cross-border worker phenomenon implies that the EU should compensate countries sending workers abroad, since these countries lost their healthiest workers, which can destabilize the sustainability of the social protection system according to which the healthy pay for the sick.

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