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From Commuting to Connectivity? Cross-Border Telework and the Evolution of Cross-Border Labour Markets

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The emergence of digital communication technologies and the COVID-19 pandemic have changed the nature of work, giving rise to cross-border teleworking as an important dimension of labour mobility. This study explores the interplay between cross-border telework and traditional cross-border labour mobility, focusing on two case studies: Cascadia (US/Canada) and the Greater Region (EU). Through the analysis of desk research, legislative documents, and in-depth interviews, the study examines how national borders and telework shape the development of digital cross-border labour markets. The findings show that while cross-border telework uses digital tools to foster economic integration and reduce geographical constraints, its growth is hampered by inadequate regulatory frameworks. The article concludes that cross-border telework complements and reshapes traditional cross-border labour markets, presenting both opportunities and challenges for regional economic integration in a digitally connected world.[1]

***Keywords**: cross-border telework, cross-border labour markets, cross-border integration, cross-border functional linkages, Cascadia, the Greater Region.*

Introduction

The digital space is proving to offer exceptional opportunities for cross-border activities, including international trade in Information and Communication Technology (ICT) and ICT-enabled services (Brunet-Jailly 2021), information and knowledge transfer, value chain development, e-commerce, remittances (ESPON 2024), telemedicine (Whitten & Cornacchione 2010) and teleconferencing, as digital solutions help to reduce border frictions that often dampen cross-border relations (Richardson & Cappellano 2022). This development has changed our understanding of the functional dimension of cross-border integration (Durand 2015), focusing on the physical connectivity (Bertram et al. 2023) facilitated by cross-border transport infrastructure and manifested in the movement of goods, services, and people (Durand et al. 2020; Durand & Decoville 2020; Turner et al. 2022).

Digital transformation also extends to labour mobility. The COVID-19 pandemic, combined with rapid

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advances in digital communication tools, has significantly reshaped the way work is done, with millions of people worldwide shifting to remote work (OECD 2021a). While digital solutions have enabled people to work virtually from anywhere, they have also fuelled the growth of international virtual labour mobility, commonly referred to as cross-border telework, making labour mobility an even more diverse phenomenon. These changes have also created additional challenges and consequences in areas such as taxation, labour law, insurance and access to healthcare, social security, data protection, and the implementation of additional legal benefits (Bruurs 2023).

According to Castells, "the space of flows is not placeless, although its structural logic is. It is based on an electronic network, but this network links up specific places, with well-defined social, cultural, physical, and functional characteristics" (1996, 413). This means that "cyberspaces coexist with geographic spaces, providing a new layer of virtual sites superimposed over geographic spaces" (Kitchin 1998, 403). On the one hand, digital linkages extend the geographical realm. On the other hand, digital linkages change the geographic space (Zook 2007). This means that although digital solutions provide connectedness globally, the development of digital cross-border linkages may be place-based and often remain territorially defined. Therefore, this paper seeks to examine the development of digital linkages in cross-border labour markets (telework) and to contrast them with more traditional (physical) forms of cross-border flows, namely cross-border labour mobility and commuting. More specifically, by focusing on cross-border telework, it aims to illuminate the relationship between cross-border economic linkages in both geographical and digital space and the role of the national border in the development of cross-border labour markets.

The article draws on two case studies—Cascadia, a bi-national economic and environmental region spanning the US–Canadian border, and the Greater Region, encompassing Luxembourg and adjacent border areas of France, Germany, and Belgium—to empirically examine the interplay between cross-border labour markets, national borders, and cross-border telework. These regions were selected for their illustrative value and analytical potential. Both exhibit high levels of cross-border integration, with established economic linkages, supportive policy frameworks, and a strong presence of sectors conducive to telework. Notably, during the COVID-19 pandemic, both regions recorded some of the highest proportions of teleworkers in their respective contexts—Cascadia within the US and Canada, and the Greater Region within the European Union. At the same time, the two regions offer a basis for a meaningful comparison due to contrasting institutional and structural contexts. They differ in the characteristics of their cross-border labour markets, the permeability and governance of their borders, and the broader frameworks of supranational, intergovernmental, and interregional integration in which they are embedded. This juxtaposition allows for a nuanced analysis of how telework develops in differing cross-border settings, shaped by both shared features and divergent governance and labour market dynamics.

The paper relies on a mixed-methods approach, combining desk research, legislative analysis, and semi-structured in-depth interviews. The integration of rich empirical data—including statistical information, policy documents, and interview findings—offers a comprehensive, multidimensional perspective on the phenomenon under study.

The remainder of the paper is structured as follows: the next section provides an overview of the literature on cross-border workers, labour markets, and telework. The case study analysis section examines the Cascadia and Greater Region cases to provide an empirical examination of cross-border labour markets and telework. Finally, the concluding section discusses the findings of the study.

Literature Review

Cross-border commuting and cross-border labour markets

As the processes of de- and re-territorialization of state borders deepen, national economies and labour markets are undergoing significant changes. One of the main manifestations of these changes is the development of cross-border labour markets, which provide workers with access to more diversified job opportunities and enterprises with access to a wider pool of skills. Cross-border labour mobility, which is at the heart of cross-border labour markets, reflects the dynamics of globalization, migration policies, and regional economic integration. The literature highlights the complex interplay between economic incentives, geographic factors, and socio-political contexts as key elements shaping cross-border labour catchment areas, understood as geographical regions spanning national borders where people regularly commute for work (Böhm & Opioła 2019; Turner et al. 2022). These territories are arguably the most common type of cross-border functional areas, which are regions that span the borders of two or more countries functioning as single, interconnected socio-economic and/or spatial systems despite administrative divisions (Jakubowski et al. 2022). While cross-border commuting can enhance economic opportunities and foster regional integration (Sohn 2014a), it also creates a number of challenges, including employment regulations, health insurance and healthcare issues, and tax regulations.

One of the central themes in the literature is the economic rationale for cross-border labour mobility. The

'push and pull' theory posits that cross-border mobility and commuting are primarily driven by economic factors, including regional income differentials and employment opportunities (Buch et al. 2009; Comerio et al. 2020). This view is supported by a rich literature highlighting how wage differentials and geographical proximity (Pires & Nunes 2017) reinforce the economic underpinnings of asymmetric cross-border movements from poorer to richer countries, and hardly vice versa, as individuals seek better employment opportunities across borders (Decoville et al. 2013). However, cross-border commuting can also improve economic performance on both sides of the border by fostering interaction between regions, thereby generating economies of scale and agglomeration economies (Broersma et al. 2022; Möller et al. 2018).

While traditionally viewed as barriers to mobility and exchange, borders have increasingly been conceptualized as resources that can be utilized for economic, political, and social advantages. Rather than simply obstructing flows, borders can generate opportunities for cross-border cooperation, market creation, and labour specialization (Sohn 2014a). They often serve as catalysts for the development of border regions, encouraging the emergence of cross-border clusters, special economic zones, and enhanced connectivity between adjacent jurisdictions (Scott 2012). From this perspective, the border is not a static dividing line but a dynamic space where actors actively negotiate and leverage differences in regulatory, economic, or cultural contexts to their benefit (Brunet-Jailly 2005).

However, cross-border commuting is not only determined by economic factors. The conditions for the development of cross-border mobility are largely determined by border openings and political reforms that facilitate cross-border commuting and allow workers to participate in the labour market under similar conditions as local residents (Beerli & Peri 2015). A particular role in this regard is played by policy processes at the supranational level, such as the European integration process, based on the historical steps of the establishment of the Schengen area, the abolition of systematic border controls, and the increase in the permeability of national borders (Cavallaro & Dianin 2019; Gottholmseder & Theurl 2007), which alternate labour supply and demand dynamics on both sides of the borders (Beerli & Peri 2015; Bello 2020). Conversely, tighter border controls can exacerbate labour shortages, demonstrating how policy decisions on border regimes can directly affect labour market conditions (Devadoss & Luckstead 2018).

Finally, cross-border commuting depends on transport infrastructure and existing transport modes (Kouti & Ramirez 2010). A coherent cross-border transport network is essential to facilitate efficient commuting and enhance regional integration (Kramarz et al. 2020; Nordregio et al. 2023), but insufficient cross-border transport options remain a significant barrier to cross-border activity (Bertram et al. 2023; Medeiros 2019). This barrier could be partially removed with the rise of teleworking and virtual migration, which leads to less transport (Hartmann 2019). Undoubtedly, telework adds another layer to the understanding of (cross-border) labour markets, providing new opportunities for cross-border workers and changing existing socio-spatial dynamics.

Telework and the jobs that can be done remotely

Historically, work has been closely associated with specific physical locations. However, this link began to weaken as work became increasingly centered on information that could be managed remotely. The digital revolution, which has introduced a wide range of tools and technologies, has further weakened the dependence of work on location, allowing many information-based tasks to be performed virtually anywhere with access to the internet and electronic devices (Graham & Anwar 2019). As Standing (2016) observes, this shift has led to a significant migration of labour without a migration of workers.

According to UNECE (2022, 47), telework refers to a specific form of remote work that relies on personal electronic devices such as computers, tablets, or telephones (either mobile or fixed) as essential tools for performing work. While there is considerable overlap between telework and homeworking – with many teleworkers working from home and many homeworkers teleworking – the two concepts remain distinct. Telework should not be also confused with digital work, which is characterised as both income-generating and digitally intensive, rather than simply facilitated by digital networks (Graham & Anwar 2019). Furthermore, while telework is often equated with telecommuting, there are regional preferences: "telework" is more common in Europe, while "telecommuting" is more common in the United States. For example, the Washington State Energy Office describes telecommuting as part-time work or a transportation alternative that allows employees to work from home or an office near their residence instead of commuting (Johnson 2013). Therefore, telework is considered a broader and more relevant concept overall.

A first wave of teleworking took place in the 1980s, but rapid development of this phenomenon has occurred more recently, with the boom brought about by induced changes in the labour market during the COVID-19 pandemic reaching a peak in the 2020s, when almost half of the workforce in Australia, France, and the UK was teleworking, as well as around a third in the US and Canada (OECD 2021a). Although teleworking has a potentially broad application, not all jobs can be performed remotely. Dingel and Neiman (2020) estimate that only 37% of jobs in the US can be performed entirely at home, with considerable variation across

industries. The current literature on telework highlights its transformative effects on labour markets. Research suggests that telework can increase job satisfaction and productivity by providing greater flexibility and reducing commuting time (Felstead & Henseke 2017), and increase job accessibility, especially for those in remote or underserved areas (De Vos et al. 2017).

Cross-border telework

Before the advent of ICT tools, cross-border work was limited to workers physically crossing international borders to work in another country. However, advances in digital platforms and other technologies have changed these patterns. Cross-border workers now include a wide range of individuals, such as temporary migrants, daily cross-border commuters, seasonal workers, consultants travelling internationally for specific projects, and cross-border teleworkers who work remotely for companies in one country while living in another. In addition, nomadic workers who have no fixed place of residence are a distinct subset of this group (Choudhury et al. 2021).

Cross-border teleworking provides access to pools of skilled workers in other parts of the world. There are many reasons for the current interest in this area: competitive market pressures, skills shortages, wage differentials, and workers' expectations of a better work-life balance and less commuting. However, cross-border 'teleworkability' depends on the job, with different occupations having different degrees of tasks that can be performed remotely (UNECE 2022). In general, it is most common in knowledge-intensive services. For example, most of the world's IT workforce teleworks, while more than 18% work remotely across borders (Maggioli 2022).

Based on the definition provided by Eurofound (2020), cross-border telework refers to any work arrangement where dependent or independent workers perform their tasks remotely for an employer located in a different country than their own, utilizing digital technologies such as networks, laptops, mobile phones, and the internet. As outlined by Zwaan (2022), three distinct categories of cross-border telework can be identified. Each of these forms of cross-border telework carries distinct legal and practical implications, influenced by the international nature of the arrangements and the specific characteristics of the work relationship.

The first refers to telework conducted under a formal employment contract, where workers are paid by companies that do not maintain a legal entity within the worker's jurisdiction. In such cases, despite the absence of a local branch or subsidiary, the employment relationship is governed by the contract between the worker and the employer operating abroad (Zwaan 2022). Such an arrangement generates a range of implications, including the fact that it does not exempt a foreign employer from the obligation to comply with the labour laws of the country where the employee performs their work. It may also lead to difficulties regarding tax and social security obligations, as well as the enforcement of employee rights (OECD 2021b).

The second, self-employment, encompasses cross-border telework performed by owners of unincorporated enterprises, commonly referred to as own-account workers. These individuals are not engaged in traditional paid employment but instead earn income through commercial transactions. Within this category, two subtypes can be distinguished. Independent workers engage in commercial agreements without hierarchical dependency on a client or organization. In contrast, dependent contractors are formally self-employed but maintain a hierarchical dependency on a client (UNECE 2022). This form offers the greatest flexibility for both parties but carries the risk of false self-employment, lack of employee protection, and issues related to coverage under the social security system (Stefanov et al. 2021).

Employment via Employer of Record (EOR) introduces yet another, third model of cross-border telework. Here, a third-party organization, the EOR, is responsible for hiring and paying employees on behalf of another company. This arrangement may involve a local entity established within a specific jurisdiction or an online platform designed to facilitate the administrative complexities of managing a cross-border remote workforce (Zwaan 2022).

The phenomenon of cross-border telework is still largely understudied. The case studies presented in the next section aim to shed light on the phenomenon of cross-border telework, including its drivers, barriers, and consequences for the further development of cross-border labour markets.

Methodology

A three-stage study included desk research, document analysis, and semi-structured in-depth interviews. The desk research—based on secondary data from administrative sources, relevant reports, and news articles—aimed to assess the development of cross-border teleworking in the context of connectivity and cross-border labour mobility. To assess the level and dynamics of telework and cross-border telework, data were drawn from the Bureau of Labor Statistics (US), Statistics Canada, STATEC (Luxembourg Statistics), the Transfrontier Operational Mission (MOT), and the Chamber of Employees of Luxembourg.

Document analysis included the analysis and interpretation of legislation at national, EU, and international level in order to understand the conditions created by existing regulatory regimes for the development of

telework. Publicly available legal databases—including Congress.gov, GovInfo.gov, the Justice Laws Website, and EUR-Lex among others—were utilized in the search for relevant documents. The query employed keywords such as: cross-border telework, cross-border telecommuting, cross-border telework + labour standards, cross-border telework + occupational health and safety, cross-border telework + employment standards, and more.

Finally, the results of semi-structured in-depth interviews conducted between November 2022 and May 2023 were used to gain new insights into the development of cross-border telework in Cascadia. Interviews were held with 11 representatives from US companies employing teleworkers residing in Canada, as well as members of business associations and public sector institutions with extensive knowledge of the Cascadian labour market, particularly in relation to telework. The interviews utilized a flexible guide with open-ended questions designed to explore participants' perspectives in depth while allowing the interviewer to adapt the sequence or probe further based on responses. This approach ensured both consistency across interviews and the collection of rich, nuanced insights. Interviewees were asked, among other things, about the scale, dynamics, and prospects of the cross-border telework market, the main drivers and obstacles to its development, and the influence of different regulatory regimes on cross-border teleworking.

Case Study Analysis

Cascadia (US/Canada)

The idea of a binational economic and ecological region in the Pacific Northwest and Western Canada, with the Vancouver–Seattle megalopolis at its core, known as "Cascadia", emerged in the 1990s (Alper 1996; Brunet-Jailly 2006; Loucky & Alper 2008). Once largely dependent on the export of raw materials, the area is now one of the world's leading centres of high-tech industries. The region's rapid economic development in recent decades has been accompanied by significant levels of cross-border commuting, shopping, and trade in goods and services, which have increased significantly with the passage of the Free Trade Agreement (FTA) and the North American Free Trade Agreement (NAFTA) (Konrad & Nicol 2008). Cascadia is also home to a cross-border innovation ecosystem promoted by the Cascadia Innovation Corridor (CIC), which is developing multidimensional cross-border economic linkages (Cappellano 2019; Trautman & Cappellano 2019). This initiative has been supported by Microsoft Corporation, which—like many other US companies from Washington State—shows interest in better access to talent from Canada and the de-bordering of the cross-border labour market (Cappellano et al. 2021; Friedman et al. 2019).

According to the Bureau of Economic Analysis, Washington State is the 11th largest economy in the US, with nearly 3.6 million jobs, compared to 2.8 million jobs in British Columbia. The structure of gross value added (GVA) in both Washington State and British Columbia is dominated by finance, insurance, real estate, rental and leasing, information, and professional and business services. There are many similarities in the employment structures of Washington State and British Columbia. Both have a significant share of service sector jobs, more than 80% of total employment. Furthermore, the two main cities of the Cascadia region, Vancouver and Seattle, share a similar economic cluster portfolio, characterised by a large number of employees in business services, e-commerce distribution, information technology and analytical instruments, financial services, and marketing, design, and publishing (Cappellano 2019).

One of the distinctive features of the two regions is the immense importance of the high technology sector in the economy and the employment structure. For several decades, Washington State has been home to large and growing sectors in software publishing and the logistics and aviation industries with companies like Microsoft, Amazon, Boeing, Zillow, and Redfin centered in the Seattle area. The economic impact of the technology industry accounts for more than 20% of the Washington state economy, which is the highest rate in the US and well above the national average of 8.8%. In the Seattle–Tacoma–Bellevue metropolitan area, the industry accounts for nearly 30% of the local economy (Saldanha 2023). In British Columbia, companies providing telecommunications services, software, and motion picture production & post-production, among others, generate about 6.6% of the province's economic output (Statistics Canada 2022b). Approximately 70% of BC's high-tech firms are located in the Mainland/Southwest region, most of them in Metro Vancouver (Schier 2021), the fastest-growing high-tech market in North America (CBRE 2022), often described as "the new tech hub" (Vancouver Economic Commission 2023).

The growing importance of the high-tech sector in Cascadia is reflected in the structure and dynamics of the labour market. Washington State has the highest concentration of technology workers in relation to its overall employment base in the US (Saldanha 2023). In British Columbia, the technology sector employs over 150,000 professionals, 75% of whom work in Metro Vancouver. This represents about 6.6% of jobs (compared to 6.0% nationally) (Schier 2021). Despite the lower importance of the high-tech sector in Canada's economy compared to the United States, Canada has recently experienced a much higher rate of employment growth in the sector (CBRE 2022). The sector's rapid growth and increased demand for labour are putting upward pressure on wages. Technology workers in BC earn 15% more than the national average in the high-tech sector. However, wages for high-tech software/services workers in Vancouver are on average 30%

lower than in Seattle. Washington State is second only to California in this regard, with Seattle behind Silicon Valley and San Francisco (Schier 2021; CBRE 2022).

Labour mobility, often characteristic of many border regions, is relatively limited in Cascadia, particularly in relation to developed trade flows (Gibbins 1997). According to the results of a 2018 passenger vehicle interception survey conducted by BPRI in partnership with the Whatcom Council of Governments at four ports of entry between British Columbia and Washington State, only 3% of Canadians (CAN) and 8% of Americans (US) were crossing the border for work/business purposes (Border Policy Research Institute 2019). Despite the geographical proximity, Canadians make up a relatively small proportion of the working population in Washington State. In 2021, Canadian-born individuals accounted for less than 3.9% of the foreign-born workforce (approximately 42,000) (Migration Policy Institute 2023). In general, the data underscore the limited cross-border labour mobility within the Cascadia corridor (Richardson 2017).

Washington State and British Columbia are among the states/provinces with the highest percentage of people working remotely in the United States and Canada, respectively (Burrows et al. 2023; Jakubowski 2023). This may be related to the structure of the Cascadia region's economy, with developed high-tech industries, including the IT sector (Richardson 2017). However, the number of cross-border teleworkers in Cascadia is very difficult to estimate. Some light is shed on this issue by the results of Statistics Canada's Labour Force Survey (LFS). In June 2022, when the LFS included questions on this topic for the first time, 2.6% (87,000) of employees in Canada who work most of their hours at home report to an office or worksite in another country. The proportion of cross-border teleworkers was highest in British Columbia, with about 4.3% of homeworkers (range 2.6% to 6.4% at the 95% confidence level), or about 16,000 employees. At the same time, in British Columbia, about 10.6% of home-based workers mostly interact with people in another country (55,100), compared with a national average of 7.5% (Statistics Canada 2022a). Although it is likely that a significant proportion of teleworkers are employed at workplaces in the US, the results of this survey do not answer the question of what percentage of teleworkers report to an office or worksite located in the US or Washington State.

According to the interviewees, in some sectors (e.g., software development and other ICT or ICT-enabled services), cross-border teleworking has been developing for at least a few years, while in other sectors it has only become more visible with the outbreak of the COVID-19 pandemic and the more general shift towards teleworking that it has triggered. The cross-border telework market has recently become more diversified, but it is highly differentiated from sector to sector. While cross-border teleworking is most prevalent in the software development sector, this industry also has the widest and an almost global range of connections. This makes the market for cross-border teleworking in the information technology services sector fuzzy, characterised by many multidirectional links. Given the nature of the industry, cross-border teams of workers are not limited to the Cascadia region. Rather, the ability to access cross-border teleworkers has led some high-tech companies to seek them out around the world, taking advantage of the cost benefits. There has also long been, and continues to be, a migration of BC workers to California (Silicon Valley) rather than Seattle. Additional opportunities for hiring cross-border telecommuters have been provided by online platforms such as Deel (www.deel.com), Oyster (www.oysterhr.com), or Amazon MTurk (https://www.mturk.com), which enable cross-border hiring and global payroll.

According to respondents, the development of cross-border teleworking in Cascadia also reveals another interesting feature. In the pre-pandemic period, sourcing talent from Canada was mainly the domain of large and medium-sized companies. They did this by attracting knowledge migrants using institutional capacities that allowed them to overcome barriers related to US visa policies, or by establishing offices on the other side of the border (such as the Microsoft Development Centre or Amazon Vancouver). Small (and to some extent medium-sized) firms have not been able to compete on an equal footing for Canadian labour. The development of cross-border telecommuting in the Cascadia region has levelled the playing field between firms of different sizes and can therefore be considered more favourable to small firms.

Based on respondents' statements, two main groups of determinants and drivers of cross-border telework in Cascadia can be distinguished: those of a general nature and those specific to the region. The first group includes more general factors, such as the digitalization of the economy, the spread of teleworking forced by the COVID-19 pandemic, the dynamic development of teleworking tools and the greater efficiency of teleworking compared to stationary work, and the increasing popularity of this form of work in the broader context of the cultural changes that are taking place. However, the importance of these factors remains highly sector-specific. In addition to factors of a general nature, it is possible to identify several factors that influence the development of cross-border telework in Cascadia. First, cross-border telecommuting facilitates access to talented knowledge workers in British Columbia. Second, a key factor influencing the development of cross-border telework in Cascadia remains the wage gap (wages for high-tech software/services workers in Vancouver are on average 30% lower than in Seattle). Third, although cross-border teleworking is a solution that significantly reduces the role of geography in international flows of workers and the way work is performed, geographical proximity and the associated

lack of time zone differences positively affect the progress and efficiency of tasks performed by workers in international teams. Fourth, the linguistic and cultural proximity of Americans and Canadians positively influences the development of telecommuting in Cascadia. Another factor is the relatively good knowledge of the labour market by Washington State companies.

On the other hand, the main barrier for the further development of the cross-border telework identified by the interviewees is the lack of adequate regulation of cross-border telework, both in the US and Canadian legal systems and at the international level (bilateral and within USMCA). It is especially relevant to challenges such as employment regulations, health insurance and medical care issues, tax regulations, laws protecting the flow of intellectual property across borders, and data security. With both NAFTA and USMCA emphasizing the regulation of foreign trade and investment, cross-border labour migration has been and continues to be largely neglected. In parallel, only some of the challenges of cross-border telework have been regulated in bilateral agreements. Regulations and their interpretation in the US and Canada differ, leaving some legal aspects of cross-border telework unclear, such as the applicable labour and employment laws or health and safety regulations for teleworkers abroad. Generally, however, both the US and Canada do not have specific requirements governing cross-border remote work. All of this prompted one of the experts to describe the cross-border telework market as a "regulatory wild west".

The Greater Region

Located in the heart of Europe, the Greater Region covers an area of approximately 65,400 km with a total population of around 11.5 million. It is a vibrant transnational area encompassing the border regions of France (Grand Est, mainly Lorraine), Belgium (Wallonia), Germany (Saarland and part of Rhineland-Palatinate), and the whole of Luxembourg. It is known for its cross-border cooperation and integration within the European Union and its unique position as a cultural and economic crossroads. Over the years, regional and local actors from the Greater Region have developed different forms of cross-border governance, such as the Euroregion of the Greater Region, formerly also known as SaarLorLux, and the European Grouping of Territorial Cooperation (EGTC), which promotes cooperation in areas such as economic development, environment, and education and serves as a model for cross-border cooperation in other areas (Böhm & Drápela 2016; Decoville & Durand 2017; Nelles & Durand 2014).

The geographical core and economic engine of the transnational region is the city of Luxembourg. Once dominated by the steel industry, Luxembourg has successfully diversified its economy to become a global financial centre (OECD 2015). The financial sector currently accounts for around 25% of the country's GDP, with Luxembourg serving as a key operational centre for numerous international financial institutions. Beyond finance, Luxembourg has fostered growth in information technology, telecommunications, and logistics, further broadening its economic base. The economic landscape of the Greater Region is further enriched by sectors such as agriculture, particularly viticulture in the Moselle Valley, and a burgeoning tourism industry that capitalises on its rich cultural heritage and natural beauty. This diverse economic structure underlines the region's adaptability and resilience, with Luxembourg playing a central role in its economic dynamism. However, there are notable economic differences across the region. Luxembourg's GDP per capita is among the highest in the world, while other parts, such as the rural areas of Wallonia and Lorraine, face economic challenges.

Luxembourg's strong economic position and the consequent development of a cross-border labour market have consolidated its position as a cross-border metropolis (Decoville et al. 2013; Sohn 2014b; Sohn et al. 2009) and the centre of an important cross-border functional area, benefiting from the EU's single market, which promotes the free movement of goods, services, and labour. In the EU, barriers to migration and mobility are at an absolute minimum (free movement of persons) and there is freedom to move without hindrance to work, but only for citizens and permanent residents within the zone. Indeed, Luxembourg's economy relies heavily on workers from neighbouring countries, whose cross-border commuting is one of the region's main characteristics (Carpentier 2012; Drevon et al. 2018).

The number of cross-border workers in Luxembourg has grown steadily over the past 30 years, attracted by the country's dynamic economy and higher wages. There are 479,000 people working in the country, of whom 47% are cross-border workers, mainly from France. Only 25% of the workforce is of Luxembourgish nationality (STATEC 2023). In 2022, over 222,000 workers commuted daily to Luxembourg, making the city the most common destination for cross-border commuters in the EU. The main area of origin for cross-border workers is the French region of Grand Est, particularly Lorraine, from which 113,000 cross-border workers commute. From Belgium (Région Wallonne), 49,000 workers commute every day, mainly from the province of Luxembourg, while Germany's regions of Rheinland-Pfalz and Saarland contribute 45,000 and 14,000 respectively (Schütz & Thiele 2023).

Cross-border workers in Luxembourg are key to the local economy, especially in the financial, technology, and services sectors. As a global financial centre, Luxembourg has had to become highly specialised in order to compete with other financial centres while maintaining and developing its business volume. In order to maintain its competitive advantage, Luxembourg

needs highly qualified human resources, which it has so far found in the Greater Region (Fromentin 2021). A wealth of literature points to other conditions conducive to labour migration, the most important of which are higher wages and social benefits in Luxembourg (Albanese & Marguerit 2022; Belkacem & Pigeron-Piroth 2020; Carpentier 2012) and geographical proximity as well as a developed transport infrastructure (rail and road) that facilitates daily commuting.

The global pandemic caused by the SARS-CoV-2 virus has had a profound effect on the way work is organised in Europe, leading to a surge in the popularity of remote working. These changes were particularly evident in Luxembourg, where remote working became a key element of the labour market, especially for those engaged in cross-border work. The pandemic led to the implementation of lockdowns and travel restrictions, compelling numerous employees to perform their duties from home. In response to the travel restrictions and border closures that occurred in 2020, several European countries, including France and Luxembourg, introduced emergency regulations that permitted the widespread adoption of teleworking without disrupting existing tax and social security systems. These regulations enabled cross-border workers to work from their country of residence, preventing the shifting of tax and insurance obligations (MOT 2022).

The proportion of teleworkers in Luxembourg was already relatively high before the COVID-19 pandemic (20% in 2019). The proportion rose sharply from 26% to 52% in 2020, reflecting the widespread shift to teleworking caused by the closures and restrictions imposed. After an initial peak in the following months, the share of teleworkers declined, stabilising at around 38–40% in 2021. After the easing of restrictions in 2022, telework remained stable, with the proportion of teleworkers in Luxembourg between 32% and 34%, an increase of 70% compared to the level before the COVID-19 pandemic, indicating that telework has been maintained as a standard option in some sectors (STATEC 2023). According to a report by the Chamber of Employees of Luxembourg (Schütz & Thiele 2023), at the end of 2023, one third (29%) of Luxembourg employees were still teleworking regularly.

Teleworking in Luxembourg has therefore played and continues to play an important role in shaping today's labour market. It has become common practice in many sectors, especially in the digitally skilled professions that dominate the Luxembourg labour market. However, telework in Luxembourg has proved particularly important for frontier workers, who make up almost half of the country's workforce. During the pandemic, it allowed many of them to remain in their country of residence and provided them with work during COVID-19. Currently, after the pandemic, a significant factor contributing to the importance of teleworking is the growing challenge of traffic and commuting in and around Luxembourg, which has prompted consideration of flexible working solutions (Kennedy 2024) that allow workers to reduce their daily commute, thus saving travel costs and time (European Commission 2024). Employers have also recognised the value of teleworking, using it as a way of structuring work that offers employees greater flexibility and the opportunity to work from home. Thus, as Kennedy (2024) writes, Luxembourg is a "country embracing the teleworking lifestyle".

However, despite the ease of working from home, there are income tax and social security implications that affect both the employee and the employer. In the case of Luxembourg, these challenges are particularly relevant given its unique employment structure and reliance on workers from France, Germany, and Belgium (European Commission 2024). As one of the main recipients of cross-border workers, Luxembourg offered a flexible approach to teleworking during the pandemic. Its agreements with France, Germany, and Belgium allowed cross-border workers to telework up to a certain number of days per year without changing their tax residence status. These agreements provided a framework for managing the tax implications and social security obligations of teleworkers, although some problems remained. A partial solution to these problems was provided by measures taken at EU level, which led to the adoption of the Framework Agreement on the Application of Article 16(1) of Regulation (EC) No. 883/2004 (2023). This document aimed to address the complexities created by the growth of cross-border telework by allowing derogations from the usual "25% rule" for social security legislation. It allows the social security legislation of the employer's country to apply even if telework is less than 50% of the working time in the employee's country of residence. This will ensure smoother administrative procedures and better adaptation to the realities of cross-border telework. The framework agreement also included a definition of cross-border telework.

Discussion and Conclusions

The COVID-19 pandemic accelerated profound changes in the way work is done, as millions of people around the world began to work remotely. Although many people have returned to their offices since the end of the pandemic, much work that does not require daily face-to-face interaction with clients, supervisors, or colleagues is still done remotely (Finlayson 2021). These developments have also paved the way for the rise of international virtual labour migration (cross-border teleworking), making labour mobility an even more diverse phenomenon. A comparison of two case studies, namely cross-border telework in the Cascadia and Greater Region border regions, allows us to look at the

determinants, dynamics, and prospects of cross-border telework in different spatial, economic, and political contexts and to draw some conclusions.

First, the study shows that COVID-19 did not introduce entirely new trends in cross-border teleworking, but (exponentially) accelerated existing trends. Forced by periods of closure and supported by rapid improvements in digital communication tools, the shift towards telework in both cases reflected earlier linkages, i.e., high cross-border labour mobility prior to COVID-19. While cross-border teleworking did not reach significant levels in Cascadia during the pandemic, it became very popular in some cross-border areas of the European Union (MOT 2022). A good example is the Greater Region, where prior to the pandemic there was a developed cross-border labour market, characterised by a significant number of cross-border workers and cross-border commuters, among others. The outbreak of the pandemic has led a significant proportion of cross-border workers to switch to teleworking, although today, in the absence of restrictions, this most often takes the form of hybrid work. Both examples also suggest that cross-border telework does not necessarily develop where there is simply a high potential for remote working, but where the cross-border labour market is characterised by strong functional links.

Second, the situation in the cross-border telework market depends on the size and scope of the labour markets in cross-border areas. Cross-border flows are often conditioned by existing disparities, e.g., in terms of job availability and wages. These differences between the two labour markets can be exploited by workers seeking employment on either side of the border (Decoville et al. 2013; Jakubowski 2020). This is evident in the case of the cross-border labour market with a main core in Luxembourg, which forms a large catchment area covering the border areas of neighbouring countries and concentrating intra-central cross-border flows. In the case of Cascadia, the situation is somewhat different. On the one hand, workers in British Columbia are much more likely to telecommute to firms in Washington State than vice versa. The high level of education at Canadian universities and more liberal immigration policies have long made British Columbians an attractive group of potential employees for companies in the booming high-tech industry in the Seattle metropolitan area. Another important factor is the existing wage gap (Richardson 2017). In Washington State, on the other hand, the cross-border labour market is characterised by global connections and rivalry with California. Indeed, both metropolitan areas—Seattle and Vancouver—are characterised by a very large supply of jobs and seek to attract knowledge workers from around the world. This means that the development of virtual labour markets is subject to two opposing processes: globalisation and regionalisation. The development of digital solutions makes it possible to work from anywhere (digital nomads) and to attract skilled workers from almost anywhere in the world. Nevertheless, as the Internet tends to produce economic geographies with an increased number of "conversations" (via e-mail and other electronic media) between distant locations, it often requires localized clusters where face-to-face interaction can take place (Leamer & Storper 2001).

One of the main barriers identified is the lack of adequate regulation of cross-border telework. Due to its transnational nature, much of today's digital labour is not bound by regulations (Graham & Anwar 2019). According to Policy Horizons Canada (2016), "virtual work is relocating the job from a regulated environment to an unregulated one where current labour law does not necessarily apply". By breaking the link between the country of residence and the place of work, telework forces changes in the implementation of existing legal frameworks related to employment, including labour and tax laws, employment standards, occupational health and safety, and equality. In many countries, including the US and Canada, there is no specific legal status for employees who work remotely from another country. However, this does not mean that cross-border teleworking takes place in an unregulated environment. As noted by Graham and Anwar (2019, 185), "if digital labour is seen to take place in a global digital market, some would argue that the reason why it is largely unregulated is that it is unregulatable". To counter this idea, they recognize that "digital work is not global. Rather, it is international. It has clear concentrations, and always/inherently falls under the jurisdiction of at least one place". It proves problematic in this regard to determine under which jurisdiction a cross-border teleworker falls, and to what extent. For example, the lack of a specific legal status for cross-border teleworkers in Cascadia means that direct employment of teleworkers is still rare compared to self-employment or employment through EOR. In the case of the Greater Region and, more broadly, the European Union, an attempt has been made to address at least some of these issues through the adoption of the Framework Agreement on the Application of Article 16(1) of Regulation (EC) No. 883/2004. However, there is essentially no coherent global regulatory framework for cross-border telework. Cross-border telework requires an appropriate policy agenda at the international level to address many unresolved issues, particularly a supportive legal framework to remove the uncertainty associated with the status of cross-border teleworkers and to secure employee benefits. At present, regulation, as opposed to technological solutions, does not allow for fully borderless telework.

These observations lead to the general conclusion that the linkages in the digital space reflect, to some extent, the linkages in the geographical realms. We may conclude that digitalization enhances traditional

cross-border labour market linkages in certain contexts, such as enabling remote meetings with international partners and forming global working groups. In other cases, it replaces traditional connections, as seen in the shift from labour migration and cross-border commuting to teleworking. Additionally, it fosters entirely new types of cross-border interactions, exemplified by the rise of online platforms facilitating cross-border recruitment and global payroll management.

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Note

1 This article is partly based on the author's 2023 report, "Teleworking Across the Border: Insights from Cascadia", Border Policy Research Institute Publications, 136. https://cedar.wwu.edu/bpri_publications/136

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