# Foreign Opportunity and Local Revival: Evidence from the French Rust Belt

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**Abstract**

This paper studies whether and how distressed regions can recover from industrial decline. We exploit differences in access to an increasingly thriving Luxembourg labor market for neighboring residents of the French "Rust Belt". We document a three-phase expansion of treated local labor markets, driven by an initial workplace substitution of incumbent workers towards cross-border job opportunities, a medium-term rise in labor force utilization, and a long-run sustained increase in population via net domestic in-migration. A broader process of local revitalization follows, with higher incomes, reduced reliance on transfers, and resilience to social dislocation, although it is partially offset by rising housing costs and congestion. This leads to a net decrease in far-right and anti-EU vote shares, muting the rise of populism visible elsewhere in former industrial regions of France. Our findings suggest that former industrial regions are not inherently rigid nor doomed to fall to anti-globalization backlash, but can and do adjust – given sufficiently large-scale reversals in local labor demand.

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Why do some regions remain trapped in persistent decline while others recover? This question is crucial to understanding the welfare consequences of local shocks (Blanchard and Katz, 1992; Notowidigdo, 2020; Foschi et al., 2025). It has become particularly relevant as globalization generates large spatial disparities in economic opportunity and political discontent. A vast literature documents that adverse foreign shifts, such as import competition, can generate persistent local declines in employment and income, as well as rising support for populist parties in former industrial regions of developed economies (Autor, Dorn, and Hanson, 2013; Autor et al., 2020; Choi et al., 2024; Rodrik, 2021). Much less is known about how such struggling regions adjust when new economic opportunities emerge, and whether place-based policies or transformations can reconnect left-behind places to economic growth (Austin, Glaeser, and Summers, 2018; Kline and Moretti, 2014). The answer depends on whether persistent regional decline reflects adjustment frictions that prevent workers and places from adapting, or simply the absence of large and easily accessible sources of new labor demand.

In this paper, we study how an initially lagging region adjusts to a large positive labor demand shock, taking advantage of an almost-ideal historical experiment to dissect the short, medium and long-run adjustment of places. We follow the industrial heartland of northeastern France, a historically decaying "rust belt", after part of it gained access to a major new source of demand for workers. In the late 1980s, the rapid transformation of neighboring Luxembourg into a booming services-led economy (following EU-wide financial liberalization) generated large and persistent differences in access to high-paying foreign jobs between residents of otherwise similar municipalities of the French rust belt.

We show that large and persistent new economic opportunities can reverse decades of regional decline. This adjustment unfolds gradually. Incumbent workers initially reallocate across workplaces and sectors. In the medium run, local labor supply utilization rises through higher participation and reduced unemployment. After several decades, migration flows respond, amplifying the local economic revival. These transformations are large enough to reshape not only local labor markets, but also the distribution of living standards and key political outcomes, dampening or even muting the populist wave. Our findings suggest that local labor markets are not inherently rigid, even after severe industrial decline. Their capacity to adjust depends critically on the nature, scale, and spatial incidence of economic shocks.

This episode provides a rare setting to study how local labor markets respond to economic opportunity, addressing three common limitations. First, typical domestic booms arise from many forces, such as innovation or investment, that jointly and simultaneously shape regional prosperity (Combes and Gobillon, 2015). Foreign shocks may help circumvent this endogeneity concern, but do not always lend themselves to local exposure designs: the benefits of globalization, such as cheaper imports, are often spatially diffuse (Borusyak and Jaravel, 2021). Luxembourg's expansion originated abroad, unrelated to contemporaneous conditions on the French side. Its incidence was confined to a predetermined radius within commuting distance, allowing for a transparent difference-in-differences exploiting this differential exposure.

Second, the renewed economic opportunity emerged in a depressed region. Because industrial dynamics are persistent and serially correlated, such places tend to experience repeated adverse shocks while prosperous areas continue to attract new investment, migration, and employment opportunities (Amior and Manning, 2018). More broadly, due to standard Heckscher-Ohlin forces, episodes of international integration that benefit *workers* in advanced economies have been rare. When they did occur, they mostly accrued to dense, highly educated cities (Bakker et al., 2024) which also benefited from simultaneous agglomeration forces and skill-based technical change, and were less affected by the rise of populism (Rodriguez-Pose, 2020). Rather than comparing prosperous and decaying regions, our design compares initially lagging areas with a shared history of industrial decline that do or do not gain access to a reversal in economic opportunity.

Third, the isolated and foreign origin of the initial shock allows us to dissect the margins of local adjustment. A common difficulty in integrated domestic economies is that all markets adjust jointly, obscuring which margins respond first and over what horizon. The cross-border setting allows us to order downstream effects over almost half a century using a consistent and granular set of data covering cross-border commuting, employment, incomes, industry composition, migration flows, housing markets, fiscal transfers, and electoral behavior. Rather than observing the old and new spatial equilibria, this long panel allows us to trace the sequence through which regional adjustment unfolds. The ordering of responses is itself informative about the relative strength and pace of various adjustment margins emphasized by static spatial models (Monte, Redding, and Rossi-Hansberg, 2018).

We uncover four main results. First, declining regions initially adjust to new economic opportunities through the reallocation of incumbent workers. Improved labor market options in Luxembourg generated a dramatic rise in cross-border employment among residents of French municipalities close to the border. By the end of the sample period, more than 35 percent of prime-age workers (10 percent of the population) in treated areas were employed in Luxembourg, where wages are 60-65 percent higher, with even take-up across occupations and gender, while cross-border employment remained negligible in nearby control municipalities and around other international borders in the rust belt. Using worker-level panel data, we show that the initial adjustment was driven primarily by incumbent workers. In particular, male workers employed in manufacturing during the industrial decline of the 1980s became substantially more likely to permanently exit domestic employment following the shock, a pattern we interpret as reallocation into cross-border jobs for those most exposed to the industrial decline. Census data corroborate this interpretation: the first generation of cross-border commuters consisted overwhelmingly of mature men native to the region employed abroad in services rather than traditional manufacturing. Access to booming foreign labor markets can thus become a central channel of adjustment for declining regions.

The second stage of adjustment operates through an expansion of employment among incumbent residents. Short-run increases in cross-border employment largely reflected a one-for-one reallocation away from domestic jobs. By contrast, in the medium run (roughly a decade in), total employment rises as labor force utilization increases and unemployment gradually drops among incumbent residents. While local population remains essentially unchanged, improved access to foreign opportunities draws previously inactive individuals into the labor market and induces more local job creation in treated areas. The magnitude of this response reveals the scale of underutilized labor supply in the declining region. At baseline, prime-age employment rates in treated municipalities stood at just 62 percent, compared with a national average of 75 percent, and the subsequent rise in employment closes roughly half of this initial gap. Most of this gain arrived early: within roughly a decade, and before any significant migration, the employment-to-population ratio had already risen by about 5 percentage points, close to 80 percent of its long-run increase, almost entirely through higher labor force

participation. By the end of the period, treated municipalities gain roughly 36 additional jobs per 100 initial working-age residents. These gains are broadly shared across the workforce, with occupations at the lower end of the skill distribution accounting for roughly two-thirds of the increase in employment and women accounting for a slight majority of the long-run gains despite the initially male-dominated commuting response.

Third, the large employment gains ultimately translate into a broader revitalization of formerly declining regions. Two to three decades after the initial shock, population expands by roughly 15 percent, driven first by lower out-migration and only gradually by rising inflows, transforming a declining industrial region into a growing residential cluster. Population growth is accompanied by a compositional shift toward more educated residents with stronger labor market attachment, further raising employment rates. Housing markets adjust to population inflows through more new construction, increased crowding, and declining vacancy rates. Treated areas also experience improvements in access to public and private services, higher disposable income and declines in poverty and reliance on social transfers. These patterns contrast with the "social dislocation" documented in regions exposed to negative trade shocks (Autor et al., 2025); conversely, access to economic opportunity abroad can revitalize former industrial areas. While average living standards improve, these gains are unequally shared. Rising demand for local non-tradables leads to higher rents and congestion. As a result, non-commuting residents of exposed areas experience lower real income, home-ownership, and consumption. Inequality rises – both between commuters and domestic workers, and between workers and non-workers, consistent with a *Balassa-Samuelson* effect operating through access to foreign labor markets, similar to locations with stronger access to trade in goods (Fajgelbaum and Redding, 2022).

Fourth, these economic transformations translate into changing political fortunes. Exposure to foreign labor demand leads to large declines in far-right vote shares, offsetting much of the long-run rise in anti-globalization sentiment observed in nearby control municipalities. While part of this decline mirrors changes in local incomes and population density, these direct channels account for only about half of the total estimated effect. The role of selective migration appears limited, and the results suggest a direct treatment effects on political preferences. Rather than shifting support toward other anti-globalization parties, voters instead reallocate

toward mainstream parties. We also find stronger support for European integration, reflected in both lower opposition to the European Union in the 2005 referendum and higher vote shares for pro-European parties in European Parliament elections. Local politicians exhibit increased socioeconomic status, a supply shift consistent with the overall compositional change of the treated municipalities.

Taken together, our findings provide a unified view of how distressed regions dynamically adjust to new economic opportunities. First, our long-run perspective is central: adjustment unfolds sequentially, and population responses, for example, only emerge multiple decades after the initial shock. Besides, initial conditions matter: renewed demand for workers has large effects in the presence of significant pre-existing labor and housing market slack in lagging areas. Finally, international integration in advanced economies can work both ways: while competition from cheaper foreign labor has been shown to trigger economic disruption and political discontent, conversely, a boost in foreign demand acts as local stimulus and counters the broad-based rise of populist parties visible elsewhere in declining industrial regions.

**Contribution to the literature** A large body of work quantifies regional adjustment to economic shocks over the short- and medium-run, and studies their incidence on local incomes and welfare (Hornbeck and Moretti, 2024). Many such studies rely on the intersection of time-varying national dynamics and pre-existing local industry structure (Bartik, 1991). However, the low average intensity, strong serial correlation, and spatial structure of such instruments can blur the precise definition of treatment and control areas, limits the investigation of pre-existing trends, and may bar a consistent quantification of effect sizes over long periods (Goldsmith-Pinkham, Sorkin, and Swift, 2020). Other circumvent these concerns by studying precisely timed and localized shocks, such as a sudden rise in the valuation of mining resources (Feyrer, Mansur, and Sacerdote, 2017; Bartik et al., 2019; Allcott and Keniston, 2018) or a natural disaster (Nakamura, Sigurdsson, and Steinsson, 2022), but may lack the time horizon to analyze short-, medium-, and long-run effects, or the ability to extrapolate from temporary conditions to permanent labor demand shifts. Finally, places that neighbor each other are often subject to similar unobserved trends and ripple effects (Manning and Petrongolo, 2017), limiting the potential for a sharp geographic treatment-control characteri-

zation when exploiting changes in *domestic* product market conditions. We make progress on all three limitations, by exploiting a well-defined, localized change arising from *abroad*, with limited contamination between control and treatment areas due to daily commuting feasibility constraints, while accounting for most margins of adjustment over the short- and long-run.

Our work also relates to the literature studying the labor market consequences of cross-border employment. Beerli et al. (2021), Dustmann, Schönberg, and Stuhler (2017), and Muñoz (2024) find varying degrees of short-run employment crowd-out for natives in *destination* areas. Some studies (Butikofer, Loken, and Willen, forthcoming; Illing, 2025; Dodini, Loken, and Willen, 2022) evidence positive short-run wage effects for commuters in *sending* regions, but null or negative population responses. Hafner and Hedtrich (2022) find positive wage and employment effects of cross-border outside options for domestic workers and firms. Our focus is on broader place-based consequences for initially struggling regions over five decades and across employment, migration, housing, fiscal, and political channels. We evidence a subsequent spatial reallocation of employment and population toward exposed sending areas, generating housing congestion and substantial shifts in electoral patterns.

Our paper is also related to recent work considering the effects of increased emigration for sending regions in emerging economies (Khanna et al., 2022). We consider the effects of temporary (rather than permanent) mobility on sending areas, which allows us to examine other important local consequences (notably, net domestic migration, fiscal transfers, and housing market congestion), but also to evidence long-term effects on electoral behavior.

Existing studies of these electoral linkages generally focus on the effect of *inflows* on voters in *destination* regions, where locals compete with newly arrived foreign commuters (Alrababah et al., 2024; Maycas-Sardi and Serrano-Serrat, 2025). They find *increased* support for far-right and anti-immigration parties among incumbent residents after a rise in cross-border commuting arrivals, consistent with evidence on the electoral effects of in-migration or import competition (Tabellini, 2020). By contrast, our paper highlights the political consequences of increased *access* to foreign labor markets for *sending* regions. It allows us to shed light on the voting consequences of (temporary) emigration for home countries, an elusive empirical target, since permanent out-migration can hardly affect voting behavior at home except through selection (see Anelli and Peri (2017) and Auer and Schaub (2024)).

# 1 Institutional and Historical Background

## 1.1 Europe's Heartland and the French "Rust Belt"

The empirical setting of this paper lies within one of Europe's historical industrial cores. The northeastern region of France (today the "*Grand-Est*" and "*Hauts-de-France*" regions) had long been central to the country's industrial base and exhibited the highest manufacturing employment shares in the country in the mid-1970s (Figure 1). The corridor spanning northeastern France, western Germany, Belgium, and Luxembourg concentrated much of continental Europe's coal, steel, and heavy manufacturing since the 1800s (Appendix Figure A.1, A). From that point on, however, the region experienced a rapid and persistent process of deindustrialization. Between 1975 and the late 2010s, the *Grand-Est* province lost roughly 60 percent of its manufacturing employment, corresponding to 400,000 jobs. The contraction was particularly severe in clusters focused on coal mining and steel production.[1] By the 2020s, northeastern France has become a typical advanced-economy "rust belt" region (Gagliardi, Moretti, and Serafinelli, 2023): heavily exposed to dwindling manufacturing employment, and characterized by weak wage growth, population losses, and political discontent.[2]

## 1.2 The Luxembourg-France Labor Market Integration Shock

**EU-wide Financial Liberalization and Sectoral Shift.** For much of the twentieth century, Luxembourg shared a similar industrial structure with its neighbors in the Belgium-France-Luxembourg-Germany "Greater Region" (also known as SaarLorLux), relying heavily on coal mining and steel production. In the 1960s, manufacturing accounted for roughly 31% of employment, comparable to Belgium (30%) and France (29%) (OECD, 1964).

Starting in the mid-1980s, however, Luxembourg's industrial structure shifted toward a

[1] As also discussed in Berland, Tabellini, and Tricaud (2026), large employers such as *Usinor* and *Arcelor* in steel, *Creusot-Loire* in heavy industry, *Moulinex* in manufacturing, and the coal mines of the Northern *bassin minier* (mining basin) closed or underwent major restructuring over that period.

[2] Within this area, our analysis focuses in particular on the region of Lorraine, immediately bordering Luxembourg, Germany, and Belgium, the French region with the largest post-2000 employment losses. In 2020, the region's gross domestic product amounted to just shy of €60 billion (approximately €25,300 per capita) making it one of the poorest areas in mainland France. Unemployment reached 10.5 percent in 2015. Between 2000 and 2020, GDP per capita declined from about 110 percent of the EU average to less than 85 percent, and grew about 0.5 percentage points less fast than the national average on an annualized basis.

diversified financial services hub. This transformation was triggered by the liberalization of European capital markets, most notably the introduction of the "EU passporting system" in 1988, which enabled financial firms to serve clients across the bloc from a single location.[3]

While these reforms applied uniformly across member states, Luxembourg disproportionately benefited due to its pre-existing legal and fiscal environment. In particular, long-standing policies favoring internationally mobile capital, such as the 1929 holding company regime, strong banking secrecy (enacted in 1981), and investor-protection rules, combined with preferential tax treatment for investment funds and multinational headquarters, made Luxembourg an especially attractive location for firms. Together, these institutional features fueled the rapid expansion of Luxembourg's economy after the late 1980s.[4]

While financial services account for roughly 11% of total employment in Luxembourg, the country retains a diversified labor market structure, with 8% of employment in manufacturing, 10% in construction, 17% in business services, and 23% in public administration. Luxembourg also hosts several EU institutions and major corporate headquarters (e.g., Amazon EU, ArcelorMittal, PwC, Goodyear), further contributing to diversification beyond finance and to labor demand across a wide range of occupations, skill levels, and industries.

**Wage divergence.** The shift toward a services-led economy led to much faster income growth in Luxembourg than in neighboring countries. In Figure 2, panels A1 and A2 plot GDP per capita and compensation per employee in Luxembourg and France over time. While the two countries were on similar trajectories prior to the mid-1980s, a clear divergence emerges after the EU-wide financial liberalization. By 2022, real GDP per capita in Luxembourg was more than twice that of France, whose growth trajectory was broadly similar to that of its other neighbors (Figure A.5). In the region, only Luxembourg experienced exceptional real income growth coinciding with the introduction of the EU financial passport. By the end of the 1980s, nominal compensation per employee had risen much more steeply in Luxembourg,

[3]The 1985 UCITS Directive (85/611/EEC), which Luxembourg was the first country to adapt into national legislation in 1988, enabled cross-border distribution of investment funds. In parallel, the 1988 Directive on the Liberalization of Capital Movements (88/361/EEC) removed remaining restrictions on capital flows. Appendix A.1 provides more details on the reforms and the subsequent financial service growth.

[4]Although part of foreign investment in Luxembourg is linked to profit-shifting by multinational corporations, these inflows account for less than 2% of total employment in the country, according to IMF estimates (De Mooij et al., 2020); see Appendix A.1 for more institutional details.

and the gap persisted thereafter: the wage difference reached roughly €40,000 in 2025.[5]

Panel B of Figure 2 plots average wage differences between French residents employed in Luxembourg and observationally similar workers from the same origin region employed in France, using data from Viglino and Hamez (2025). On average, cross-border workers earn approximately 65 percent more than comparable local workers (€47,700 versus €27,900 in 2019). The wage premium is substantial across all occupations (panel B1) and education levels (Panel B2), including among workers with only a high school diploma or no diploma.[6]

**Infrastructure Improvements** Transportation infrastructure between France and Luxembourg also improved substantially over the period. In particular, the construction and opening of the A31-E25 motorway in 1981 created a direct highway connection between northeastern France and Luxembourg City, following a decision by Luxembourg to expand cross-border road access to its capital. Because the cross-border region lacks major cities connected by dense rail networks, cross-border commuting occurs predominantly by car. As of 2022, roughly 83 percent of workers commuting to Luxembourg travel by car. Of these workers, 50% used the A31-E25 highway daily to cross the border (INSEE, 2024).

**Mobility Frictions** The right to work across borders within the EU was established with the Treaty of Rome and became operational by the late 1960s, allowing French workers to take up employment abroad and commute daily without a work permit. In practice, work mobility remained constrained by some practical frictions, such as passport controls at the border. The Schengen Agreement, followed by the 1990 Schengen Convention, established a framework for the gradual removal of these barriers. Its implementation in 1995 eliminated systematic checks at internal borders for EU member states, effectively removing routine mobility frictions for cross-border commuters within the Schengen Area.

[5]Figure 2, A2 is expressed in *nominal* terms, the economic divergence most relevant for cross-border work. French residents employed in Luxembourg earn *nominally* higher wages but consume primarily in France, where prices are lower, so the effective gain in purchasing power is larger than what real GDP per capita comparisons adjusted for country-specific price indices would suggest.

[6]These figures likely understate the disposable income differential, as they measure French wages net of payroll taxes but before income taxes but some Luxembourg-sourced incomes are reported after income taxes withheld at source. Cross-border workers owe income taxes in Luxembourg, even if they reside in France, according to European *lex loci laboris*. They must however file French tax returns and *report* foreign-earned income to ensure other domestic earnings of the household are taxed at appropriate marginal tax brackets. Overall, effective labor taxation is substantially lower in Luxembourg than in France (OECD, 2023).

## 1.3 Aggregate Growth in Cross-Border Workers

The economic divergence of Luxembourg made the country a major destination for cross-border commuting. Figure A.12, Panel A, traces the long-run increase in daily commuting flows from Germany, Belgium, and France from Luxembourg social security records. While cross-border commuting was negligible before the early 1980s, it rose sharply thereafter– particularly from the French side– reaching more than 220,000 daily commuters by 2024, including 120,000 from France.[7] These workers account for nearly half of the country's salaried workforce. Luxembourg's reliance on foreign labor is unique in Europe and among the highest globally, comparable to levels observed in Gulf economies like the UAE.

On the *sending* side, cross-border employment has become a consequential source of net income for the French economy. Residents employed abroad (mostly in Luxembourg, Switzerland, and Monaco) represent about 2.5% of private employment in the country, and close to 10% in the Grand-Est region we study. Appendix figure A.7 shows that wages received abroad reported on French tax returns rose to 4 percent of reported wage earnings as of 2025.[8] According to the World Bank (see Figure A.6), the country's reliance on salaries earned abroad places it 4th globally by sheer size of received remittances (just below emerging economies with numerous emigrant workers: India, Mexico, and the Philippines).

Panel (b) of Figure A.12 shows that it occurs almost exclusively in border *departements* (provinces), and rose substantially more at the Luxembourg border after the 1980s divergence. In line with wage differentials, flows are highly unbalanced and effectively one-way, with a ratio of 220:1 relative to commuting from Luxembourg to France. Residential migration is negligible by comparison; fewer than 2,500 Luxembourg-born individuals reside in northeastern France and work in Luxembourg in 2021. As of 2024, the France-Luxembourg corridor is the largest cross-border commuting flow in the European Union, slightly ahead of Hungary-Austria (European Commission, 2024).[9]

[7] One of the potential reasons for France's strongest cross-border commuting response to the economic boom is improved transport infrastructures through the highway extension in 1981.

[8] Despite some concerns regarding under-reporting and evasion in tax returns, French national accounts tell a similar story over the long run. Figure A.8 displays the evolution of the ratio of compensation of domestic employees received from the rest of the world to the total compensation of employees received by households, showing a clear trend break in the late 1980s and a steady rise thereafter. The level differences with tax return data stem from different concepts of wages (net or gross of withholding taxes).

[9] Outside the EU, the largest flow on the continent is between France and Switzerland.

## 1.4 Spatial Concentration and Commuting Feasibility

Daily commutes impose spatial constraints on workers' joint residence and workplace choices. In France, the distribution of commuting distances is narrow and effectively right-truncated. Figure A.10 shows that the vast majority of workers travel short distances between their home and place of work: more than 95 percent of workers commute less than 50 kilometers one-way, and almost none travel more than 70 kilometers. This upper bound appears stable across locations and types of employment. Importantly, this geographic is not specific to cross-border workers but characterizes commuting behavior more broadly across the French labor market.

The maps in Figure 3 depict the expansion of cross-border employment to Luxembourg during our period of interest (from the 1960s to the early 2020s). It occurred almost entirely within this feasible commuting range. While commuting to Luxembourg was virtually nonexistent across municipalities in northeastern France in 1968, by 2022 it had become highly prevalent in municipalities located within 50 kilometers of Luxembourg City. In contrast, shares of residents commuting abroad remain close to zero throughout in municipalities located beyond 70 kilometers from Luxembourg City.[10]

Figure 4, Panel A further illustrates both the increasing magnitude and the spatial gradient of commuting patterns. In 1968, the share of residents employed abroad was close to zero across the entire region. By 1990, a steep slope had emerged, with cross-border employment rising but concentrated in municipalities closest to Luxembourg City. The spatial reach of commuting widened over time as employment opportunities in Luxembourg attracted workers residing farther away. By 2021, nearly 80 percent of employed residents in French municipalities located within 10km of Luxembourg City work abroad, and the share remains sizable (around 35 percent) even at distances of 30km. The intensity of cross-border employment decays with distance and becomes negligible beyond 70km. As explained in section 2, we exploit this sharp spatial gradient in the intensity of cross-border commuting exposure to construct our empirical design in a difference-in-differences framework, and a complementary cross-sectional "censored gravity" approach exploiting the kinked, non-linear relationship between distance and commuting behavior.

[10] Although cross-border commuters travel slightly longer average distances than domestic workers, the right tail of the commuting distribution remains thin: more than 99 percent of commuters to Luxembourg reside less than 70 kilometers from their workplace.

## 1.5 Data

Our primary unit of observation is a French municipality or *commune*; there are more than 35,000 municipalities in France, with a varying size comparable to US ZIP codes. We harmonize municipalities to the smallest time-consistent geographic level to account for mergers and splits since the 1960s. This granular level of analysis allows us to measure outcomes at a fine spatial scale, and to evidence local differentials stemming from the feasibility of commuting while controlling for unobserved trends at higher levels of aggregation.

The primary source is long-run Census microdata files covering French residents from 1968 to 2022. We use exhaustive French population census files for the years 1968, 1975, 1982, 1990, 1999, 2010, 2015 and 2021.[11] These allow us to distinguish people's place of work and place of residence at the *commune* level, and thus to construct long-term evidence on commuting flows across municipalities, while simultaneously observing a number of individual demographic, housing, and employment characteristics as well as individual-level consumption proxies. The census has two main limitations. Individuals cannot be linked across waves, although information on previous place of residence allows us to construct migration flows and net migration rates at the municipality level. In addition, the census does not directly report income, taxes and transfers, rents, or other welfare-relevant measures.

We thus complement the census with several additional administrative sources. We use long-run municipality-level information on death and birth rates from administrative records; reported incomes and tax revenues from the French Treasury; municipality-level vote results for all presidential, parliamentary, and European elections in the Fifth Republic (1969-2022) compiled by Piketty and Cagé (2023); and detailed modern-day data on housing rents, social transfers, local public services, amenities, and local public finance from a variety of sources. We also incorporate geographic and road network information from OpenStreetMap.

Finally, to analyze worker-level labor market dynamics, we use employer-employee administrative data from the French DADS (Déclarations Annuelles de Données Sociales). The DADS covers approximately 4% of the French population for the early period, and then the

[11] Up to 1999, the census was conducted as a traditional full census of the French resident population at discrete intervals. Beginning in 2004, it was replaced by a rotating sampling frame: municipalities with fewer than 10,000 inhabitants are surveyed exhaustively over a five-year cycle, while larger municipalities are covered through annual rotating samples.

universe of private-sector employees from 1996 onwards. These data, which capture employment records in France and do not include cross-border workers employed in Luxembourg, allow us to construct municipality-level measures of residence-based and workplace-based *domestic* employment, hours worked, and composition-adjusted wages. We also exploit the panel component of the dataset, which follows a representative random sample of individuals over time, to track the differential labor market trajectories of incumbent workers residing or working in municipalities exposed to cross-border employment opportunities.

# 2 Research design

Our identification strategy exploits the combination of an economic pull factor (the post-1985 substantial divergence in wages between Luxembourg and France) and time-invariant, fine-grained variation in commuting feasibility across municipalities within the rust belt (driven by geographic distance to Luxembourg City). This results in time-varying local exposure to high-wage employment opportunities abroad.

## 2.1 Difference-in-Differences

To dissect how *places* adjust to the foreign demand shock in the short, medium and long-run, we estimate difference-in-differences specifications at the *place of residence* level. Drawing on the contrast described in section 1.4, our DiD design compares trends in outcomes in municipalities within a feasible daily cross-border commuting range (located within 0-50 km of Luxembourg City) to those located beyond (between 70 and 150 km away), before and after the 1980s divergence. We exclude municipalities between 50 and 70 km (the "donut") to avoid contamination from partial commuting exposure in later years.[12] We first verify that our exposure measure accurately captures changes in cross-border commuting behavior. We then estimate the dynamic effects of increased international integration on local economic, demographic, financial, and political outcomes.

[12]Our baseline measure of spatial exposure is proximity "as the crow flies" to the city of Luxembourg, where the majority of cross-border workers are employed. Approximately 60 percent of cross-border workers residing in France and working in Luxembourg are employed in the Luxembourg City metropolitan area. All our results are qualitatively and quantitatively robust to using distance to the weighted centroid of employment in Luxembourg, or to the closest border crossing with Luxembourg, as well as to using simulated driving times.

The non-parametric event-study specification we implement traces the evolution of treatment effects over time, reflecting the gradual increase in cross-border employment exposure experienced by border municipalities after the early 1980s. Most of our main figures display the time-varying coefficients $\beta_k$ from the following specification:

$$Y_{it} = \alpha_i + \gamma_t + \sum_{k=1968, k\neq 1981}^{2022} \beta_k \mathbb{1}(t = k) \times T(i) + \delta_X X_{it} + \epsilon_{it} \tag{1}$$

where $Y_{it}$ is an (economic, demographic, or political) outcome of interest for municipality $i$ in census-year $t$, $T(i)$ is a time-invariant measure of treatment for municipality $i$, $\alpha_i$ and $\gamma_t$ are place and year fixed effects, respectively, and $X_{it}$ is a (potentially empty) vector of time-varying controls (which can include the interaction of time-invariant municipality characteristics $Z_i$ with census-year fixed effects $\gamma_t$). The exact sample period varies by outcome variable due to data availability, but we generally begin in 1968 and end in 2021. We cluster standard errors by municipality. In addition to the dynamic event-study estimates, we report aggregated post-1981 treatment effects from a conventional difference-in-differences specification.

The coefficients $\beta_k$ measure the differential evolution of outcomes in municipalities within commuting distance of Luxembourg relative to more distant municipalities, normalized to the pre-1981 period. In post-divergence years, these capture the reduced-form effect of exposure to Luxembourg's boom on local outcomes. Under the identifying assumption that, absent Luxembourg's expansion, treated and control municipalities would have followed similar trends, they can be interpreted as causal effects of exposure to cross-border employment opportunities.

**Threats to identification** The validity of our design rests on the assumption that proximity to Luxembourg affects economic outcomes only through access to cross-border employment opportunities. In pre-1981 years, the coefficients $\beta_k$ provide support for this untestable parallel trends assumption by assessing whether treated and control areas exhibited differential trajectories for close to two decades *prior* to the shock. Still, we consider and address the main threats to this identification assumption.

A first concern is that municipalities located closer to Luxembourg may differ systematically from more distant municipalities in ways that generate distinct economic trends unrelated

to cross-border employment opportunities. While place fixed effects account for level differences in outcomes, towns with different baseline economic or demographic characteristics, such as sectoral composition or skill structure, could be exposed to other trends (e.g., trade integration or automation) that affect local labor markets. To flexibly address this concern, we control for pre-period manufacturing employment shares and initial college educated shares, each interacted with year fixed effects.

A second concern is that our estimates may capture general trends associated with all border regions rather than exposure to the rise in foreign employment opportunities. Proximity to an international border could influence economic and political outcomes through other forms of interactions, such as cultural exchanges, immigration or trade flows. To address this possibility and clarify the interpretation of our estimates, we implement two complementary designs. First, we directly control for distance to the national border interacted with census-year fixed effects. This specification only exploits variation in commuting distance to Luxembourg, within narrow bands of distance to France's northern border, thus adjusting for the time-varying effects of general proximity to foreign countries. Second, we implement a placebo design using municipalities from the same declining French region (*Grand-Est*) located near Mons, Belgium– the first major French-speaking city along the main France-Belgium transportation corridor (highway E29). These municipalities have similar geography, cross-border market access infrastructure, and baseline economic conditions on the French side of the border, but wage differentials between France and Belgium remained minimal during the period (see Figure A.5), and therefore so did cross-border commuting (Figure 4, panel B).

A final concern is that spatially correlated shocks or broader regional trends may generate differential outcomes near Luxembourg, independent of cross-border employment. For example, input-output trade linkages or local pollution could differentially affect municipalities closer to the border. Our design mitigates this concern by exploiting granular spatial variation within a narrowly defined region that otherwise experienced similar long-run decline. Furthermore, we note that aggregate trade patterns between France and Luxembourg remained economically insignificant during the period, and if anything, declined.[13]

[13]In additional results unreported for the sake of brevity, we also show robustness to adjusting inference for spatial correlation using Conley standard errors.

**Sample description.** Before turning to the effects of Luxembourg's expansion, Table 1 characterizes the municipalities in our main empirical design. Relative to France as a whole, municipalities located around Luxembourg (both treated and control) were heavily specialized in manufacturing and blue-collar occupations while exhibiting substantially lower employment and labor force participation rates. Despite the rapid expansion of the French economy during the postwar decades, these municipalities experienced much weaker population and employment growth and little or negative net migration. Together, these characteristics are typical of a declining industrial region with substantial underutilized labor resources.[14]

Within this region, municipalities that would later become most exposed to Luxembourg's pull were somewhat larger, denser and more specialized in manufacturing and manual occupations. They also exhibited lower employment and labor force participation rates, consistent with pronounced labor market slack before Luxembourg's expansion. These level differences highlight that, if anything, the treated municipalities were slightly less prosperous than the comparison municipalities. The Mons placebo columns further show that municipalities around the Mons border shared remarkably similar initial conditions to our baseline sample, supporting their use as a placebo region. The two border areas belonged to the same French region and followed comparable trajectories prior to Luxembourg's boom, making their subsequent divergence particularly informative about the effects of access to external opportunity.

**Sensitivity analysis** We vary the definition of treatment and control municipalities to probe the robustness of our findings. First, we vary the distance to Luxembourg city used to define treatment and control municipalities, and the presence or absence of a "donut" exclusion region. Second, we use physical distance to the E25 highway (rather than distance "as the crow flies" to Luxembourg city) as an alternative measure of spatial exposure. Third, because commuting and migration responses may generate spillovers beyond directly exposed municipalities, Appendix Section C.1 directly tests for geographic spillovers by using alternative control groups or comparing control municipalities to towns further away.

[14]The typical town in our sample is best characterized as rural to semi-rural, and at most peri-urban. For reference, the city of Thionville (one of the denser municipalities in the treated area) has a population density of about 800 inhabitants per $km^2$ and 40,000 inhabitants.

## 2.2 Cross-sectional spatial gradient design

We complement the DiD design with an alternative "spatial gradient" approach that exploits the "censored gravity" structure of commuting. As shown in panel B of Figure 4, distance predicts a decline in cross-border commuting shares within the feasible commuting zone, but has no predictive power beyond it. If commuting has nonzero treatment effects, this in turn generates different distance gradients in outcomes within and outside the commuting range, and a *kinked* reduced-form relationship between distance and outcomes.

Both strategies rely on the same underlying source of variation: differential exposure to a foreign labor demand shock, mediated by commuting feasibility. We implement this additional design for two reasons. First, exploiting heterogeneity *within* the treated part of our sample provides a complementary test of how proximity to Luxembourg's economic boom affects outcomes in France's rust belt at the intensive margin. Second, for some outcomes, such as rents and income inequality, long panel data are unavailable; it allows us to infer a causal relationship between cross-border commuting intensity and local outcomes using exclusively cross-sectional variation. Formally, we estimate piecewise linear specifications, allowing the relationship between local outcomes and distance to differ inside and outside the feasible commuting zone:

$$\begin{aligned} Y_i = \alpha &+ \beta_1 \text{dist}_i \\ &+ \beta_2 \mathbb{1}[\text{dist}_i \leq 70] \\ &+ \beta_3 \big(\text{dist}_i \times \mathbb{1}[\text{dist}_i \leq 70]\big) + \varepsilon_i. \end{aligned} \tag{2}$$

$Y_i$ denotes the outcome of interest, $\text{dist}_i$ is distance of town $i$ to Luxembourg, and the interaction term $\beta_3$ allows the distance gradient to differ within and outside the feasible commuting zone. The identifying assumption is that, in the absence of Luxembourg's labor demand, any relationship between local outcomes and distance to Luxembourg (e.g. through trade, cultural influence, or migration) would be independent of commuting feasibility. Under this assumption, a differential slope within the commuting radius ($\beta_3 \neq 0$) can be attributed to exposure to Luxembourg's labor demand shock.[15] To facilitate interpretation and comparison with the

[15]Indeed, if local outcomes are affected by distance to Luxembourg *exclusively* through commuting, we would have $\beta_3 \neq 0$ but $\beta_1 = 0$ and $\beta_2 = 0$. Most of our empirical findings generally fail to reject $\beta_1 = 0$ and $\beta_2 = 0$, suggesting non-commuting distance-related forces or level jumps at the commuting border are indeed minor or negligible.

DiD, we translate the estimated gradient into an implied treated-control gap attributed to the additional distance effect. Specifically, we report the difference between the average predicted outcome among treated municipalities (within 50 km of Luxembourg City) and control municipalities (70-150 km away) explained by $\beta_3$.[16]

**Empirical Roadmap** Our empirical findings proceed in four steps. First, we document how access to Luxembourg's labor market affects the reallocation of incumbent workers (section 3). Second, we examine the implications of these new opportunities for labor market expansion in formerly industrial regions, focusing on total employment and labor force utilization (section 4). Third, we study how higher incomes, population inflows, and housing market adjustment contribute to the long-run revival of struggling local economies, although with uneven welfare consequences (section 5). Finally, we analyze the political implications of this long-run adjustment for the support for populist parties and EU integration (section 6).

# 3 Reallocation Response to Foreign Labor Demand

In this section, we examine the first step of regional adjustment to foreign labor demand. We document how improved access to Luxembourg reshaped the workplace choices of incumbent residents of the French Rust Belt, and identify which workers initially benefited from these new employment opportunities.

## 3.1 Spatial Reallocation of Employment Patterns

We first dissect how improved access to Luxembourg's labor market led to cross-border commuting at the municipality level. Figure 5 reports event-study estimates from Equation 1, where the outcome is the number of prime-age (25-54) residents employed abroad, normalized by the initial (1975) prime-age population. Following the increase in nominal wages in Luxembourg, French municipalities closer to Luxembourg experienced a sharp and persistent

[16]Unlike in the DiD design, which nets out time-invariant structural differences, outcomes may exhibit systematic differences in levels or distance-slope near international borders for reasons unrelated to foreign labor demand (e.g., trade, amenities, border regulations, or persistent spatial sorting). To single out Luxembourg-specific effects, we thus also systematically perform (in appendix G.1, table A.23) a placebo spatial gradient analysis around the Mons border, which is not characterized by large wage differentials.

increase in cross-border commuting. The effects are statistically significant and economically large. Over three decades, they imply a differential increase of roughly 52 cross-border commuters per for each one hundred prime-age initial residents, relative to more distant municipalities. Measured against contemporaneous denominators, this corresponds to 35 percent more prime-age workers (30 percent of prime-age adults) employed in Luxembourg by the end of the period in treated municipalities. There is no evidence of differential pre-trends. During the 1968-1982 period, when wages in France and Luxembourg were broadly similar, cross-border employment evolved similarly across treated and control areas. The effects kickstart sharply in the late 1980s, consistent with the timing of Luxembourg's economic expansion depicted in Figure 2. By 1999, the number of residents employed abroad in municipalities within commuting distance of Luxembourg City had already increased by approximately 170 percent relative to more distant municipalities. The effect continues to grow gradually over the following decades, in line with the persistent wage gap between France and Luxembourg.[17]

One possible concern is that the rise in cross-border employment simply reflects a broader increase in workers' willingness to undertake long commutes, which would manifest itself through more cross-border work solely at the frontier. To assess this, we redefine the outcome as the share of workers employed outside their own *department*, either elsewhere in France or abroad. Figure A.18 shows that there is a differential increase in such long-distance commuting in treated areas, entirely accounted for by cross-border employment to Luxembourg. Similarly, we find no comparable gradient around the "placebo" France-Belgium border. Over the same period, the share of cross-border workers rises by at most 0.5% of the population in municipalities closest to Mons, orders of magnitude less than near Luxembourg. This provides clear evidence that the rise in commuting to Luxembourg thus reflects improved foreign employment opportunities and immediate access to a rapidly expanding foreign hub, not a general expansion in long-distance commuting (at home or abroad) among all residents of northeastern France.

We further examine which residents of the French Rust Belt benefited the most from

[17] "As the crow flies" distance to Luxembourg City predicts cross-border employment more strongly than distance to the highway alone, as shown in Figure A.17, although both treatments (expressed in shares of the resident population) exhibit similar qualitative patterns and dynamics. As illustrated in Figure 3, many municipalities lie close to the border but west of the main highway and can still reach Luxembourg City via alternative surface road connections.

the new employment opportunities generated by Luxembourg's sectoral transformation. Men account for a slight majority of the increase in cross-border employment, with the remainder accruing to women (Appendix Figure A.19, Panel A). Relative to their own weight in the local workforce, however, men are more likely than women to take up these opportunities (Panel B), consistent with evidence on men's higher willingness to trade-off commute times against wages documented in other contexts (Le Barbanchon, Rathelot, and Roulet, 2021). Consistent with Luxembourg's shift toward a service-oriented economy, 60 percent of the increase is concentrated in services (Figure 5, Panel B). Manufacturing accounts for only about 12 percent of cross-border jobs in the long run, even though it represented close to half of employment in the treated area at baseline. The new employment opportunities emerged in sectors fundamentally different from the region's historical specialization, raising the question of whether incumbent workers were able to benefit from them.

## 3.2 Incumbent Workers as the First Margin of Adjustment

We next ask who benefited from these new employment opportunities. Did regional adjustment occur because incumbent workers in the French Rust Belt successfully reallocated toward foreign jobs, or because the region attracted new workers through migration and labor-force participation? Distinguishing these channels is key to understanding the incidence of positive labor demand shocks for distressed areas. If existing workers are unable to move across sectors or employers, new opportunities may generate little benefit for those most affected by regional busts. By contrast, successful reallocation would suggest that local workers can overcome the frictions that are often thought to slow adjustment in declining regions.

We start with descriptive evidence on the first generation of cross-border commuters. Table A.6 describes residents from treated regions employed in Luxembourg shortly after the shock (in 1990). A majority of these workers were male (66%) and they were overwhelmingly incumbent residents. Only about 1 percent had moved into the treated area since the previous census of 1982, and approximately 80 percent were natives of the broader Northeast region. They are also relatively mature: their average age was about 32 and about 36% were aged 35 or older. In terms of sector of work, Table A.7 shows that the early commuters were employed in Luxembourg primarily in services (44%) and manufacturing (36%), with the re-

mainder split between construction (15%) and public, health, and education activities (4%). This early manufacturing share far exceeds the roughly 12 percent reached by 2021, consistent with early take-up by local industrial workers already living in the region.

To dissect this mechanism directly, we turn to longitudinal administrative employer-employee records covering a 4 percent sample of the French population. We follow incumbent workers in our sample municipalities aged 25–54 in 1982 continuously employed in France immediately before Luxembourg's expansion (1979–1982 in our baseline specification). The resulting sample comprises roughly 17,000 unique incumbent workers with strong pre-shock attachment to the French labor market. They are disproportionately employed in manufacturing at baseline (around 50 percent) and predominantly male (see Appendix Table A.9-A.10).

We then trace the employment trajectories of these workers as a function of their predetermined residential exposure to Luxembourg's pull, estimating worker-level event studies with worker and year fixed effects.[18] Because we only observe employment in France in the employer-employee dataset, we cannot directly observe workers' transitions to Luxembourg. We interpret differential persistent declines in French employment among more exposed workers as reflecting reallocation into cross-border work, under the assumption that treated and control workers would otherwise have followed similar domestic employment trajectories.[19]

Figure 6 reports the worker-level event-study estimates. Panel A plots two outcomes: an indicator for employment in France in year $t$ and an indicator for remaining attached to the French labor market (i.e., ever being observed in French employment in year $t$ or later). We report estimates separately for workers who were aged 25–54 (Panel A1) and 25–34 (Panel A2) in 1982. Likely residents of treated areas experience a substantial decline in employment in France, consistent with incumbent workers reallocating toward cross-border employment. The two outcomes evolve almost identically in both age groups, indicating that these transitions largely reflect permanent exits from the French labor market rather than temporary spells.

[18] Because workers' municipality of residence is not observed before 1993, we proxy pre-shock expected residential exposure using the share of workers in each worker's 1982 workplace location who reside within 50 km of Luxembourg City, computed from later exhaustive employer-employee records. Appendix D.1 describes the construction of this measure, the estimating equation, and demonstrates robustness to alternative definitions, such as workplace distance to Luxembourg city.

[19] Any positive spillovers from cross-border work to domestic employment in more exposed areas would bias these estimates toward zero, while stronger adverse employment shocks in treated versus control would bias them away from zero.

Among prime-age incumbents, employment in France falls rapidly following the expansion of Luxembourg's labor market, reaching roughly 10 percentage points below that of less exposed workers within a few years before stabilizing. By contrast, the decline among younger workers is gradual, accumulating throughout the 1990s to a similar long-run magnitude, while the effects for older workers gradually diminish with retirement hazard. These dynamics point to a sequential adjustment process. Workers already well established in the labor market responded first to the emergence of cross-border employment opportunities, while younger cohorts reallocated progressively, sustaining the expansion of cross-border employment over the following decades. This interpretation is consistent with evidence in Table A.6, where the first generation of cross-border commuters was already relatively mature.[20]

Panel B of Figure 6 asks which incumbent workers in treated areas drive this reallocation, splitting the sample by sector of employment in 1982. The reallocation is concentrated among workers initially employed in manufacturing, whose probability of remaining employed in France falls by roughly 14 percentage points. Construction workers also experience a significant, though smaller, drift away from French employment in treated areas (Appendix Figure A.26). By contrast, we find no comparable decline among public-sector workers, consistent with their stronger attachment to domestic employment and the subsequent expansion of local public services documented in the next section.[21] The incumbent reallocation is also concentrated among men, who account for roughly 70 percent of the initial workforce, and among workers earning above the median wage in 1982.[22]

Overall, our findings indicate that the first stage of regional adjustment operated primarily through the reallocation of incumbent residents rather than the arrival of new workers. This contrasts with the view that persistent reallocation frictions prevent workers in declining regions from adapting to new opportunities. Rather than rebuilding their historical industrial base, exposed parts of the region appear to recover through the reallocation of existing residents into expanding sectors.

[20] The results are very similar when using the 1982–1985 employment cohort, and under alternative clustering of the standard errors (Appendix Figure A.23).

[21] Civil servants in France have strong employment protection and low mobility rates.

[22] Meaningful effects remain below the median (approximately a 4 percentage point decline by 2000). The gender and wage heterogeneity is reported in Appendix Figure A.24.

# 4 Employment Expansion and Labor Market Revival

We now examine the second stage of regional adjustment to foreign labor demand: the broader expansion of employment in the French Rust Belt. While the initial response operated through the reallocation of incumbent workers in decaying industries toward cross-border employment, job growth gradually expanded beyond this initial group through higher labor force participation, generating sustained employment gains in otherwise declining industrial areas, including through domestic demand spillovers.

## 4.1 Aggregate Employment Expansion

We begin by studying how the overall employment of local residents evolves following Luxembourg's economic expansion. Figure 7, Panel A, reports event-study estimates for total employment (maroon series) and its two sub-components: employment abroad (green) and employment in France (pink). All series are normalized by the 1975 working-age population.

Treated and control areas follow parallel trends prior to 1982. After the onset of Luxembourg's economic expansion, in the short run, increases in employment abroad for residents of treated areas are entirely offset by commensurate declines in employment in France, leaving total employment unchanged. This pattern is consistent with the first stage of adjustment documented in the previous section, in which *incumbent* workers reallocate from local jobs to opportunities in Luxembourg. About a decade later, however, employment abroad continues to expand while the dynamic of domestic employment stabilizes. As a result, total resident employment begins to rise. By the end of the period, for each 100 initial working-age residents, an additional 52 residents employed abroad is accompanied by a decline of only about 16 in domestic employment, implying a net *total* employment increase of roughly 36% of initial population. The initial full reallocation of workers towards foreign employment was followed by a broader expansion of employment across exposed parts of the French Rust Belt. The estimates are robust to controlling for initial sectoral composition and skill structure and are absent around the placebo Belgian border (Figure A.20), indicating that they are specific to Luxembourg's labor demand shock.

We next examine the composition of these long-run employment gains. Panel B reports

the contribution of each sector, occupation, and gender to the increase in residents' total employment thirty years after the shock. Three patterns stand out.

First, in line with cross-border job growth, total resident employment growth remains overwhelmingly concentrated in services. Services account for roughly 70 percent of the overall increase in employment, while construction and public and health services account for most of the remainder. By contrast, manufacturing contributes only about 7 percent, despite accounting for close to half of local employment at baseline. This composition mirrors both structural changes in the economy, and the service-oriented structure of Luxembourg's labor demand (Section 3): the new jobs residents hold are overwhelmingly in services, so the recovery did not operate through a resurrection of the region's manufacturing base.

Second, employment growth is remarkably broad-based across occupations. Managers and professionals (e.g., engineers, doctors, and business executives), intermediate occupations (e.g., nurses, teachers, and technicians), clerical and service workers (e.g., office staff, retail workers, and childcare providers), and manual workers all experience substantial employment gains. Together, these four groups account for more than 90 percent of the overall employment gain, with no single occupational category contributing more than 30 percent, and manual workers gain nearly as much as managers and professionals. This pattern reflects the diversity of occupations employed within service industries. In spite of Luxembourg's sectoral specialization, regional recovery was not confined to a narrow set of high-skilled financial jobs, but generated employment opportunities throughout much of the skill distribution.

Finally, employment gains became gradually more broadly shared across the workforce. Women account for a slight majority of the long-run employment expansion, despite the initial cross-border commuting response being disproportionately male. While the first generation of cross-border commuters consisted primarily of men, the long-run employment expansion became much more balanced across genders. This evolution illustrates how the benefits of the foreign labor-demand shock progressively diffused beyond the tradable-sector, male workers who initially responded to opportunities in Luxembourg.

## 4.2 Unemployment and Labor Force Participation

We next examine how the broader employment expansion documented above translated into improved local labor market outcomes. Figure 8 reports the evolution of the labor force participation rate, the employment rate, and unemployment, each expressed as a share of the contemporaneous working-age population, so that the employment and unemployment margins add up to participation (we return to population responses in section 5).

Employment rates rise substantially following Luxembourg's economic expansion, by about 7 percentage points among working-age residents in the long run. This increase is accompanied by a large rise in labor force participation of about 5 percentage points, beginning after roughly two census waves and closely matching the timing of the employment gains. The magnitude of this participation response suggests that the low initial employment rates in these areas reflected substantial underutilization of the labor force, that could respond only once new employment opportunities emerged. At baseline in 1982, prime-age employment rates in treated municipalities stood at 62 percent, well below the national average of 75 percent, and the long-run employment rate gain of 6.7 percentage points closed roughly half of this initial slack gap. Rather than simply reallocating already employed workers across workplaces, improved access to foreign labor demand progressively drew previously inactive residents into employment, making labor force participation a central margin of regional adjustment.

By contrast, unemployment improves only gradually, declining by about 1.5 percentage points of the working-age population by the end of the period (roughly 2.3 points measured conventionally, as a share of the labor force). The delayed decline indicates that the second stage of regional adjustment initially operated through the mobilization of previously inactive residents rather than through the immediate absorption of unemployed workers. Conventional labor market indicators thus improved only long after the employment expansion was underway, as the initial increase in employment is driven primarily by higher labor force participation.

Appendix Figure A.21 confirms this interpretation by expressing employment, labor force participation, and unemployment relative to the 1975 working-age population. Under this alternative normalization, the initial employment expansion is almost entirely accounted for by higher labor force participation, while the number of unemployed residents remains essentially

unchanged. Overall, the second stage of regional adjustment primarily reflects the mobilization of previously inactive residents. The later evolution of labor market indicators in Figure 8 also reflects subsequent changes in the size and composition of the local population (e.g. the denominator), to which we return in section 5.

### 4.3 Local Job Opportunities and Demand Spillovers

We next ask whether this exposure also reshaped labor demand within French towns themselves. Higher incomes earned in Luxembourg may increase spending on locally produced goods and services, transforming the structure of domestic employment within commuting distance of the new economic center. In this section, we distinguish employment of residents, studied above, from jobs located in a municipality, regardless of whether they are filled by local residents or by in-commuters from elsewhere in France.

While the number of *residents* employed in France declines in treated municipalities, as documented in Figure 7, the total number of *jobs* located in these municipalities rises (Appendix Table A.13). Expressed relative to the initial prime-age population, workplace employment increases by roughly 6 to 8 percentage points through 2010-2015 before stabilizing around 4 percentage points by 2021, as estimates become noisier in the most recent census waves. Roughly half of these additional jobs are filled by local residents and half by domestic in-commuters traveling from other French municipalities.

These additional local jobs are concentrated in services, which account for 85 percent of the increase in workplace employment, with public, health, and education activities contributing a further 20 percent (Appendix Table A.13). Consistent with this expansion, the sectoral composition of local employment also shifts away from manufacturing activities. Holding fixed the total number of jobs located in treated municipalities, the manufacturing share of workplace employment declines by roughly 3 percentage points, while the public, health, and education share increases by about 4 percentage points by 2021 (Appendix Table A.15). Thus, while residents increasingly work in Luxembourg, the jobs created within the French Rust Belt are primarily local service jobs.

These findings are consistent with a local labor-demand spillover operating within France. Although the initial employment response occurred across the border, part of the resulting

earnings were spent locally, sustaining additional jobs on the French side. Here, local demand is fueled by income earned outside the local production economy rather than by the expansion of a local export sector.[23] The magnitudes are imprecisely estimated, however, and we therefore interpret these estimates as suggestive.

Because part of the increase in workplace employment reflects domestic in-commuters, we next examine where these workers come from. Decomposing the growth in commuting into treated municipalities by workers' municipality of residence shows that it comes primarily from the treated zone itself (45 percent of total growth) and from the adjacent 50-70 km donut excluded from our estimation sample (39 percent). By contrast, the 70-150 km control band accounts for only 14 percent of the increase (Appendix Table A.16). Control municipalities continue to supply only a small share of all in-commuters to treated areas throughout the period, increasing only from 5 percent in the 1980s to about 8 percent by 2021. The expansion of workplace employment therefore mostly reflects the growing integration of labor markets within the exposed area rather than a substantial reallocation of workers from the control group. This geography of commuting also supports our identification strategy by showing that any spillovers remain largely confined to the treated area and the excluded donut.

Our findings suggest that higher earnings from cross-border employment supported a modest expansion of local labor demand within France, with demand spillovers from increased incomes, rising labor force participation and population growth more than offsetting the direct effects of the reallocation of labor supply abroad. This expansion was concentrated in local service activities and in line with the broader revival of population and activity in the treated regions, but we find no evidence that it amplified a broader stimulus effect for the local production base. When benchmarked against current population (appendix table A.14), workplace employment did not rise disproportionately, and we find no significant increase in the number of firms located in treated municipalities, with, if anything, a slight decline in manufacturing firms (Appendix Table A.17 and Figure A.27).

[23] See also (Maroto et al., 2026) for another piece of evidence on rising non-locally sourced incomes triggering commensurate effects on local spending and employment in France.

# 5 Long-Run Regional Adjustment and Revitalization

In this section, we examine the third stage of regional adjustment. We ask whether the large employment gains documented above ultimately translated into a broader revitalization of regions initially exposed to the industrial bust. We begin by studying population responses and demographic composition, before turning to housing market responses, access to public and private services, and indicators of local prosperity and inequality.

## 5.1 Population Adjustment and Demographic Renewal

While previous work documents little population adjustment following negative external labor demand shocks (Autor, Dorn, and Hanson, 2013; Choi et al., 2024; Muñoz, 2024), we show in our setting that distressed regions eventually experienced a substantial demographic renewal when exposed to a persistent positive labor demand shock. The long-run perspective is crucial here. We evidence that population adjustment in former industrial regions is sluggish in the short and medium run, and only materializes 20 years after the initial economic shock.

Figure 9, Panel A, reports event-study estimates using the log of municipality resident population as the outcome variable. Prior to 1988, population trends are similar in control and treatment municipalities, consistent with our parallel pre-trends assumption. For close to two decades following the shock, municipalities more exposed to Luxembourg do not experience statistically or economically meaningful population growth relative to less exposed areas. The absence of differential population growth implies that migration remained remarkably unresponsive during the first two decades following the shock, despite the large improvements in employment opportunities and labor market conditions documented above.

A differential only begins to open between 2000 and 2010, two decades after the initial divergence. From that point on, exposed municipalities experience sustained population growth. By 2021, population levels are approximately 15 percent higher in municipalities closer to Luxembourg relative to control municipalities. These results are robust to the inclusion of flexible time-varying controls and to allowing for differential trends based on initial manufacturing shares or pre-period educational composition. Over the same period, population levels in municipalities closer to the non-booming foreign labor market remained flat, with precisely

estimated null effects (Figure 9) that are statistically different from the population growth observed in municipalities near Luxembourg starting in 2010.

**Expansion Through Net Migration Flows** We quantify the net migration response in two complementary ways. The first is a population-accounting measure, which backs out net migration as the inter-censal change in population net of local births minus deaths. It is estimated precisely because it relies only on population counts and administrative measures of vital records, but does not allow us to break down net migration by demographic characteristics. The second reconstructs net migration directly as gross inflows minus gross outflows. This measure is noisier because the census migration question changes across waves.[24] Reassuringly, both measures yield a similar picture (Figure 9, Panel B). Net migration remains modest during the first two decades following the expansion of cross-border employment opportunities and rises sharply only after 2010. By 2021, the annualized net migration rate treatment effect reaches roughly 1.2 percentage points of the initial population under the accounting measure and about 0.8 percentage points under the gross-flow reconstruction.

To understand the sources of this demographic revival, we decompose net migration into its gross inflow and outflow components (Figure 9, Panel C and Appendix Table A.19). In the first two decades, the modest migration gains arise primarily through the retention margin. Gross outflows decline while inflows remain largely unchanged, suggesting that improved access to well-paid cross-border employment reduced the need for residents to leave the distressed region in search of economic opportunities elsewhere, compared to control locations. This pattern mirrors the individual-level evidence in Section 3, where incumbent workers from treated municipalities reallocate into cross-border jobs but remain local residents. The geography of out-migration reinforces this interpretation. Among residents who leave exposed municipalities, the average distance moved declines by roughly 40 percent over the period, while remaining flat around the placebo Belgian border (Appendix Figure A.31). Improved

[24]For census years 1968, 1975, 1982, 1990, and 1999, the census records whether individuals changed municipality since the previous census wave, while in later years it records whether individuals moved during the previous year (in 2015 and 2021). To ensure comparability across periods, we annualize migration rates in earlier census years. Because later censuses measure migration over a shorter horizon, the resulting gross-flow rates are mechanically noisier. Throughout, we normalize migration flows by the pre-shock (1975) population so that gross inflows and outflows sum exactly to net migration and the denominator is itself unaffected by the treatment.

local opportunities therefore reduced precisely the long-distance out-migration that residents of the declining Northeast would otherwise have had to undertake in search of work elsewhere.

Over time, however, the demographic response increasingly reflects new arrivals rather than reduced departures. Gross inflows remain largely unchanged during the first two decades following the shock but accelerate sharply after 2010, eventually reaching roughly 1.2 percentage points of the initial population per year by 2021, compared with about 0.5 percentage points for gross outflows. The long-run population gains are therefore driven primarily by increased inflows, reflecting the attractiveness of treated areas after their revival by foreign labor demand. Higher outflows beyond 2015 only partially offset these gains, largely through a mechanical stock-churn effect, as the population expansion generates more gross departures even if individual mobility propensities remain unchanged. Consistent with this interpretation and their improved attractiveness, when flows are normalized by the contemporaneous population (rather than the fixed 1975 population), exposed municipalities exhibit substantially lower out-migration rates by the end of the period (Appendix Table A.19, final column).[25]

We next examine the origins of the new arrivals. Decomposing gross inflows by origin reveals that the demographic revival reflects both international migration and population reallocation within the broader Northeast. By 2021, foreign inflows account for roughly 54 percent of the treatment-induced increase in gross inflows, making them the single largest source of population growth. Part of this foreign inflow likely reflects residential relocation from Luxembourg itself, consistent with cross-border residential sorting, alongside genuine international migration. A further 17 percent originates from neighboring French *departements* within the same region, while migration from distant French regions contributes little. The remaining 29 percent reflects moves within the same province (*departement*). Access to Luxembourg therefore did not merely slow population decline; it transformed exposed municipalities into attractive residential locations for both international migrants and residents of the surrounding region. More broadly, the migration dynamics reveal a two-stage process of regional revival. In the first decades following the expansion of cross-border employment opportunities, demographic adjustment occurred primarily through a higher retention of incumbent residents. Only later, once the boom had become firmly established, did exposed

[25]The positive gross-outflow contribution in the long run therefore reflects a larger population rather than a weakening of the retention effect.

municipalities begin attracting substantial numbers of new residents.

This in-migration did not disproportionately draw from our control group. Tabulating movers into treated municipalities by the distance-to-Luxembourg ring of their previous residence, the 70–150 km control band supplies only about 7 percent of the 1982–2021 growth in in-migration—the smallest of all origin rings—while the bulk originates within the exposed zone itself (47 percent) and from abroad (19 percent) (Appendix Table A.20). The population gains in treated areas therefore reflect genuine new residents rather than a mechanical reallocation of population out of the comparison group, mirroring the in-commuting evidence, where the control band likewise supplies only a small share of the growth in local jobs.

The long-run population recovery of the French Rust Belt thus reflects both reduced exit and increased entry, with the latter eventually becoming the dominant source of demographic growth. The revival of the French Rust Belt first operated by retaining incumbent residents before progressively attracting new ones, transforming a declining industrial region into a growing residential labor market.

**Changes in Population Composition** Given our finding of substantial population reallocation, we investigate whether highly exposed municipalities experienced changes in their demographic composition (appendix Figure A.30). We find no evidence that growing municipalities became disproportionately male or significantly younger by the end of the period, suggesting that the positive migration response to the local economic opportunity shock is not primarily driven by these demographic groups. However, we do detect a positive and significant effect on the share of working-age individuals (25-54) and in particular on educational composition: treated municipalities experience a roughly 5 percentage point differential increase in the share of college-educated residents.

A final question is whether these population gains reflect a broad regional adjustment or displacement from neighboring municipalities, which could jeopardize the SUTVA assumption underlying the difference-in-differences strategy. In Appendix Section C.1, we find limited evidence of economically meaningful population spillovers to control regions through a variety of strategies, suggesting that the population responses estimated above largely reflect geographically concentrated gains rather than population losses in neighboring municipalities.

## 5.2 Housing Market Response to Regional Revival

The population inflows documented above naturally raise the question of whether local housing markets accommodated the resulting increase in housing demand. Housing markets are often viewed as a key source of persistence following adverse local shocks. Because housing is durable, declining regions inherit excess housing stocks and depressed prices that can trap places in decline by slowing spatial adjustment (Glaeser and Gyourko, 2005; Notowidigdo, 2020). Access to Luxembourg provides an opportunity to study the reverse process in a sharp empirical setting: whether a sustained but localized increase in labor demand can reactivate slack housing markets and support demographic revival.

In Figure 10, Panel A, we study how the local housing stock evolved in French municipalities with better access to Luxembourg. The event-study estimates show a significant increase in the number of housing units, with dynamics that closely mirror the timing of the population increase. By 2021, the housing stock had risen by about 10 percent in more exposed municipalities, against a roughly 15 percent increase in population. Although less than proportional, this effect represents a substantial supply response in the former industrial region: new construction accommodated the bulk of the population inflow, even if not all of it.

Part of the inflow was also absorbed the existing housing stock: we find a roughly 2-percentage-point decline in the local vacancy rate, as shown in Panel B of Figure 10, with no comparable decline around the non-booming Belgian border. The adjustment thus also operated through fuller utilization of existing housing units. The same tightening appears in households' own housing consumption. Using the household-level census record of dwelling size and household composition, we find that residents of more exposed municipalities consume fewer rooms per person, as shown in Appendix Figure A.32, with a decline of roughly 0.15 rooms per person relative to control municipalities by the end of the period. Part of the population inflow was thus accommodated through lower housing consumption per local resident, consistent with increased utilization of the housing stock at the intensive margin. As depicted in Section 5.5, this average decline masks opposing distributional effects across groups, as cross-border commuters consume more space while non-commuters consume less.

As a result of this rising pressure on local housing markets, housing costs increased significantly in more exposed areas. While long-term data on home values for the area do not

exist,[26] we can utilize our spatial gradient design, and the associated placebo exercise at the Belgian border, to show that proximity to Luxembourg is causally associated with higher current rents, measured by a composite rent index (a housing-stock-weighted average of rents for apartments and for single-family homes). Rents are approximately 34 percent higher in municipalities within the feasible commuting zone than in more distant control municipalities, with no comparable gradient around Mons (Figure 10, Panel C).

Our empirical findings thus indicate that, starting from substantial counter-factual slack, new construction, increased crowding and lower vacancy rates accommodated much of the resulting population inflow. Tighter housing markets ultimately translating into higher rents and lower housing consumption per resident. While elastic supply accommodated much of the demographic adjustment, allowing regional revival to occur primarily through population growth, the remaining price adjustment nonetheless fell disproportionately on a transfer from renters to owners.

## 5.3 Sustaining Local Amenities and Local Services

We next ask whether this demographic revival translated into improved access to local services. We focus on six core and typical amenities: doctors, pharmacies, banks, grocery stores, kindergartens, and primary schools. We measure access using three complementary indicators: the total number of services per 1,000 residents, proximity to the nearest service (measured as the negative of the average distance to the closest facility in each category), and a two-step floating catchment area (2SFCA) index that accounts for both service availability and congestion from competing users.[27]

Appendix Figure A.33 reports the results. By 2022, municipalities more exposed to the foreign labor-demand shock had approximately 0.9 additional services per 1,000 residents relative to comparable control municipalities (Panel A), were located about 0.6 kilometers closer to the nearest service on average (Panel B), and experienced significantly greater access after

[26] Exhaustive administrative price data on home sales in France (the *DV3F* database) only exist for the post-2010 period. More importantly, the three French provinces closest to Germany (*Bas-Rhin, Haut-Rhin, and Moselle*), which include most of the treated region of interest in this paper, do not follow the same reporting standards due to different local regulations regarding notaries since the Franco-Prussian war of 1870 and the German occupation that followed. They are therefore not included in the *DV3F* data.

[27] For each of the services, it divides the number of facilities reachable within a 20-km radius by the population competing for them, and sums across the six services.

accounting for congestion effects (Panel C). Importantly, these gains occurred despite a broad decline in local service provision across the region. In both treated and control municipalities, the absolute number of services per capita fell over time as amenities concentrated in larger towns and population growth diluted per-capita provision (see Appendix F.4). The positive treatment effects indicate that treated municipalities were better able to maintain access to amenities than the surrounding declining region, muting the "social dislocation" forces often associated with declining industrial areas.

Improved access to foreign economic opportunity contributed to local revitalization not only through employment gains, but also by sustaining the local demand necessary to the viable provision of public and private services. This has significant implications: in the European context, a growing literature links political discontent to the deterioration of local services that followed population losses in distressed areas (Algan et al., 2019).

## 5.4 Average Income Growth and Local Prosperity

A key question of interest is whether the local employment revival translated into broader improvements in local economic well-being. We focus on changes in local incomes, reliance on social transfers, and fiscal outcomes.

We begin by examining average nominal taxable income at the municipality level, shown in Figure 11, Panel A. Following our spatial-gradient approach, we plot average taxable income by 5-km bins of distance to Luxembourg City (green) and Mons (orange), together with flexible polynomial fits estimated separately on each side of the 70 km commuting threshold. Municipalities within the feasible commuting zone experienced substantially faster income growth than more distant municipalities (Panel B), while no comparable gradient emerges around Mons. By the end of the period, municipalities closest to Luxembourg reached average taxable incomes of roughly €50,000, compared with approximately €30,000 outside the commuting zone. Estimating Equation (2), we find that moving ten kilometers closer to Luxembourg raises average taxable income by €2,790 (6.9 percent).[28] Since the same 10-kilometer increase in proximity raises cross-border employment by slightly more than 10

[28]The nonparametric estimates further suggest that the gains are largest very close to the border, implying that the linear specification provides a conservative summary of the income effects for the most exposed municipalities.

percentage points (Figure 4), these estimates closely match the 60-65 percent wage premium earned by comparable workers employed in Luxembourg while pointing to limiting nominal wage spillover effects for domestic workers in treated regions.

To better capture living standards, we next examine disposable income using *Filosofi*, which combines labor and capital income, transfers, and taxes while adjusting for household size. We find similarly strong spatial gradients in median disposable income (Panel C), indicating that the gains generated by foreign employment opportunities translate into higher living standards even after taxes and redistribution.

We finally turn to reliance on major means-tested transfers using administrative data from Social Security sources in Panel D. We find a clear negative relationship between proximity to Luxembourg and reliance on social transfers. Therefore, foreign employment opportunities not only increased average incomes but also reduced reliance on the social safety net.[29]

## 5.5 Unequal Gains from Local Revival

While access to foreign labor demand in exposed former industrial regions of northeastern France resulted in broadly shared employment expandsions across demographic groups, this regional revitalization needs not imply equally shared welfare gains. When access to highly paid foreign employment opportunities differs across residents, positive demand shocks may generate uneven distributional consequences.

**Inequality within workers and between residents** A first margin operates within the labor market. As cross-border employment expands, a subset of workers earns substantially higher wages abroad, while workers who remain locally employed do not experience comparable gains (although they benefit from the modest employment expansions documented above). This divergence increases local income dispersion. Consistent with this mechanism, Panel A of Figure A.35 shows that municipalities more exposed to Luxembourg exhibit significantly higher D9-D1 interdecile ratios. Quantitatively, moving ten kilometers closer to Luxembourg

[29] Appendix Figure A.37 decomposes these transfers by program: unemployment benefits, housing allowances, an earned income tax credit (the *prime d'activité*, a lump-sum monthly transfer paid to low-income workers), child allowances, and basic income support. The negative gradient holds across programs.

is associated with a 7 percent increase in income dispersion relative to the Belgian border.[30]

Second, nominal inequality also increases between workers and non-working residents. While cross-border employment generates large income gains for employed individuals, these gains do not directly benefit retirees and other inactive households. Panel B illustrates this pattern by showing that the ratio of average pension income to average taxable income declines with exposure to Luxembourg. As labor income rises while pension income (largely reflecting past domestic careers from before the cross-border employment boom) remains largely unchanged, the income gap between working-age residents and retirees increases.

**Real incidence: consumption and welfare effects** Nominal inequality understates disparities in real income in the presence of local price adjustment. As shown in figure 10, rents increased differentially in areas most exposed to the foreign commuting boom. To directly evidence how nominal income inequality combined with local non-tradable price congestion translates into real consumption differences at the end of our sample period, we examine two objects of interest: the consumption differentials, *within a municipality*, between cross-border commuters and observably similar non-commuting resident workers; and the consumption differentials between non-commuters in highly exposed municipalities and non-commuters in untreated locations. We study the former by regressing within-municipality variation in proxy outcomes for consumption on an indicator for working abroad, along with a series of observable individual-level controls. We assess the latter by instrumenting for the local share of cross-border workers in a municipality using distance to Luxembourg city and studying its association with individual-level outcomes for non-cross border commuters, controlling again for the same observables at the individual level.

Table 4, panel A, shows that, relative to domestic workers in the same municipality with identical ages, education, immigration status, and family size, cross-border commuters consume more living space and more rooms per capita (columns 1 and 2); are more likely to own multiple cars (column 3); and are more likely to be homeowners (column 4) and less likely to

[30]These effects are economically large. Using this inequality measure, Thionville (one of the largest municipality in the Luxembourg-treated region) ranks among the most unequal French cities with more than 20,000 inhabitants nationally, and is one of the few outside the Ile-de-France region to do so (Observatoire des inégalités, 2025). More broadly, the few highly unequal cities outside the Paris region are border locations with access to high-wage foreign labor markets (e.g., Luxembourg or Geneva), consistent with differential access to foreign opportunity as a key driver of local inequality.

live in publicly provided social housing (column 5). By contrast, panel B evidences the contrasting findings that, within the feasible commuting range, non-commuters in towns closer to Luxembourg city (and thus with a higher share of cross-border commuters) experience lower non-tradable consumption (rooms per capita and living space per capita), a lesser (although not statistically significantly so) likelihood of home-ownership, and a higher chance of living in social housing.

Taken together, these findings indicate that rising access to highly-paid foreign labor markets causes a divergence in domestic living standards, to the benefit of "compliers" who take up cross-border commuting opportunities, but partly at the expense of non-commuters and non-workers in the most exposed areas who experience rising congestion costs and material non-tradable consumption reductions. The economic gains generated by foreign labor demand were thus substantial but unevenly distributed across residents of the region, and the political implications of these distributional consequences are theoretically ambiguous.

# 6 Political Consequences of Local Revival

The areas under study share many of the characteristics commonly associated with political discontent, including a history of industrial specialization and relatively low levels of educational attainment. In this section, we test whether, and by how much, access to new economic opportunities can change the political fate of these places and reverse the political backlash that has traditionally accompanied industrial decline.

## 6.1 Regional Revitalization and Far-Right Support

**Presidential election first-round results** French presidential elections provide an ideal setting to study the political consequences of regional decline and later revitalization. Since as many as 16 candidates run simultaneously, first-round vote shares capture preferences over a wide range of policy views, rather than strategic coordination between two blocs, and are measured consistently at the municipality level over several decades. Platforms are nationwide, and no local election can occur simultaneously, avoiding any "contamination" between local and national stakes. We focus on the vote share of far-right candidates, whose platform

has remained relatively stable over time and has long been characterized by opposition to European integration and globalization.[31]

Figure 12, Panel A plots 2022 first-round far-right vote shares against distance to Luxembourg City and, as a placebo comparison, distance to Mons. A pronounced spatial gradient emerges around Luxembourg. Support for the far right drops sharply with proximity to the border within the feasible commuting zone and flattens beyond it, mirroring the non-linear spatial decay in commuting to Luxembourg's labor market. By contrast, we find no comparable relationship around Mons. This suggests that political outcomes are closely related to access to foreign employment opportunities rather than to broader geographic factors. Quantitatively, the gradient implies that far-right support in 2022 is approximately 6 percentage points lower in treated municipalities (within 50 km of Luxembourg City) than in comparable control municipalities (70–150 km away), with no similar gap around the Mons placebo.

While the cross-sectional relationship is sharp, it could still reflect permanent differences specific to the Luxembourg border rather than exposure to labor market opportunities. We therefore turn to our event-study framework to study whether this political divergence emerged following the expansion of Luxembourg's labor market. Figure 12, Panel B, shows that municipalities more exposed to Luxembourg followed similar political trends prior to the shock. Differences in far-right vote shares only emerge in the early 1990s and grow steadily over time. By 2022, the far-right vote share is approximately 7 percentage points lower in municipalities that benefited from access to Luxembourg's dynamic labor market relative to nearby non-exposed municipalities. This effect is large, corresponding to roughly one quarter of average far-right support in control municipalities in 2022.

The results are robust to interacting baseline demographic characteristics with year fixed effects. If anything, controlling for initial sectoral and educational composition slightly increases the estimated decline in far-right support, suggesting that absent access to Luxembourg, these municipalities would likely have experienced even stronger trend increases in support for the far right. Consistent with the cross-sectional evidence, we find no comparable decline around the Belgian border. Results are also similar when the outcome is expressed in proportional

[31] See appendix H.1 for more institutional background. Consistent with the broader geography of political discontent in France and in other rich countries, support for the far right is particularly high in much of the northeastern rust belt, a former industrial region characterized by economic decline.

terms using an inverse hyperbolic sine transformation (Appendix Figure A.39).

**Presidential election runoff-stage results** Two-rounds elections lead to potentially distinct strategic voting motives in the runoff stage (Pons and Tricaud, 2018). Thus we next ask whether the decline in far-right support was also visible when the far-right reached the runoff stage, and large enough to shift electoral outcomes. Figure A.40 demonstrates that the spatial gradient for second-round outcomes in the three elections in which a far-right candidate competed in the second round follow similar patterns to the first round, with larger magnitudes (e.g. 7.9p.p in the runoff stage in 2022 versus 6p.p in the first-round).[32] Thus first-round effects are not small nor transitory reductions in vote shares, but translate into meaningful electoral consequences. In 2017, exposure to Luxembourg was sufficient to reverse the typical runoff winner (Figure A.41). By 2022, following a much stronger national performance by the far right, both treated and control municipalities shifted in the same direction, but the exposure effect remained substantial. Although Le Pen won the average control municipality by more than 13 percentage points, her average margin in exposed municipalities was only 4 percentage points. As a result, the far-right lost 40 percent of exposed municipalities in 2022, against only 24 percent of control municipalities (Appendix Table A.31).

## 6.2 Accounting for the Political Effects

We next ask who benefited from the decline in far-right support, and whether it primarily reflects changes in the composition of the local population, improvements in local conditions, or treatment effects on preferences due to the connection between foreign integration and economic gains.

**Electoral Shift to mainstream parties** A decline in support for one party need not imply a broader political realignment. Voters may instead shift toward other anti-system parties, become politically disengaged, or move back toward mainstream politics. We document that the decline in far-right support was reallocated across the political spectrum, shifting voters towards mainstream center and center-right parties that are generally more supportive of

[32] Because a far-right candidate reached the presidential runoff only in 2002, 2017, and 2022, we cannot estimate the event-study design on second-round outcomes.

market-oriented reforms and European integration. The political consequence is not a realignment toward progressive or pro-redistribution movements, but a shift from protest politics to mainstream government parties.

Appendix figure A.42, Panel A, plots the spatial gradient in first-round support for Macron in the 2017 presidential election.[33] Mirroring the decline in far-right support documented before, support for Macron rises sharply with proximity to Luxembourg, with no comparable pattern around the placebo border. This provides evidence that part of the political gains from regional revitalization accrued to mainstream pro-European candidates.

Panel B generalizes this result by decomposing the electoral effects of exposure to Luxembourg across the major political blocs in every presidential election since 1981. Because vote shares sum to one, the decline in far-right support must be offset by gains for other candidates. The decline in far-right support in exposed municipalities (about 6.9 percentage points by 2022) is absorbed primarily by the mainstream right (about 4.5 percentage points) and, in the later period, by centrist parties (about 3 percentage points, largely reflecting support for Emmanuel Macron since 2017). By contrast, support for the traditional left declines by roughly 2 percentage points, while support for the far left changes little. Finally, we find little evidence that these changes reflect higher turnout (Appendix Figure A.47) or greater within-municipality political polarization (Figure A.48). The political realignment therefore reflects changes in vote choice rather than electoral participation or ideological polarization.

**Limited selection effects** A natural question is whether the political divergence mostly reflects differences in the characteristics of new residents. Access to Luxembourg may have attracted residents with systematically different political preferences. Several pieces of evidence suggest, however, that such selection cannot be the primary explanation. First, the timing is inconsistent with a purely compositional story. Support for the far right begins to diverge in the early 1990s (Figure 12), shortly after the expansion of cross-border employment, whereas the demographic renewal documented above occurs only about two decades later. Second, when we split exposed municipalities into terciles according to their (ex post) population growth since 1975, the decline in far-right support remains large and statistically

[33] We focus on 2017 because Macron was not an incumbent then. The same spatial gradient for 2022 shows similar patterns (Appendix Figure A.43).

significant even among municipalities whose population remained stable or declined over the period. The corresponding event studies display flat pre-trends and begin to diverge only after the expansion of Luxembourg's labor market, and the increase in cross-border employment is similar across all terciles (Appendix Figure A.45 and Table A.33).

**Mediators and mechanisms** Given the limited role played by population renewal, a distinct question is how much of the political gap is driven by local economic revival. Municipalities within commuting distance of Luxembourg exhibit far-right vote shares approximately 5.4 percentage points lower than comparable control municipalities, consistent with the event-study and spatial-gradient estimates. Table 5 sequentially adds groups of 2022 municipality characteristics as mediators. The estimated gap changes little after controlling for demographic characteristics, educational attainment, sectoral composition, or labor-market conditions, suggesting that observable differences in population composition account for relatively little of the political divergence. By contrast, the gap declines substantially once we account for population density and, especially, local average incomes. Under the full set of controls, the estimated difference falls to 2.4 percentage points.

Figure 13 reports the order-invariant decomposition proposed by Gelbach (2016) (Appendix Table A.32). Income is by far the largest observable channel, accounting for 2.3 percentage points of the initial gap (42 percent), followed by population density, which explains an additional 1.1 percentage points (20 percent). Educational attainment, unemployment, and sectoral composition contribute comparatively little. Differences in age structure partly offset these channels, working in the opposite direction.[34] Overall, observable characteristics account for slightly more than half (56 percent) of the political divergence, with higher local incomes themselves representing nearly 42 percent of the gap.

Overall, the evidence points to improvements in local economic conditions rather than demographic change or selective migration as the primary driver of the timing and magnitude of the political effects. Higher local incomes account for by far the largest share of the political divergence, consistent with the broader process of regional revitalization documented throughout the paper. Nonetheless, nearly half of the political gap remains unexplained by

[34]This reflects the fact that exposed municipalities became slightly younger over time and younger voters display greater support for the far right in France.

contemporaneous municipality characteristics, suggesting that access to Luxembourg reshaped political preferences through a broader set of economic and social changes that cannot be captured by current observables alone.

## 6.3 Broader Political Realignment in the French Rust Belt

**Support for European Integration** The electoral recomposition documented above suggests that the decline in far-right support led to broader changes in political preferences. If access to jobs in Luxembourg changed how residents of the former industrial areas of France perceived globalization and cross-border economic integration, these effects should also be visible in attitudes toward European integration itself.

To investigate this hypothesis, we first turn to the 2005 French referendum on the European Constitutional Treaty, a national vote centered on the future of European integration. The proposed treaty aimed to deepen economic and political integration within the EU. The "No" campaign was supported by euro-skeptic parties, including the far right, and reflected opposition to further European integration (Muñoz, 2025). Figure 14, Panel A, plots the share of "No" votes by distance to Luxembourg. Municipalities most exposed to cross-border employment were substantially less likely to reject the proposed European Constitution. Within 40 km of Luxembourg, moving 10 km closer lowers the "No" share by about 3 percentage points (and roughly 5 percentage points within 30 km), with no comparable pattern around the placebo border with Belgium. The localized nature of the gradient reflects the geography of cross-border commuting at the time. In 2005, cross-border employment had not yet spread beyond the inner commuting ring, reaching 30–60% of workers within 40 km of Luxembourg but only about 5-10% immediately beyond, barely above control levels (Appendix Table A.25). The political response thus closely mirrors this early pattern of labor market integration.[35] Municipalities that benefited most from the employment opportunities created by European integration were also the least likely to vote against further European integration.

The referendum provides a localized snapshot of attitudes toward European integration early in the expansion of cross-border employment. To trace these attitudes over the long

[35]Because exposure in 2005 was concentrated in the communes nearest Luxembourg, the estimated political gradient is also localized rather than spread across the full commuting zone. Appendix G.3 and Table A.25 report estimates across bandwidths together with the underlying exposure geography.

run, we turn to elections to the European Parliament. These single-round elections focus on European rather than national issues and, unlike two-round presidential elections, allow voters to express preferences over the full range of parties without strategic voting. [36] Using party positions from the Chapel Hill Expert Survey (Jolly et al., 2022), we assign each electoral list a score ranging from one (strongly opposed to European integration) to seven (strongly supportive) and classify lists below the midpoint as euro-skeptic. Figure 14, Panel B, shows that the euro-skeptic vote share in the 2019 European election declines sharply with proximity to Luxembourg, with no comparable gradient around the placebo border at Mons (the 2024 election is shown in Appendix Figure A.49). Panel C extends the analysis to all six elections between 1999 and 2024, reporting the treated–control gap in the vote-weighted average integration score (the underlying spatial gradients for every election are shown in Appendix Figure A.50). Municipalities more exposed to Luxembourg become progressively more supportive of European integration as cross-border employment expands. The gap increases steadily over time and peaks at the end of the period, with no comparable evolution around Mons, the non-booming foreign labor market. European Parliament elections thus confirm, across six independent elections and a different electoral setting, that access to Luxembourg's labor market durably shifted local attitudes toward European integration.

**Political Representation** We finally ask whether these changes also translated into changes in local political representation. Regional revitalization may affect not only how citizens vote, but also who enters local politics and who is ultimately elected. We use the national register of local elected officials from the French Ministry of the Interior, which records the occupation of every sitting mayor as of 2026. Appendix Figure A.51 plots the share of mayors with high-skilled occupations (e.g., managers, professionals, and business owners) against distance to Luxembourg. Municipalities closer to Luxembourg elect substantially more high-skilled mayors. The share reaches about 50 percent in the most exposed municipalities, compared with about 35 percent in the control areas. This pattern is consistent with the broader economic

[36] The ballot is also national, so that differences across municipalities reflect voter preferences rather than differences in the local supply of candidates. From 2004 to 2014, the ballot was organized at the level of eight large regions, but our treatment and control municipalities always belonged to the same region and therefore faced the same set of candidates. A far-right list receives votes in 96 to 100 percent of municipalities in every election, with nearly identical presence in treated and control municipalities, so the spatial comparison isolates demand differneces rather than differential candidate entry (Appendix Table A.35).

transformation documented above and suggests that the political consequences of regional revitalization extended beyond voting behavior to the composition of local political elites.[37]

# 7 Discussion of the results

Our findings suggest a different view of how distressed regions recover. Rather than reflecting an inherent inability of workers or places to adapt, persistent regional decline may instead arise because left-behind regions rarely gain access to sufficiently large and persistent sources of new economic opportunity. When such opportunities emerge, regional adjustment unfolds gradually rather than simultaneously, through a sequence of worker reallocation, labor-force expansion, demographic renewal, and broader local revitalization. In this section, we discuss the broader implications of these findings for regional adjustment, the external validity of our setting, and place-based policy.

## 7.1 A dynamic and sequential process of regional adjustment

Our results reveal a gradual, three-stage adjustment process to the positive foreign labor demand shock generated by Luxembourg's expansion. Table 3 summarizes how local labor markets adjust to the foreign labor demand shock over time for all outcomes. Rather than generating simultaneous adjustments across all margins, exposure to the foreign labor market boom triggers a sequence of responses that unfold over nearly three decades.

**Phase 1: Reallocation (0–5 years).** In the short run, adjustment occurs through the reallocation of existing workers across labor markets. In the years immediately following the 1988 shock, the immediate increase in employment abroad is matched one-for-one by a decline in employment within France, implying that incumbent French residents reallocate across labor markets without raising overall employment. Total employment and population remain essentially unchanged. This rapid commuting response is consistent with the existing literature documenting larger elasticities of commuting flows, compared to employment and population adjustments (Monte, Redding, and Rossi-Hansberg, 2018). Importantly, in

[37] A similar but much noisier and quantitatively smaller gradient is observed around the Mons placebo.

this earlier stage, the reallocation mostly involves incumbent workers transitioning to foreign job opportunities, in particular among those workers (male, full-time, manufacturing) most exposed to the challenge of a widespread domestic industrial decline.

**Phase 2: Employment Expansion (5–10 years).** In the medium run, improved opportunities lead to an expansion of local employment through an expansion of local labor supply. Beginning in the late 1990s, the substitution effect weakens, and employment gains abroad are no longer fully offset by losses in domestic employment. However, population levels remain flat. The lack of a substantial population adjustment over a 10-15 year horizon is consistent with previous studies documenting limited migration responses to *negative* trade, migration or global recession shocks over comparable time periods (Autor, Dorn, and Hanson, 2013; Choi et al., 2024; Muñoz, 2024; Yagan, 2019).

The employment expansion is therefore supported by higher employment rates among incumbent residents and mostly reflects a rise in labor force participation. In labor markets with substantial initial slack, employment can expand meaningfully in response to positive foreign demand shocks even in the absence of significant population growth. This is consistent with evidence in other contexts, e.g. fracking booms in the U.S. (Feyrer, Mansur, and Sacerdote, 2017). The French rust belt was characterized by low baseline employment rates, allowing incumbent residents to absorb much of the positive labor demand shock during the first decade following Luxembourg's expansion. This result also implies that reduced-form responses to market access shocks are not constant, but rise over time, as we observe in the data. As the adjustment margin shifts over time from pure job reallocation toward net employment expansion among incumbents, the pool of potential cross-border commuters on the French side of the border increases, amplifying the commuting response to the wage divergence shock.

**Phase 3: Regional Revitalization (20–30 years).** In the long run, population inflows reinforce these gains and fuel local labor market expansion. Our results suggest that long time horizons may be necessary to detect meaningful migration responses: after three decades, population ultimately increases by nearly 15 percent. Population growth is driven by net in-migration, reflecting both higher inflows and lower outflows, and is accompanied by an increase in the share of college-educated residents. Treated municipalities also attract more

residents from abroad and from other *departements* within the distressed Northeast region, suggesting a widening geographic pull. These demographic changes, in turn, reshaped local living conditions and point to a broader process of regional revitalization: vacancy rates decline and housing construction expands, while treated municipalities experience rising local prosperity, reduced reliance on social transfers, and better access to local public and private amenities. Our results, beyond the direct case of positive cross-border employment opportunities, underscore the critical importance of considering long-run adjustment when evaluating the distributional and political consequences of globalization.

## 7.2 Lessons learnt and external validity

**Beyond cross-border commuting?** Although our empirical setting exploits cross-border commuting, the underlying mechanism is broader. A similar revival may arise whenever a formerly declining region gains access to a large nearby labor market, whether through improved transportation infrastructure or the emergence of a new booming industry nearby. Regional recovery depends on the size and accessibility of new economic opportunities. Regions with similar industrial histories may therefore experience sharply different trajectories if one lies within commuting distance of a resilient hub while the other remains isolated.

Three features of our setting nevertheless deserve specific emphasis. First, Luxembourg generated an unusually large labor demand shock. Its cross-border wage differential substantially exceeds the gains typically associated with commuting within France,[38] and replicating our results across all neighboring countries suggests the cross-border employment, total employment, and political responses increase with the foreign-French income gap (Appendix Figure A.28). The magnitude of our estimates should therefore be interpreted in light of the exceptional size of the underlying opportunity.

Second, these opportunities are accessed primarily through daily commuting rather than immediate relocation. This allows employment options to expand before population, housing markets, and firms adjust. The timing may differ when accessing new opportunities requires

[38]Luxembourg's cross-border wage premium (a mean log wage gap of about 0.65) exceeds that of every major within-France commuting corridor, including Toulouse (0.43) and Paris (0.34), and lies in the top 1 percent of the distribution of composition-adjusted wage gaps across French commuting corridors (Appendix Figure A.11).

permanent migration, in which case (opposite-sign) employment, population, and housing responses may occur more simultaneously.

Third, the gains arise directly from international economic integration. The political effects we document may thus reflect both improved local economic conditions and the salience of their foreign source. Comparable domestic demand shocks may generate similar economic consequences, but weaker dampening effects on the anti-globalization wave.

**Implications for Place-Based and Industrial Policy** Our findings point to several lessons for regional and industrial policy. Most fundamentally, persistent regional decline should not necessarily be interpreted as evidence that former industrial regions are structurally unable to adjust. Conditional on the emergence of sufficiently large employment alternatives, towns in the French Rust Belt responded remarkably strongly: employment expanded, labor force participation increased, population recovered, and local living standards improved. Rather than revealing limited adjustment capacity, persistent decline may instead reflect the persistent absence of new economic opportunities.

Relatedly, regional recovery does not necessitate rebuilding the industries that originally declined. In our setting, manufacturing never recovered, yet the region experienced sustained employment growth, demographic renewal, and rising prosperity, through access to new sources of labor demand. Policies that connect declining regions to expanding sectors may generate broad-based regional recovery even when employment growth occurs outside the region's historical specialization (Austin, Glaeser, and Summers, 2018; Hanson, 2023).

Finally, broad-based economic opportunity may also reshape political outcomes. We document a decline in support for anti-establishment parties that follows substantial improvements in employment and living standards that benefited a broad range of local residents. While our setting is closely tied to European integration, the broader implication is that restoring economic opportunity may be an effective way for mainstream political parties to rebuild support in left-behind regions.

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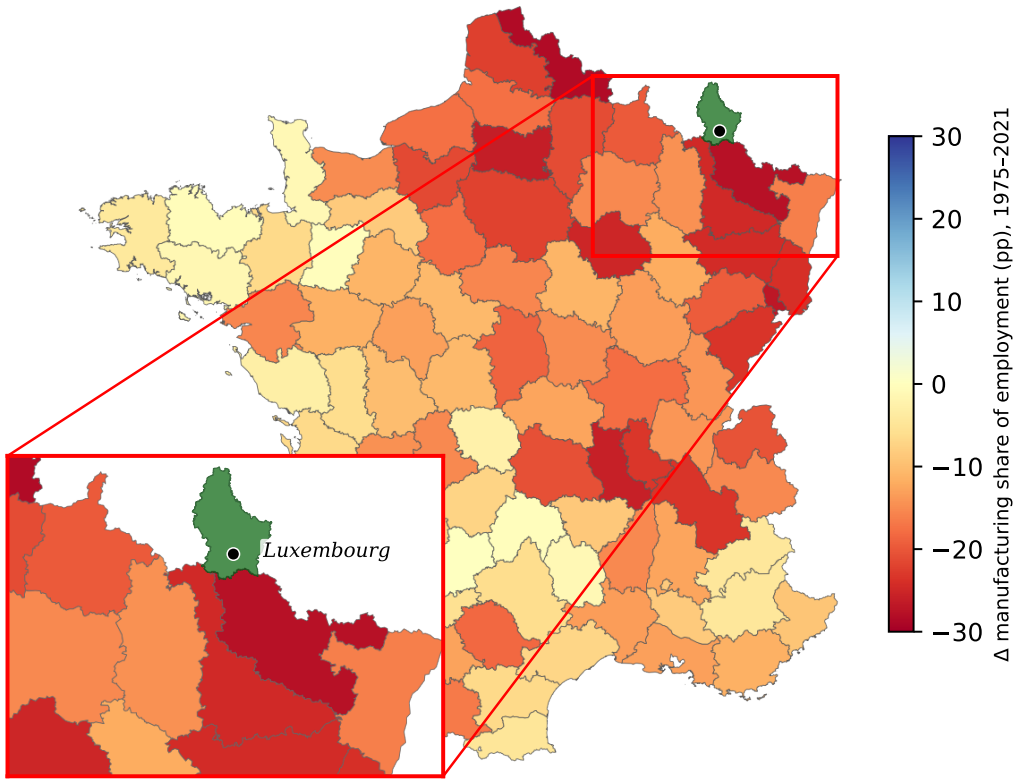
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# Main figures

Figure 1: **The French "Rust Belt"**

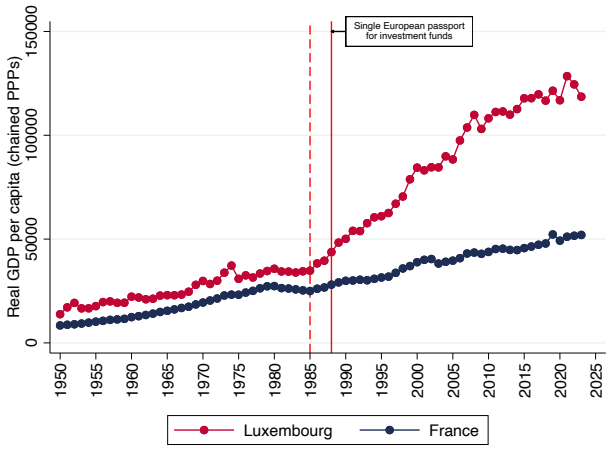



*Notes:* The map plots the change in the manufacturing employment share by department in France between 1975 and 2021. Red shades indicate declines in the manufacturing share, blue shades increases. The northeastern region (e.g. Moselle, in the inset) experienced among the largest declines in the country, having had some of the highest manufacturing employment shares before its subsequent de-industrialization. Luxembourg, the source of the foreign labor-demand opportunity, is shown in green. Source: exhaustive census data (INSEE).

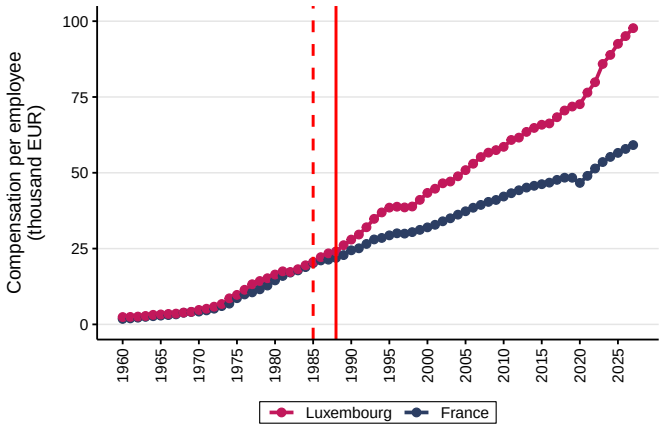
Figure 2: **Economic Divergence between Luxembourg and France**

**Panel A. Economic Growth Following the EU-Passporting System**

*A1. Real GDP per capita*

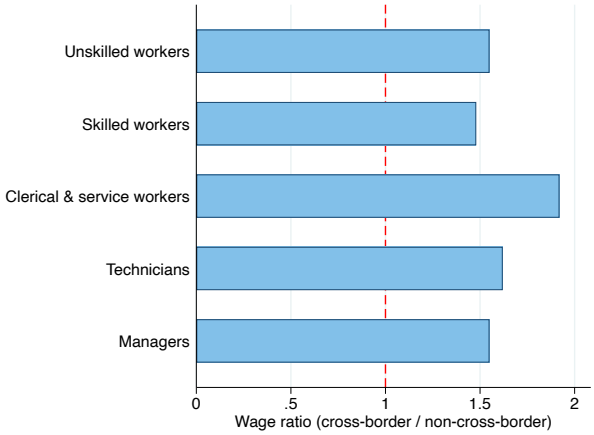



*A2. Nominal compensation per employee*

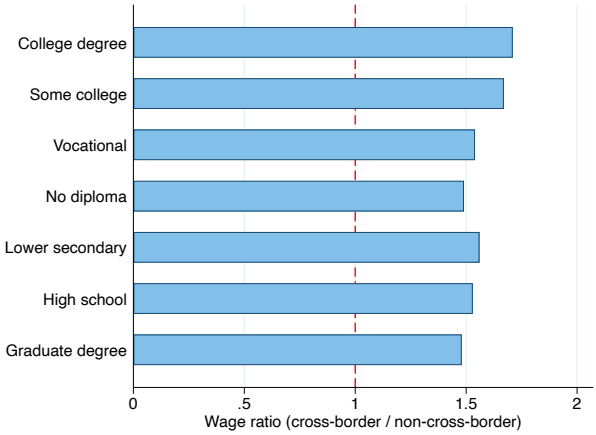



**Panel B. Wage Premium for French Cross-Border Workers**

*B1. By Occupation*



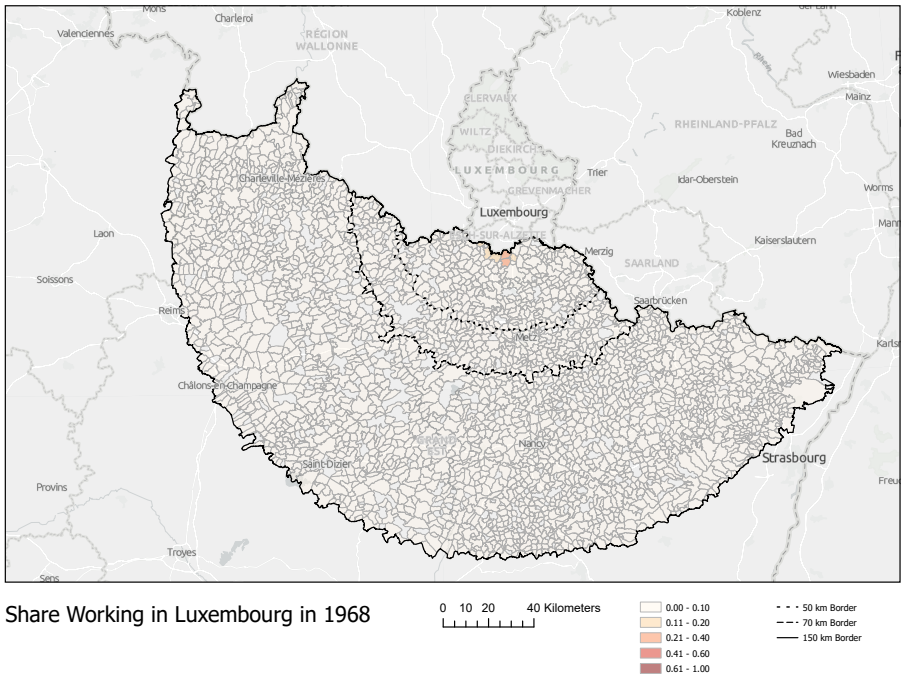

*B2. By Education*



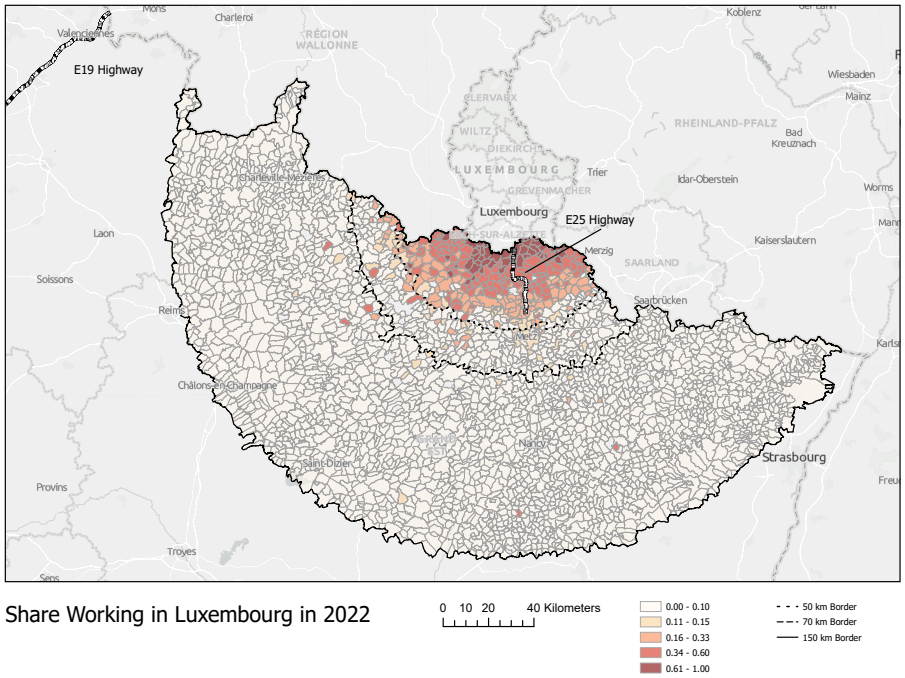

*Notes:* Panel A compares economic performance in Luxembourg and France. The left figure plots real GDP per capita using PWT data. The right figure reports nominal compensation per employee from AMECO. Panel B reports the wage ratio of French cross-border workers employed in Luxembourg relative to observationally similar French workers employed in their region of residence, separately by occupation and education. Values above one indicate a wage premium associated with cross-border employment. Wage comparisons are based on data from (Viglino and Hamez, 2025).

Figure 3: **Spatial Exposure to Luxembourg Labor Market Over Time**

## (a) Cross-Border Worker Share in 1968



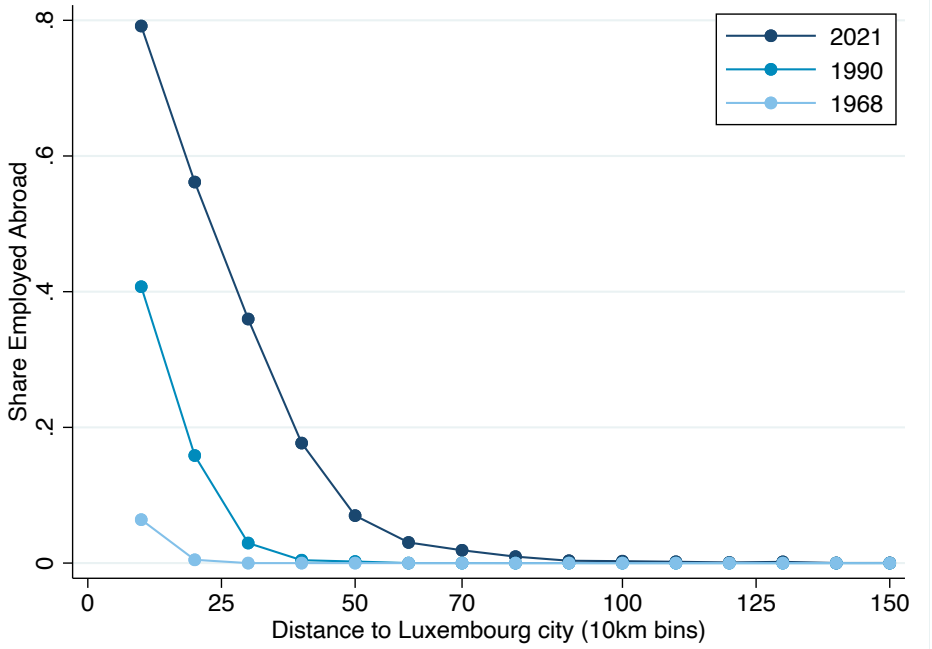

## (b) Cross-Border Worker Share in 2022



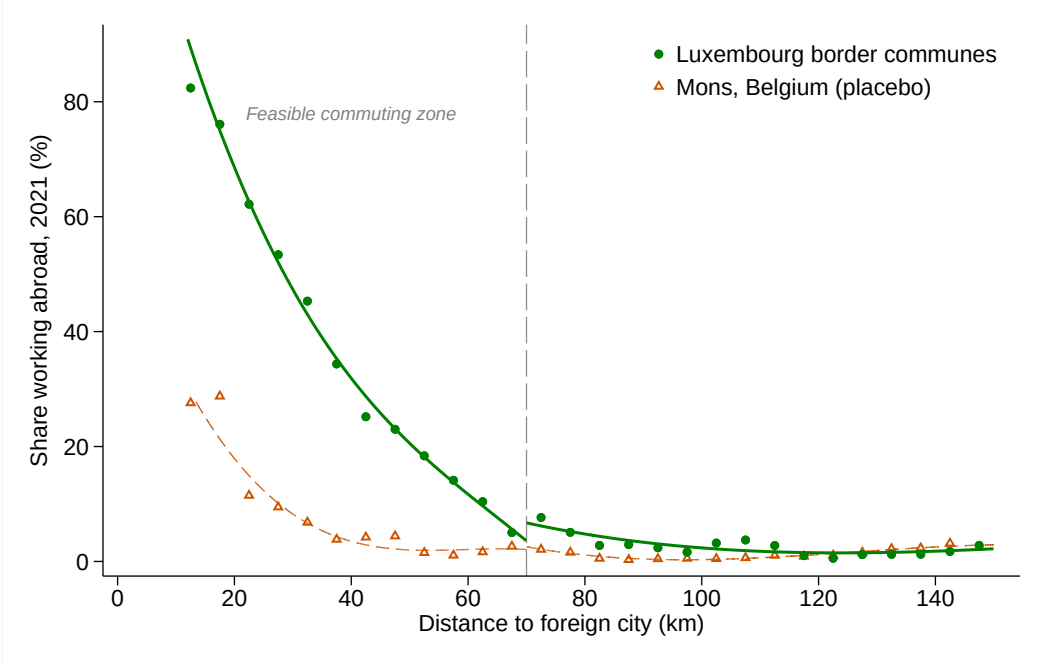

Notes: This figure shows spatial variation in the share of workers employed in Luxembourg but residing in France (cross-border workers) in 1968 and 2022. The unit of observation is a municipality (commune).

Figure 4: **Spatial Decay of Cross-Border Employment**

**A. Distance to Luxembourg City and Cross-Border Employment**



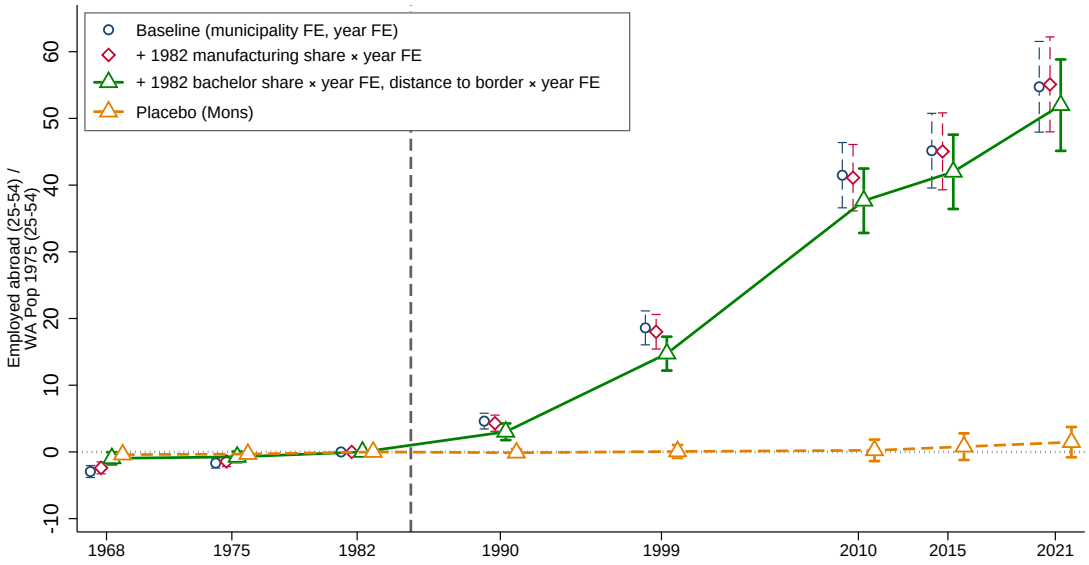

**B. Distance Gradients: Luxembourg (Booming) vs. Mons (Placebo)**



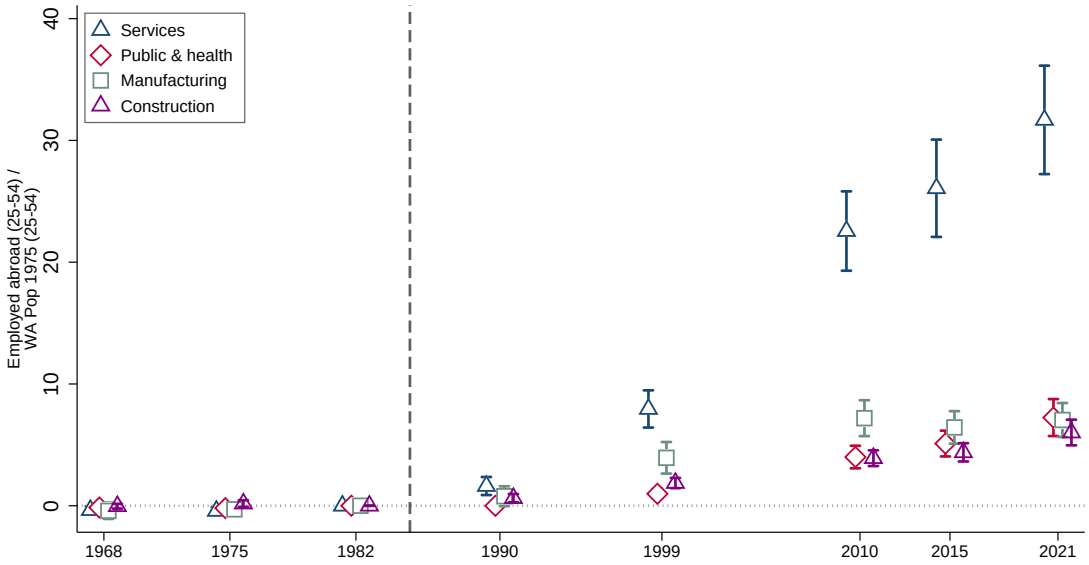

*Notes:* The figure plots the share of employed residents aged 25–54 working abroad as a function of distance to the foreign employment center. Panel A shows the evolution of the distance gradient relative to Luxembourg City. Panel B compares the spatial gradient near Luxembourg—in green (solid circles, cubic fit)—to that near Mons, Belgium—in orange (open triangles, dashed)—a geographically similar but non-booming border city; the annotated estimate is the implied treated–control gap (treated municipalities within 50 km of Luxembourg vs. control municipalities 70–150 km away), from a 500-replication municipality bootstrap. Distance bins are 5 km; the long-dashed vertical line marks the 70 km feasible-commuting threshold.

Figure 5: **Aggregate Reallocation Toward Foreign Employment**

**A. Aggregate Cross-Border Employment Responses**




**B. Sectoral Composition of Cross-Border Employment**

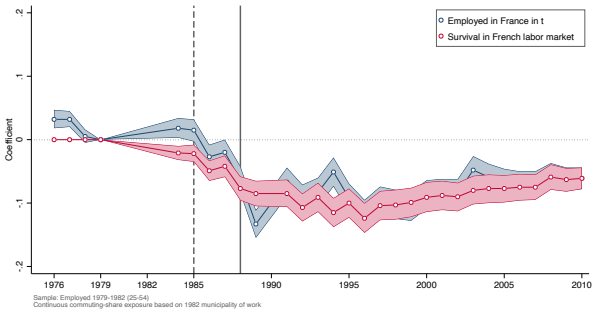



*Notes:* The figure plots event-study estimates for the share of residents aged 25–54 employed abroad, relative to the working-age (25–54) 1975 population. Treated municipalities are within 50 km of Luxembourg City; control municipalities are 70–150 km away. Estimates include municipality and census-year fixed effects; 1982 is the omitted reference year. Panel (a) reports the total effect under alternative control sets interacted with census-year fixed effects (baseline; 1982 manufacturing share; distance to the northern border and 1982 bachelor's share); the orange series is a placebo using distance to Mons (Belgium). Panel (b) decomposes the total response (full controls) by the sector of the foreign job—services, manufacturing, construction, and public & health.

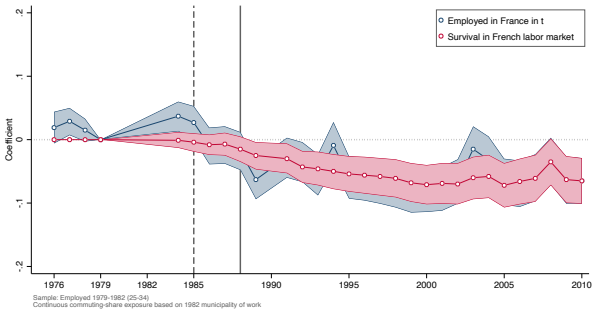
Figure 6: **Incumbent Worker Reallocation to Foreign Employment**

**Panel A. Dynamic Exit from the French Labor Market**

*A1. Prime-Age Workers (25-54)*

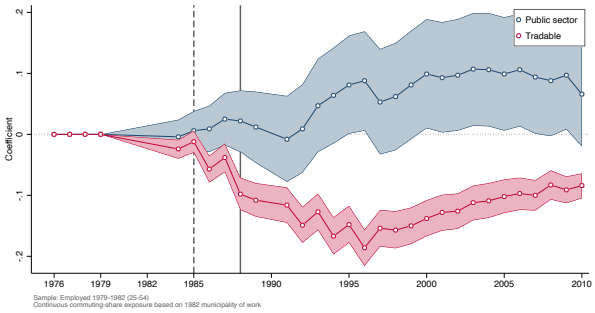



*A2. Younger Workers (25-34)*

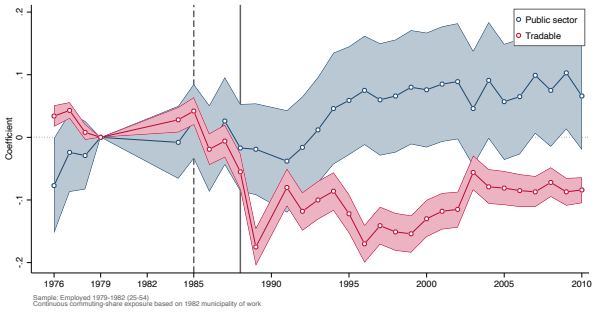



**Panel B. Which Incumbent Workers Reallocate?**

*B1. Permanent Exit from the French Labor Market*



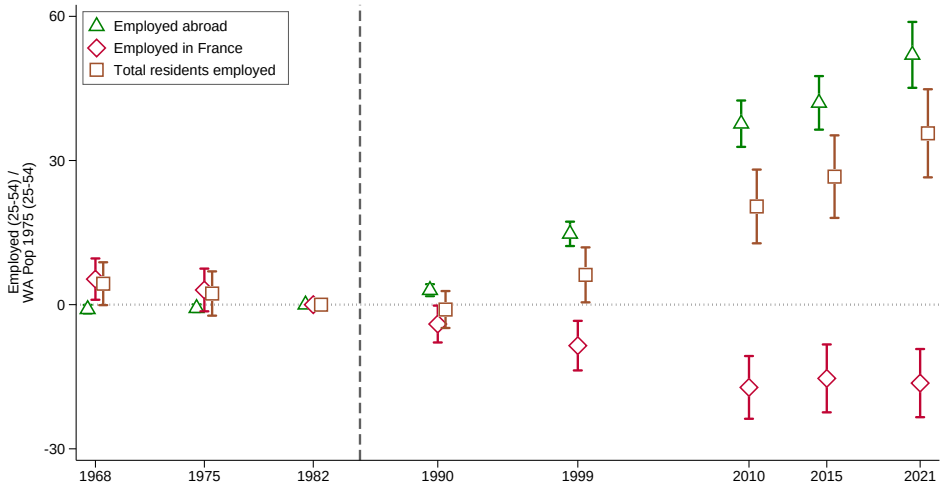

*B2. Employment in France*



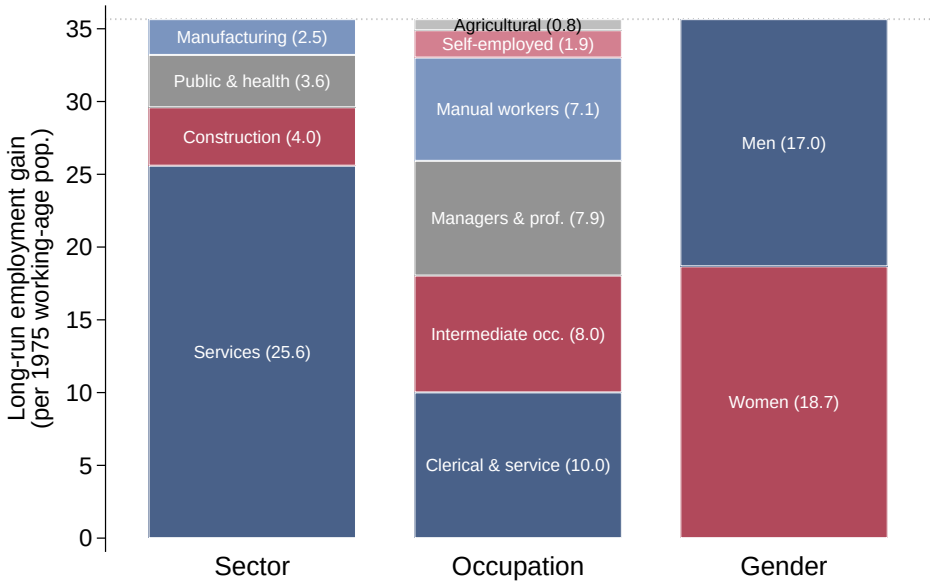

*Notes:* The figure reports event-study estimates from individual-level regressions of incumbent workers' labor-market outcomes on Luxembourg exposure (defined from the 1982 municipality of work) interacted with year fixed effects, and including worker and year fixed effects. The estimation sample is workers continuously employed in France between 1979 and 1982. Exposure is constructed from commuting linkages: each worker is assigned the share of workers in their 1982 municipality of work who reside in treated municipalities (within commuting distance of Luxembourg), computed from exhaustive DADS data in 1996. Panel A reports, for prime-age (25–54, A1) and young (25–34, A2) workers, two outcomes plotted together in each graph: an indicator for employment in France in year $t$, and an indicator for survival in the French labor market (equal to 1 for workers observed in the French employer-employee data in year $t$ or later). Panel B splits the prime-age sample by sector of work in 1982 and reports the same two outcomes—survival in the French labor market (B1) and employment in France in year $t$ (B2)—separately. Standard errors are clustered at the individual level. Results for the 1982–1985 employment cohort, alternative clustering, and additional heterogeneity (by gender and initial wage) are reported in Appendix Figures A.23–A.25.

Figure 7: **The Dynamics and Composition of Employment Expansion**

**Panel A. Aggregate Employment Dynamics**



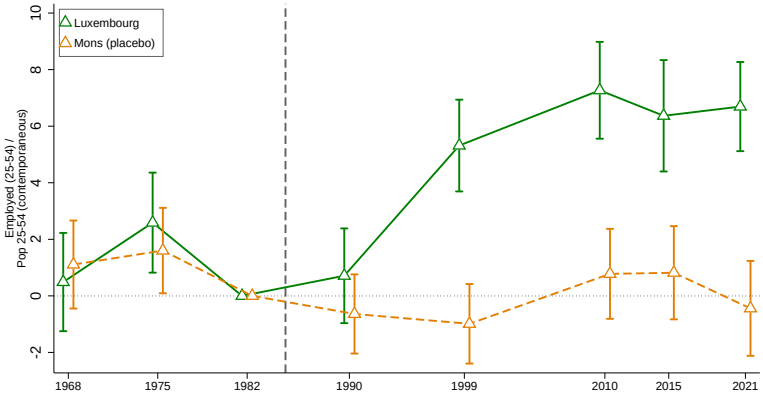

**Panel B. Composition and Incidence of Long-Run Employment Growth**



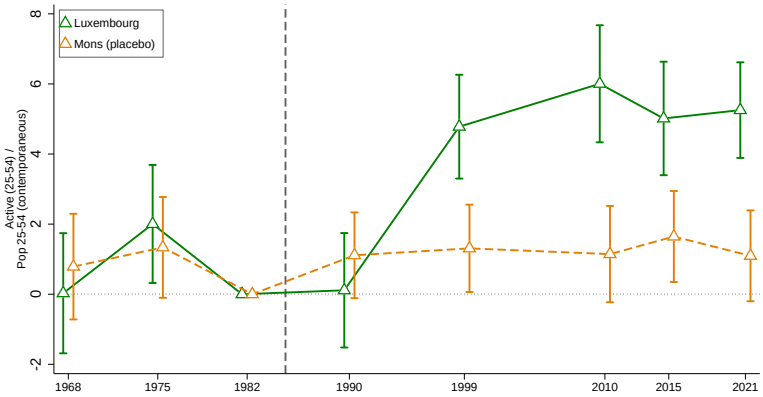

*Notes:* The figure reports the effect of exposure to Luxembourg on total employment among residents aged 25–54, normalized by the 1975 working-age (25–54) population. Panel A reports event-study estimates and decomposes the total employment response into employment in France and employment abroad, the two components sum to total employment growth. Panel B decomposes the long-run employment gain (the 2021 estimate, 30 years after the shock) by sector of activity, by occupation, and by gender. Each bar sums to the same total employment gain. Treated municipalities are within 50 km of Luxembourg City, control municipalities are 70–150 km away. Estimates include municipality and census-year fixed effects, 1982 manufacturing employment share interacted with census-year fixed effects, and 1982 bachelor share interacted with census-year fixed effects. Standard errors are clustered at the municipality level and 1982 is the omitted reference year.

Figure 8: **Employment Expansion and Labor Market Revival**

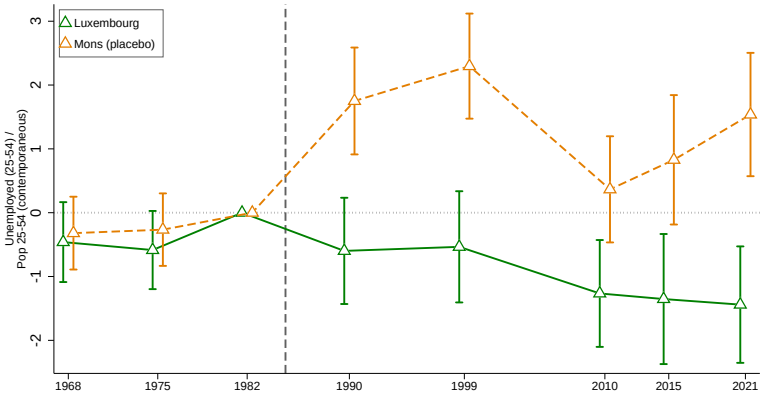
**(a) Employment Rate**




**(b) Labor Force Participation**



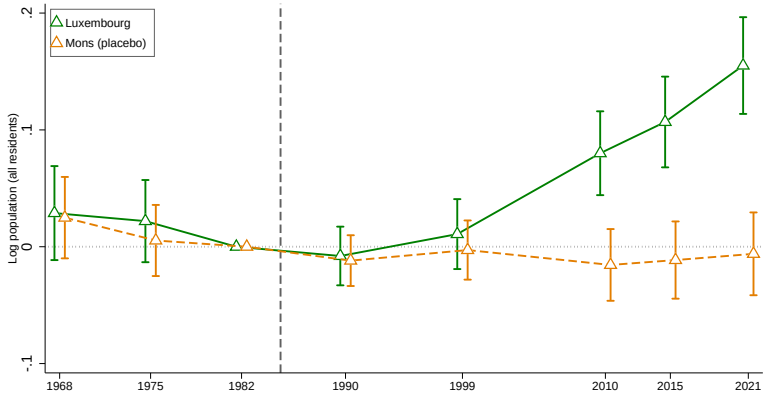

**(c) Unemployment (share of working-age population)**



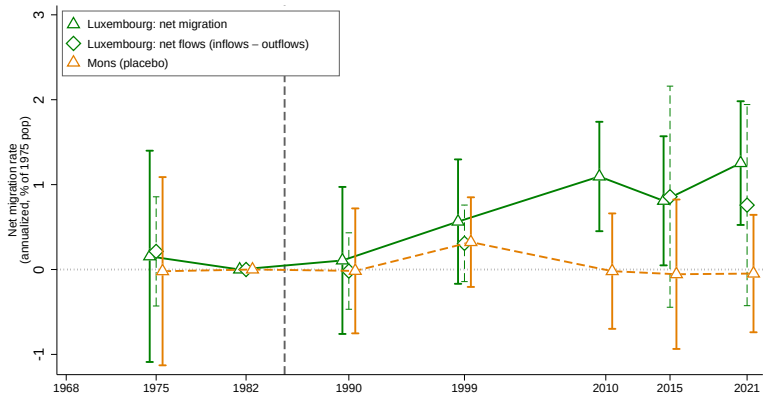

*Notes:* Event-study estimates of labor-market margins for residents aged 25–54, all expressed relative to the contemporaneous working-age (25–54) population: (a) employment rate, (b) labor-force participation rate, and (c) unemployment as a share of the working-age population. Panel (c) uses the working-age population rather than the labor force as denominator so that the employment and unemployment margins in panels (a) and (c) add up to the participation margin in panel (b), and so that its denominator is not itself affected by the participation response; measured conventionally, as a share of the labor force, the long-run treated–control decline in unemployment is about 2.3 percentage points. Solid green = Luxembourg (full controls), dashed orange = Mons (Belgium) placebo. Treated municipalities within 50 km of Luxembourg City, control 70–150 km; municipality and census-year fixed effects, 1982 reference year.

Figure 9: **Demographic Renewal Through Net Migration**

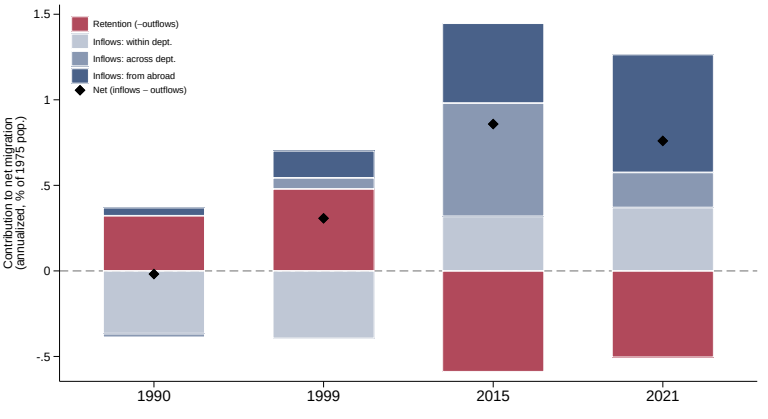
**(a) Population Growth**




**(b) Net Migration Rate**



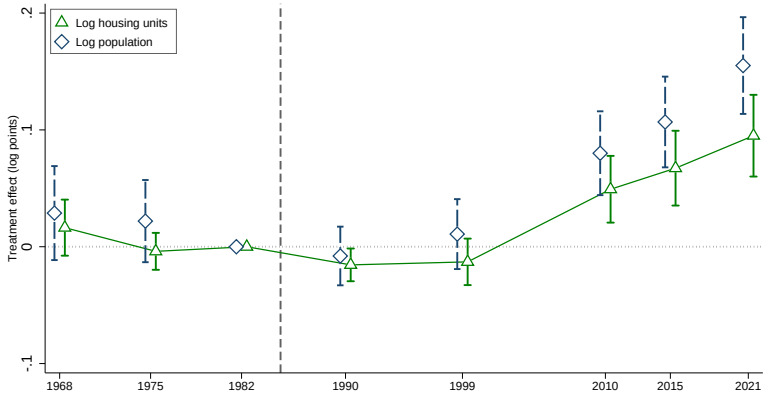

**(c) Source of Population Gains**



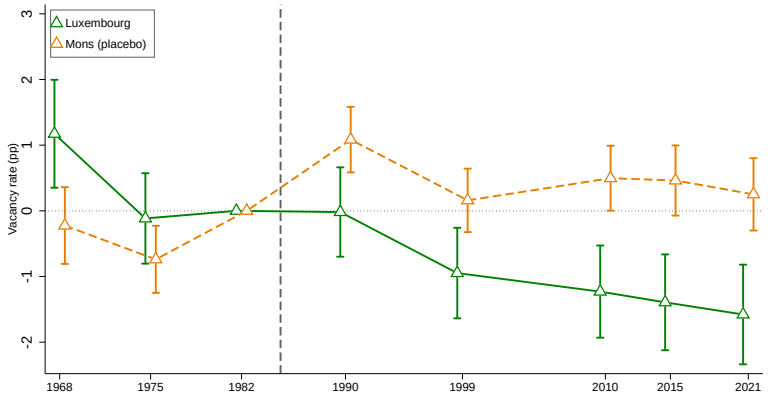

*Notes:* Panel (a): log municipal population (all residents); panel (b): annualized net migration rate (per 1975 population), with the Luxembourg net-flow measure (gross inflows minus outflows) in dashed navy. Solid green = Luxembourg (full controls), dashed orange = Mons (Belgium) placebo. Panel (c) decomposes the net migration effect into retention (−outflows) and gross inflows by origin (within/across department, abroad); components sum to the net effect (black diamond). Treated municipalities are within 50 km of Luxembourg City, control 70–150 km; municipality and census-year fixed effects, 1982 reference year. Appendix Figure A.29 reports alternative specifications.

Figure 10: **Housing Market Adjustment to Regional Recovery**

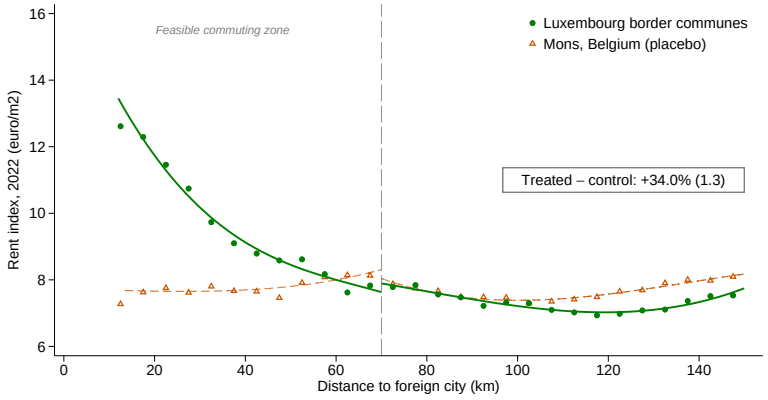
**(a) Population Growth and Housing Supply**




**(b) Vacancy Rates**

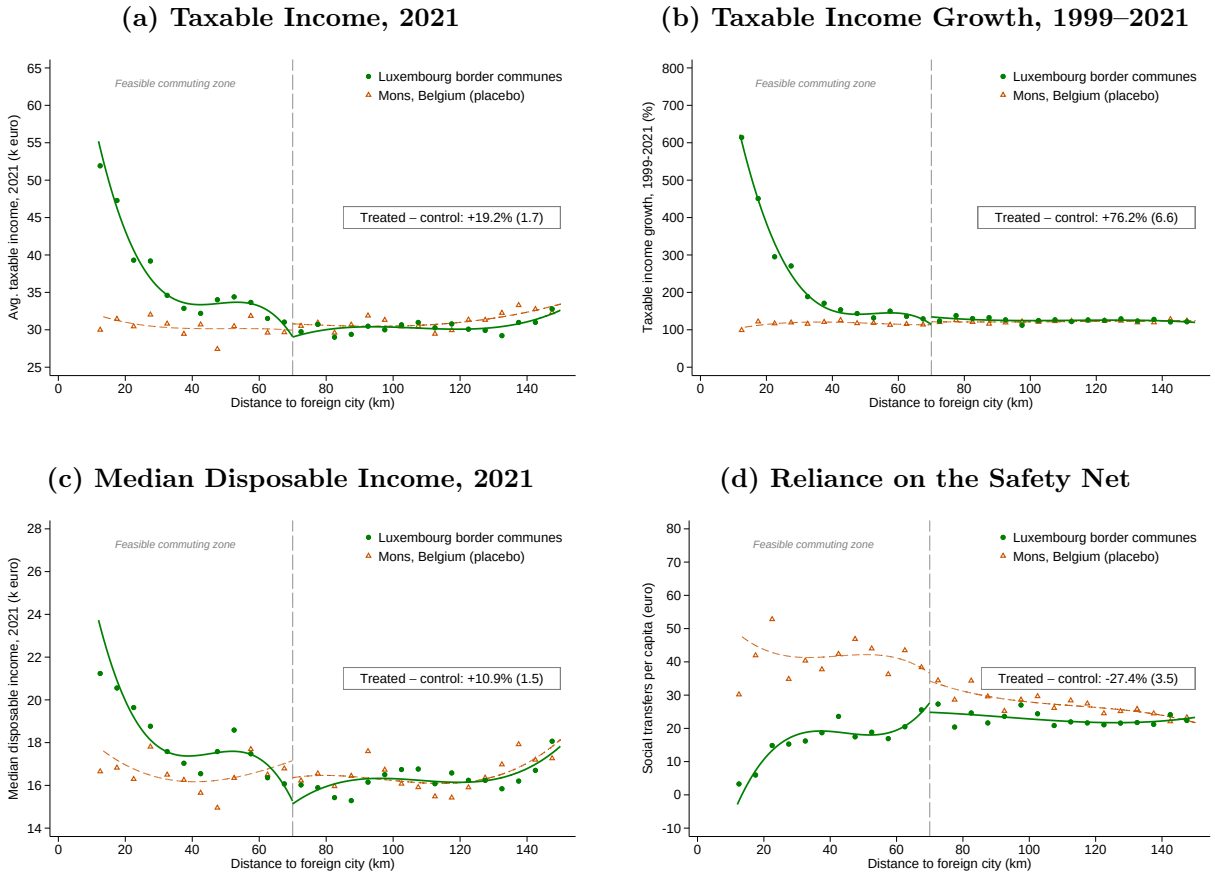



**(c) Rents**




*Notes:* Panels (a)–(b) are event studies (green = Luxembourg, dashed orange = Mons placebo); panel (a) plots log population and log housing units, panel (b) the vacancy rate (pp). Panel (c) is the 2022 composite rent-per-m$^2$ spatial gradient by distance to Luxembourg City; the annotated statistic is the fitted treated-minus-control gap (% of mean control rent, 500-replication bootstrap SE). Treated municipalities are within 50 km, controls 70–150 km. Appendix Figure A.32 reports average housing consumption (rooms per person).

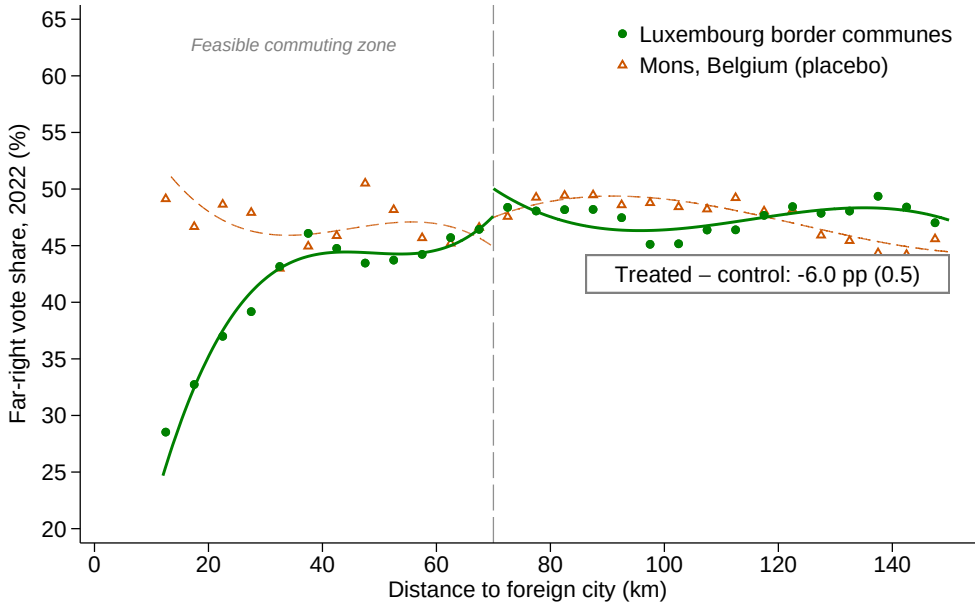
Figure 11: **Income Growth And Local Prosperity**



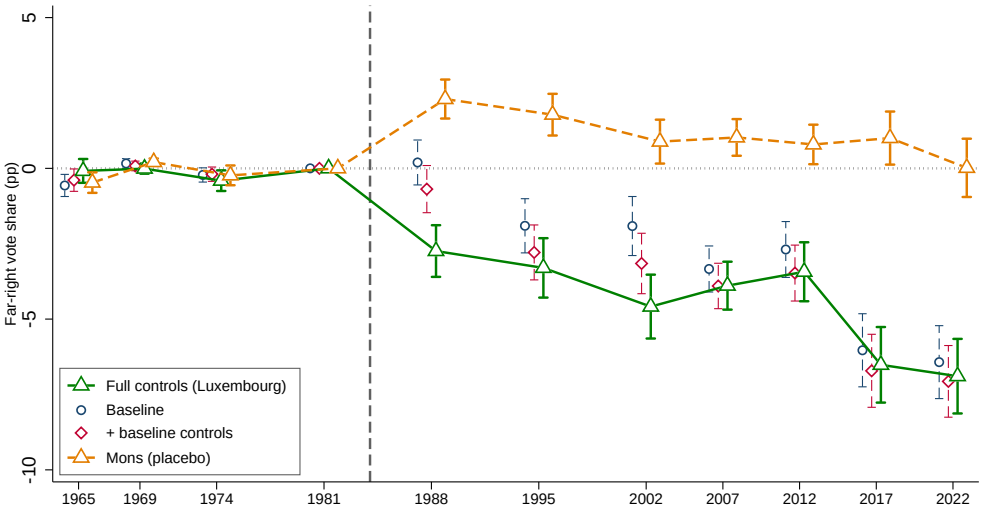

*Notes:* Each panel plots a municipal outcome against distance to Luxembourg City (green, solid circles) with the Mons, Belgium placebo gradient (orange, open triangles); lines are within-zone cubic fits and the dashed vertical line marks the 70 km commuting threshold. Panel (a): 2021 average taxable income (thousands of euros); panel (b): taxable-income growth 1999–2021 (%); panel (c): 2021 median disposable income (thousands of euros); panel (d): total social transfers per capita (euros). The annotated statistic is the fitted treated-minus-control gap (% of mean control value, 500-replication bootstrap SE); treated municipalities are within 50 km, controls 70–150 km. Appendix Figure A.36 restricts transfers to income-support programs.

Figure 12: **Access to Economic Opportunity and Far-Right Support**

**(a) Far-Right Vote Share, 2022: Spatial Gradient**

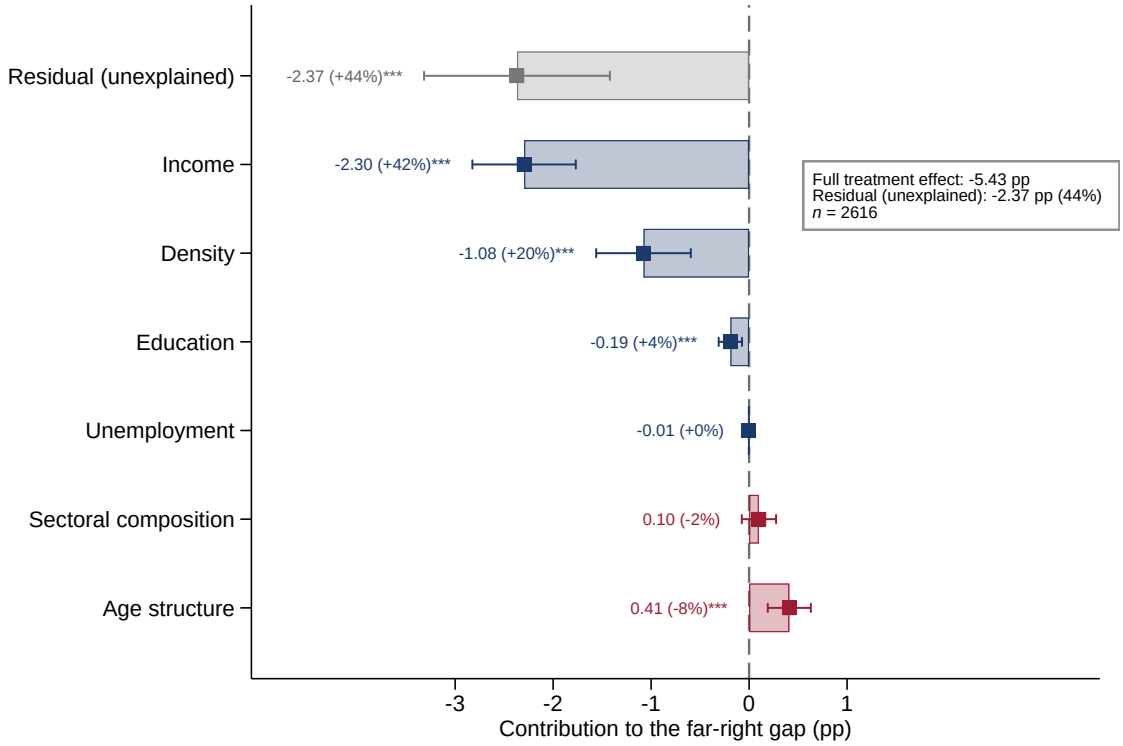



**(b) Far-Right Vote Share, 1965-2022: Event Study**




*Notes:* The far-right vote share is the combined first-round vote of all far-right candidates (not Le Pen alone) as a share of valid votes. Panel (a) plots the 2022 share against distance to Luxembourg City (green) and around Mons, Belgium (orange). Dots are 5 km distance-bin means; the long-dashed vertical line marks the 70 km feasible-commuting threshold, and lines are within-zone cubic fits. Panel (b) reports difference-in-differences event-study estimates of exposure to Luxembourg on the first-round far-right vote share across presidential elections, under three control specifications (baseline; 1982 manufacturing share; distance to the border and 1982 bachelor's share), with the Mons placebo in orange. Treated municipalities are within 50 km of Luxembourg City and control municipalities are 70–150 km away; estimates include municipality and election-year fixed effects, with 1981 the omitted reference year.

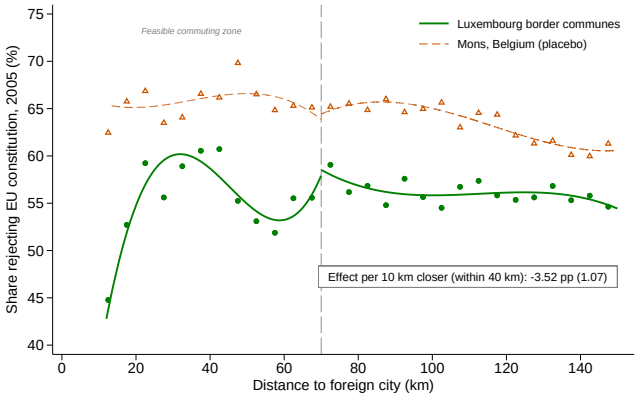
Figure 13: **Economic and Demographic Drivers of the Decline in Far-Right Support**



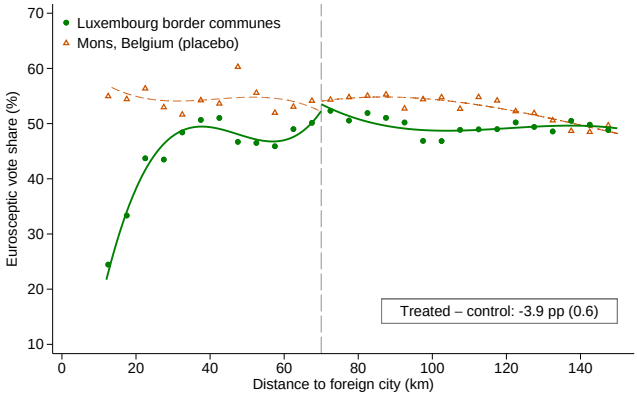

*Notes:* Gelbach (2016) order-invariant decomposition of the far-right treated–control gap (first-round 2022 vote share; treated communes within 50 km of Luxembourg City, control communes 70–150 km away). Each bar is a channel's contribution $\delta_k = \sum_{j \in k} \gamma_j \varphi_j$ to the gap, using 2021 census values: navy channels narrow the gap, cranberry channels widen it; the gray bar is the unexplained residual $\beta_{\text{full}}$. Caps are 95% confidence intervals from a 500-replication municipality bootstrap. Income (42%) and density (20%) account for most of the explained gap. Table A.32 reports the underlying estimates.

Figure 14: **Exposure to Foreign Labor Demand and Support for EU Integration**

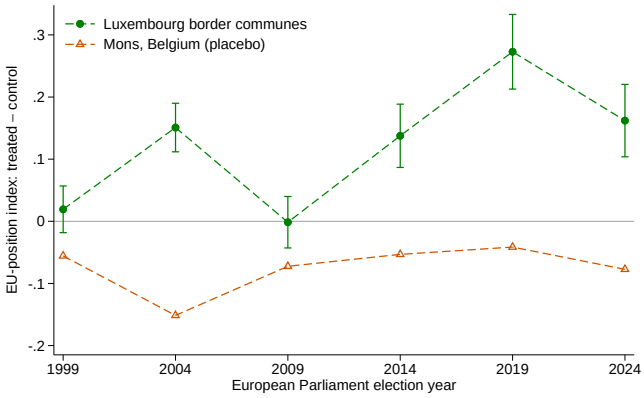
### A. 2005 Referendum on the European Constitutional Treaty




### B. Euro-skeptic Vote Share, 2019 European Parliament Election




### C. Support for European Integration Over Time




*Notes:* In all panels, green (solid circles, cubic fit) plots the gradient against distance to Luxembourg City and orange (open triangles, dashed) the placebo against distance to Mons, Belgium; distance bins are 5 km and the long-dashed line marks the 70 km commuting threshold. Panel A is the share of "No" votes in the 2005 referendum on the European Constitutional Treaty. Panel B is the 2019 European Parliament euro-skeptic vote share, defined as votes for lists rated below the midpoint of the Chapel Hill Expert Survey integration scale (Jolly et al., 2022); the 2024 election is shown in Appendix Figure A.49. Panel C plots, for each election from 1999 to 2024, the treated–control gap (municipalities within 50 km of Luxembourg minus those 70–150 km away, 500-replication bootstrap) in the vote-weighted average of that 1–7 scale, where higher values indicate a more pro-European electorate.

# Main tables

Table 1: **Pre-Shock Characteristics of Municipalities Near the Luxembourg and Mons Borders (1982)**

| | Luxembourg Border | | Mons Border (Placebo) | | Northeast | France |
|---|---|---|---|---|---|---|
| | Near | Comparison | Near | Comparison | region | National |
| *A. Industrial structure and resident labor market* | | | | | | |
| Manufacturing share among employed residents (%) | 38.7 | 27.7 | 34.9 | 25.9 | 29.0 | 23.0 |
| Manual-worker share among employed residents (%) | 44.7 | 38.2 | 39.4 | 38.8 | 39.1 | 33.0 |
| Employment rate, residents aged 25–54 (%) | 62.3 | 72.3 | 67.9 | 72.3 | 72.9 | 75.1 |
| Labor-force participation, residents aged 25–54 (%) | 66.1 | 75.6 | 72.3 | 76.3 | 76.5 | 78.8 |
| Unemployment rate, residents aged 25–54 (%) | 5.9 | 4.4 | 6.2 | 5.4 | 4.8 | 4.7 |
| Residents working across a national border (%) | 2.3 | 0.5 | 0.4 | 0.0 | 0.5 | 0.2 |
| *B. Demography and prior growth* | | | | | | |
| Population density (per km$^2$) | 238 | 78 | 298 | 117 | 132 | 136 |
| Population growth, 1968–82 (%) | +2.2 | +4.8 | −1.4 | +4.8 | +8.0 | +12.7 |
| Net migration, 1975–82 (% of pop.) | −1.4 | +1.0 | −1.8 | +0.5 | +1.7 | +4.4 |
| Housing vacancy rate (%) | 8.5 | 9.0 | 7.0 | 7.8 | 8.1 | 9.1 |
| Municipalities | 298 | 2,407 | 276 | 2,864 | 8,780 | 34,172 |

*Notes:* Simple (unweighted) means of municipality characteristics in 1982, before the expansion of cross-border labor demand from Luxembourg. "Near" municipalities lie within 50 km of Luxembourg City or Mons; "Comparison" municipalities lie 70–150 km away, following the baseline difference-in-differences sample. "Northeast" averages over the Grand Est and Hauts-de-France regions; "France" over all metropolitan municipalities. Manufacturing and manual-worker shares are measured among employed residents (place of residence). Population growth is the total change 1968–82; net migration is the 1975–82 intercensal flow as a share of initial population; prime-age employment growth is the change in employed residents aged 25–54 over 1975–82. The table is descriptive; identification rests on the difference-in-differences and spatial-gradient designs.

Table 2: **Summary of Long-Run Regional Adjustment**

| Outcome | Estimate (SE) | Long-run magnitude |
|---|---|---|
| **A. Worker reallocation and employment expansion** | | |
| Cross-border employment (per 100 prime-age res., 1975) | 52.0*** (3.5) | +52% of initial prime-age pop. |
| Total employment, 25–54 (per 100 prime-age res., 1975) | 35.7*** (4.7) | +52 in Luxembourg, −16 in France |
| Employment-to-population ratio (25–54, pp) | 6.7*** (0.8) | +6.7 pp (net expansion) |
| **B. Labor supply and industrial adjustment** | | |
| Participation, 25–54 (pp) | 5.3*** (0.7) | +5.3 pp (base 66%) |
| Unemployment, 25–54 (pp) | −1.4*** (0.5) | −1.4 pp (base ∼5%) |
| Local firms, total (per 1,000 res., 1975) | −1.7 (3.1) | no net entry |
| Manufacturing plants (per 1,000 res., 1975) | −1.2** (0.6) | net decline |
| **C. Demographic adjustment** | | |
| Population (log) | 0.16*** (0.02) | +15% larger |
| Net migration (pp/yr) | 1.3*** (0.4) | +1.3 pp/yr (base ≈0) |
| **D. Housing and amenities** | | |
| Housing units (log) | 0.10*** (0.02) | +10% more units |
| Vacancy rate (pp) | −1.6*** (0.4) | −19% (base 8.5%) |
| Local services (per 1,000 res.) | 0.9*** (0.2) | +0.9 per 1,000 (+20%) |
| Rent index, 2022 (€/m$^2$)$^{K}$ | 2.5*** (0.1) | +34% higher |
| **E. Prosperity** | | |
| Taxable income (k€)$^{K}$ | 5.9*** (0.6) | +€5,900 (+19%) |
| Disposable income (k€)$^{K}$ | 1.8*** (0.2) | +€1,800 (+11%) |
| Income inequality, D9/D1$^{K}$ | 0.87*** (0.04) | +31% wider |
| Social transfers p.c. (€)$^{K}$ | −6.2*** (0.8) | −27% |
| **F. Political outcomes** | | |
| Far-right vote, 2022 (pp) | −6.9*** (0.6) | −6.9 pp (15% below control) |
| Eurosceptic vote, 2019 (pp)$^{K}$ | −3.9*** (0.6) | −3.9 pp (8% below control) |

*Notes:* Each row reports the preferred long-run estimate of the effect of access to Luxembourg for one outcome. Estimates are final-period treated–control coefficients from the baseline event-study specification (treated ≤50 km vs. control 70–150 km from Luxembourg City). Estimates with $^{K}$ instead use the cross-sectional spatial-kink design for outcomes observed only in a recent year (income, rents, inequality, transfers, and the 2019 European vote). "Prime-age" refers to residents aged 25–54. The first two employment outcomes are normalized by the 1975 prime-age population and firm counts by the 1975 total resident population; the employment-to-population ratio, participation, and unemployment are in percentage points of the current prime-age population. "Local firms" and "manufacturing plants" are establishments located in the municipality from DADS. Percentages for political outcomes are relative to the control-group mean (far-right 47.6%, eurosceptic 49.5%). Standard errors in parentheses; $^{K}$-rows use a 500-replication municipality bootstrap. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 3: **Dynamics of Regional Adjustment**

| Outcome | Years since the 1988 shock | | | |
|---|---|---|---|---|
| | 1990 (∼2 yr) | 1999 (∼11 yr) | 2010 (∼22 yr) | 2021 (∼33 yr) |
| **Reallocation** | | | | |
| Cross-border employment | 3.0*** | 14.7*** | 37.7*** | 52.0*** |
| | (0.6) | (1.3) | (2.5) | (3.5) |
| Employment in France | −4.0** | −8.5*** | −17.2*** | −16.3*** |
| | (2.0) | (2.6) | (3.3) | (3.6) |
| **Employment expansion** | | | | |
| Total employment / 1975 pop. (pp) | −1.0 | 6.2** | 20.4*** | 35.7*** |
| | (2.0) | (2.9) | (3.9) | (4.7) |
| Participation / 1975 pop. (pp) | −1.4 | 5.2* | 20.2*** | 35.5*** |
| | (2.0) | (3.0) | (4.1) | (4.9) |
| Unemployment / 1975 pop. (pp) | −0.4 | −1.0 | −0.3 | −0.2 |
| | (0.5) | (0.6) | (0.7) | (0.8) |
| Emp.-to-pop. ratio, current pop. (pp) | 0.7 | 5.3*** | 7.3*** | 6.7*** |
| | (0.9) | (0.8) | (0.9) | (0.8) |
| Participation, current pop. (pp) | 0.1 | 4.8*** | 6.0*** | 5.3*** |
| | (0.8) | (0.8) | (0.9) | (0.7) |
| Unemployment, current pop. (pp) | −0.6 | −0.5 | −1.3*** | −1.4*** |
| | (0.4) | (0.4) | (0.4) | (0.5) |
| **Population adjustment** | | | | |
| Population (%) | −0.8 | 1.1 | 8.0*** | 15.5*** |
| | (1.3) | (1.5) | (1.8) | (2.1) |
| Net migration (pp/yr) | 0.1 | 0.6 | 1.1*** | 1.3*** |
| | (0.4) | (0.4) | (0.3) | (0.4) |

*Notes:* Each cell is an event-study (spatial difference-in-differences) treated–control coefficient at the indicated census year, relative to the 1982 baseline (treated ≤50 km vs. control 70–150 km from Luxembourg City, Full controls). The four census years fall roughly 2, 11, 22, and 33 years after the onset of Luxembourg's expansion in 1988. Cross-border and France employment, and the rows normalized "/ 1975 pop.", are per 100 initial (1975) prime-age residents (a fixed base, so they also embed population growth); the "current pop." rows (employment-to-population ratio, participation, unemployment) are in percentage points of the current prime-age (25–54) population. On the fixed 1975 base, total employment equals participation minus unemployment, so essentially all of the long-run employment gain reflects higher labor-force participation rather than falling unemployment. Population is in percent (log points ×100); net migration is the annualized rate (accounting measure, from the population change net of natural increase). The pattern traces a sequence: reallocation toward Luxembourg comes first, followed by local employment expansion through higher participation, and only later by population growth and net in-migration. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 4: **Cross-border commuting and individual consumption outcomes**

| | Housing space | | Cars | Tenure | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| | Sq.m. per cap. | Rooms per cap. | $\geq 2$ cars | Homeowner | Social housing |
| *Panel A: Cross-border commuter indicator (OLS)* | | | | | |
| *Sample: all employed workers within 70 km of Luxembourg* | | | | | |
| Cross-border worker | 2.739*** | 0.086*** | 0.042*** | 0.094*** | -0.073*** |
| | (0.107) | (0.005) | (0.003) | (0.003) | (0.002) |
| Observations | 202,740 | 202,740 | 202,740 | 202,740 | 202,740 |
| $R^2$ | 0.561 | 0.508 | 0.346 | 0.246 | 0.143 |
| *Panel B: Share of cross-border commuters (IV)* | | | | | |
| *Sample: employed non-commuters within 70 km of Luxembourg; instrument: distance to Luxembourg* | | | | | |
| Share cross-border (IV) | -6.830*** | -0.216*** | 0.036*** | -0.013 | 0.027*** |
| | (0.339) | (0.017) | (0.008) | (0.009) | (0.007) |
| Observations | 136,003 | 136,003 | 136,003 | 136,003 | 136,003 |
| First-stage $F$ | 4.1e+05 | 4.1e+05 | 4.1e+05 | 4.1e+05 | 4.1e+05 |
| Fixed effects | Municipality, education, age group, immigration status, household size | | | | |

*Notes:* Robust standard errors in parentheses. Significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. The table uses 2022 census data to examine end-of-period consumption patterns for cross-border commuters and highly-exposed non-commuters. Panel A estimates the coefficient on an indicator for being a cross-border commuter relative to domestic workers in the same municipality, controlling for education, age group, immigration status, and household size (absorbed as fixed effects), using survey weights (`ipondl`). Panel B instruments the municipal share of cross-border commuters with distance to Luxembourg city and restricts the sample to non-commuters. The first-stage $F$-statistic is the Kleibergen–Paap $rk$ Wald $F$-statistic.

Table 5: **Accounting for the Far-Right Gap: Sequential Controls**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Exposed to Luxembourg | -5.43*** | -5.48*** | -5.28*** | -5.25*** | -5.22*** | -4.33*** | -2.37*** |
| | (0.50) | (0.51) | (0.50) | (0.50) | (0.50) | (0.51) | (0.47) |
| Age structure | | Y | Y | Y | Y | Y | Y |
| Education | | | Y | Y | Y | Y | Y |
| Sectoral composition | | | | Y | Y | Y | Y |
| Unemployment | | | | | Y | Y | Y |
| Density | | | | | | Y | Y |
| Income | | | | | | | Y |
| $R^2$ | 0.037 | 0.039 | 0.074 | 0.086 | 0.089 | 0.126 | 0.223 |
| Municipalities | 2616 | 2616 | 2616 | 2616 | 2616 | 2616 | 2616 |

*Notes:* OLS regressions of the first-round far-right vote share (percentage points) in the 2022 presidential election on an indicator for exposure to Luxembourg, adding groups of 2021-census controls cumulatively across columns. Treated communes are within 50 km of Luxembourg City and control communes are 70–150 km away; the sample is held fixed at communes with all controls observed. The coefficient falls from −5.43 with no controls to −2.37 once income is included, with income and density absorbing most of the gap. Because the contribution attributed to each group depends on the order in which it is added, Appendix H.6 (Table A.32 and Figure 13) reports the order-invariant Gelbach (2016) decomposition of the same gap. Heteroskedasticity-robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

# Appendices

## A Additional Institutional and Historical Background

This appendix presents supplementary descriptive material on Luxembourg's economic rise and the channels through which the foreign demand shock reached France. It contains:

- Economic divergence of Luxembourg relative to all neighboring countries (Figure A.5).
- Ranking of countries by remittances received (Figure A.6).
- Share of foreign-source wages reported on French tax returns (Figure A.7) and in French national accounts (Figure A.8)
- Institutional history of the EU-wide liberalization of capital markets and the pre-existing features supporting Luxembourg's financial sector, including the rise of the banking sector and net assets managed by Luxembourgish UCIs (Figures A.3–A.4).
- The E25 highway and the evolution of cross-border worker counts (Figure A.9).
- Commuting-distance distribution for French residents and cross-border commuters (Figure A.10).
- The French Rust Belt in its European historical-industrial context (Figure A.1).
- The geography of manufacturing employment losses, 1975–2021 (Figure A.2).

### A.1 Additional Details on Luxembourg's Expansion

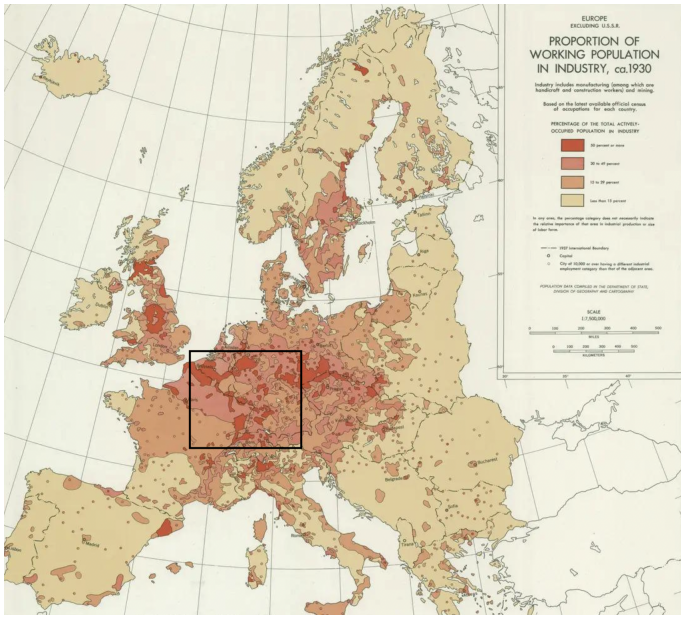
This section provides additional details on Luxembourg's economic expansion and its resulting economic structure.

### A.2 EU liberalization of capital markets

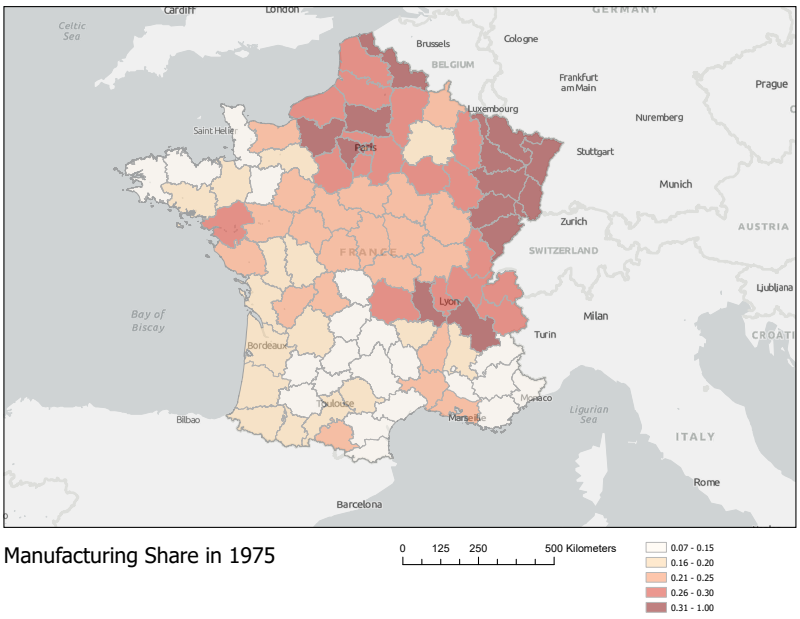
The main steps toward financial liberalization affecting Luxembourg in the 1980s were implemented at the level of the European Union (then the European Community or EC). The 1985 UCITS Directive (85/611/EEC) created a harmonized framework for collective investment

Figure A.1: **Europe's Industrial Core**

**A. Europe's Historical Heartland**

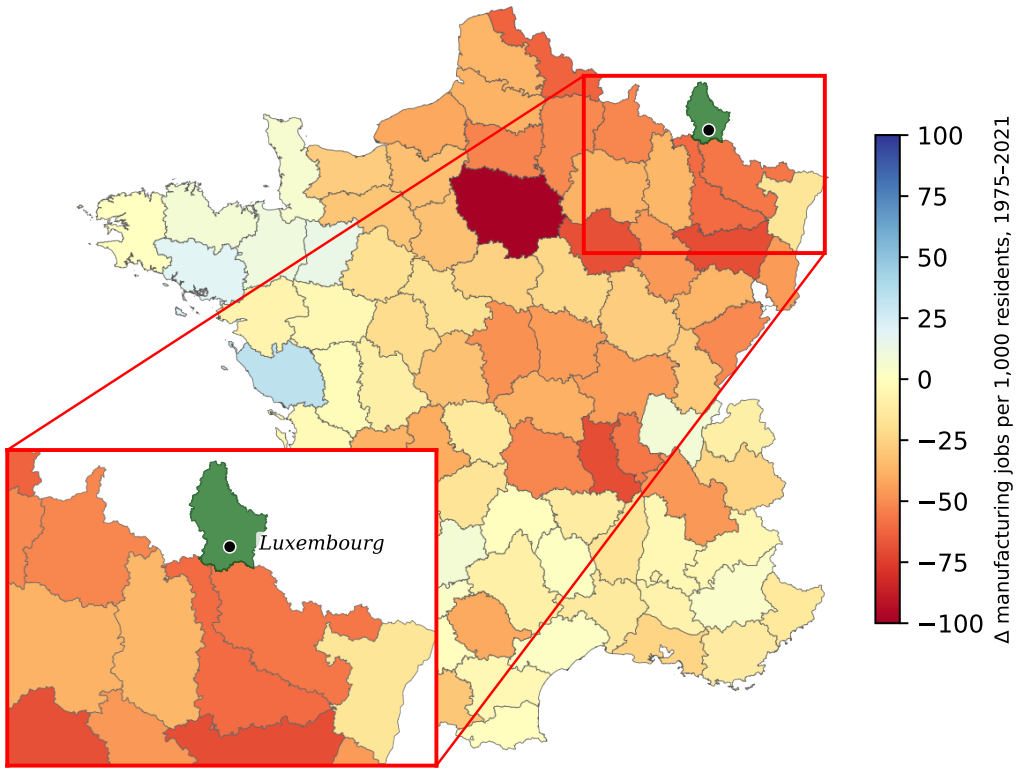



**B. France's "Rust Belt"**




*Notes:* Panel A plots historical shares of working population employed in industry circa 1930 in Europe. Panel B plots the 1975 manufacturing employment shares at the department level in France, using exhaustive census data.

Figure A.2: **Manufacturing Employment Losses, 1975–2021**




*Notes:* The map plots the change in manufacturing employment per 1,000 residents (relative to the 1975 population) by department in France between 1975 and 2021. Red shades indicate losses of manufacturing jobs, blue shades gains. The northeastern study region (e.g. Moselle, in the inset) records among the largest per-capita manufacturing employment losses in the country. Luxembourg, the source of the foreign labor-demand opportunity, is shown in green. Source: exhaustive census data (INSEE).

funds and introduced the possibility of cross-border distribution of funds authorized in any member state. This is often referred as the "EU passporting system" for financial investments. Luxembourg was the first EU country to adopt a national implementation ("transposition") of this rule in 1988, allowing investment products domiciled in Luxembourg to be marketed across the EC. In parallel, the 1988 Directive on the Liberalization of Capital Movements (88/361/EEC) removed remaining restrictions on cross-border capital flows.

These reforms were part of a wider process of European financial integration aimed at creating a single market for financial services. By allowing financial institutions and investment products to operate across borders under a unified regulatory framework, these directives substantially increased the returns to locating financial activities in jurisdictions offering a favorable institutional environment.

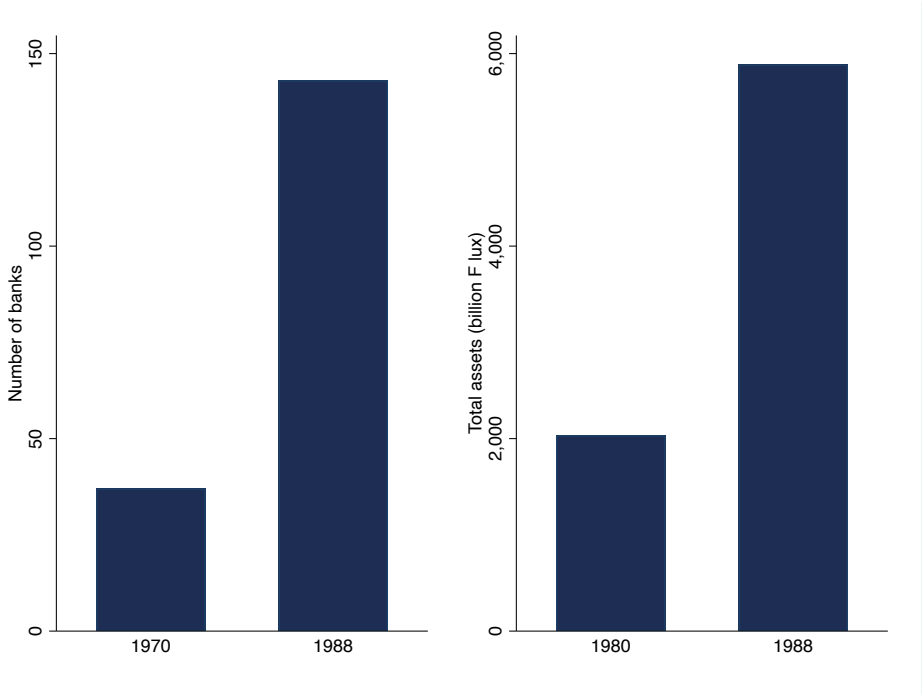
### A.3 Pre-existing institutional features supporting the expansion of the financial sector in Luxembourg

Luxembourg's rise as a financial center was supported by a set of complementary institutional features adopted over several decades. First, the country introduced a favorable legal framework for holding companies (notably the 1929 holding company regime), which facilitated the location of multinational corporate and financial structures in Luxembourg. Second, Luxembourg enacted one of the strongest banking-secrecy laws in Europe in 1981, supporting the development of private banking and cross-border wealth management activities. Third, Luxembourg developed a robust investor-protection framework. In particular, its life-insurance system includes a legal mechanism that strictly separates policyholders' assets from the insurer's balance sheet and grants priority to investors over other creditors in the event of bankruptcy. As a result, Luxembourg-based life-insurance contracts and investment funds are considered among the safest in the EU. Following the introduction of EU passporting in 1988, these institutional advantages became especially valuable, as financial firms could locate in Luxembourg while serving clients across the European Community, creating strong incentives for international companies to establish operations in the country.

Figure A.3 shows the rapid expansion of the banking sector in Luxembourg around the reform. The number of banks located in the country increased from only 37 in 1970 to 143

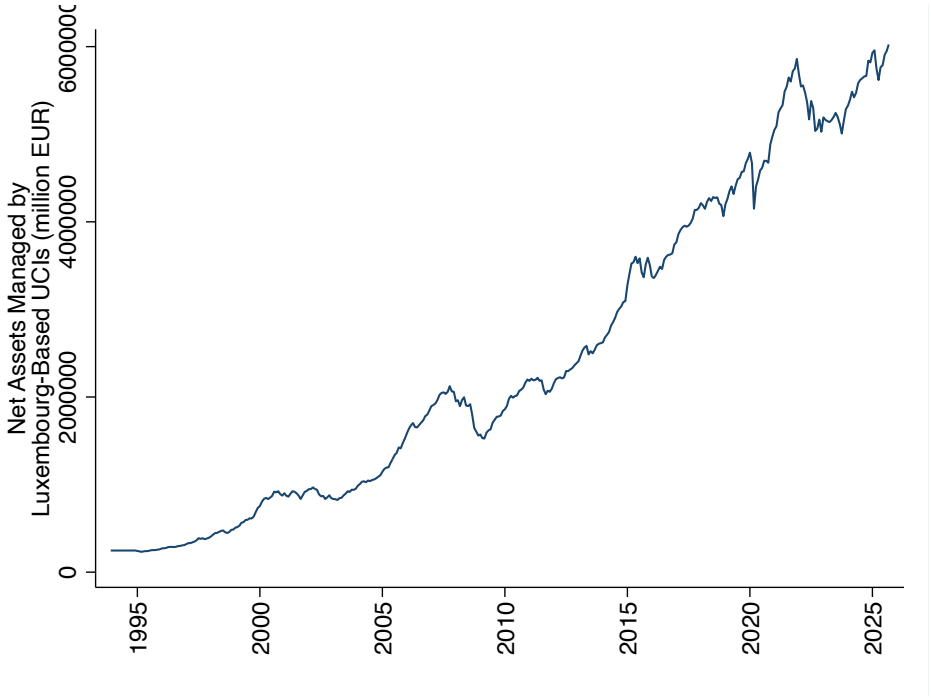
in 1988. Over the same period, the total assets managed by these banks almost tripled. In the longer run, the scale of Luxembourg's financial centre expanded even more dramatically: total net assets rose from EUR 247,077 million in 1993 to over EUR 6,025,044 million in 2025, reflecting a more than twenty-fold increase in just three decades (Figure A.4).

Figure A.3: **Rise of Banking Sector in Luxembourg Around EU-Wide Liberalization**




Notes: This figure plots the total assets managed by Luxembourg-based UCIs. Source: Institut Monetaire Luxembourgeois.

Figure A.4: **Total Net Assets Managed by Luxembourgish UCIs**




Notes: Source: Banque Centrale Luxembourgeoise.

**Other natural advantages** Luxembourg was also particularly well positioned to benefit from this integration due to its small size and openness. Luxembourg's ability to capitalize on European financial integration was also facilitated by its geographic and linguistic characteristics. Located at the intersection of major European economies (France, Germany, and Belgium) Luxembourg is well positioned within the core of the European market. In addition, the country's workforce was already highly multilingual, with three spoken languages (French, German, and English). Luxembourg also offers a stable, predictable fiscal environment, with reduced regulatory risk for multinational firms.

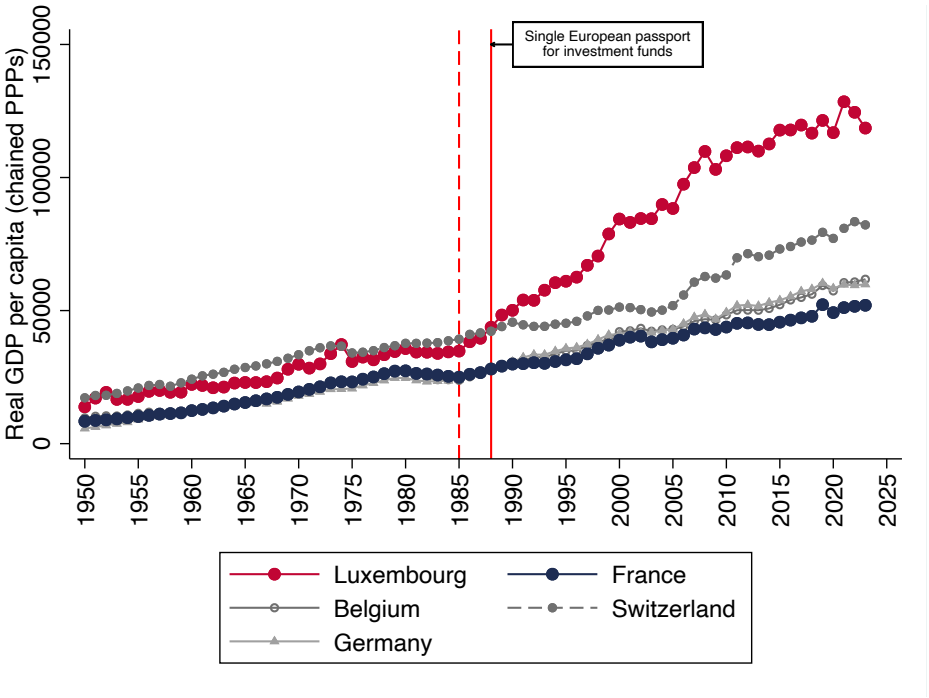
Luxembourg also hosts a number of key European institutions, reinforcing its role as a central administrative and financial hub within the European Union. These include the Court of Justice of the European Union, the European Court of Auditors, the European Investment Bank, and the Statistical Office of the European Union (Eurostat). The Secretariat of the European Parliament is also located in Luxembourg. In addition, the country hosts the EFTA Court, which serves members of the European Economic Area outside the EU. The presence of

these institutions contributes to Luxembourg's international orientation and supports a range of high-skilled administrative, legal, and financial activities.

**Tax policy and specialized activities** Business-friendly policies further reinforced these advantages. Luxembourg combined a corporate income tax rate around 23.87% in Luxembourg city (which is about the EU average but lower than statutory rates in some of its neighboring countries, like France) with targeted regimes for internationally mobile activities. In particular, holding companies benefit from broad tax exemptions, while investment funds are generally exempt from corporate income tax and instead subject to a low subscription tax, typically 0.05 percent of net assets annually, and as low as 0.01 percent for certain institutional funds. Effective tax rates on capital income are also substantially lower, due to favorable rules related to the tax base (such as depreciation allowances, inventory valuation, interest deductibility and general tax incentives) see De Mooij et al. (2020). Luxembourg also has aggressive preferential tax treatment of income from intellectual property. Finally, payroll tax rates are also much lower than in neighboring countries (for instance, 9% versus 40% in France).

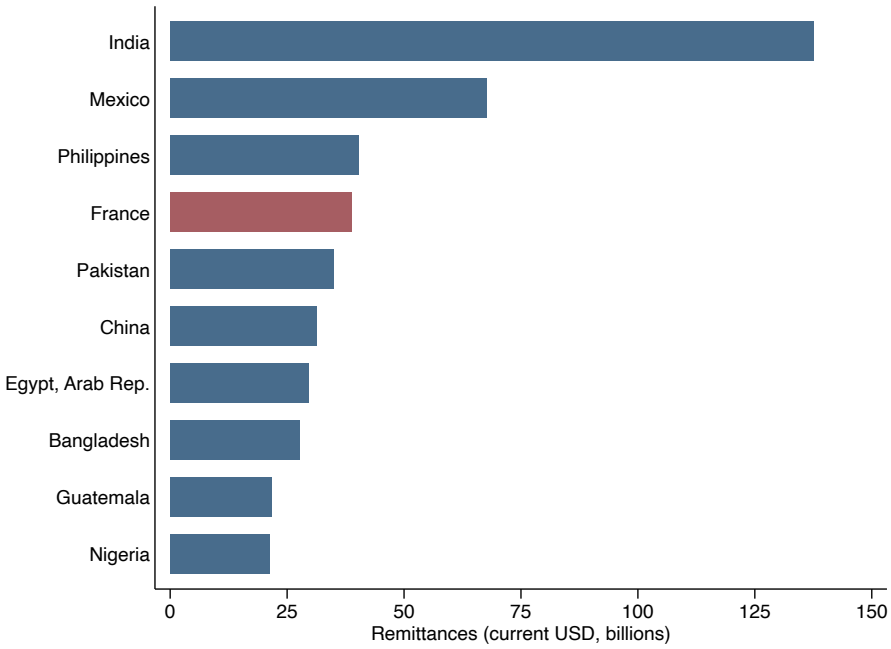
Given the large exemptions granted to international corporatations for pass-through investments, a natural question is whether Luxembourg's expansion primarily reflects the presence of special purpose entities engaged in profit-shifting, with limited implications for real economic activity. Based on IMF estimates (De Mooij et al., 2020), these large international flows "booked" in Luxembourg have very little employment contribution: around 4,500 direct jobs, i.e. less than 2 percent of total employment in Luxembourg. This number implies that pass-through financial structures cannot account for the broader expansion of labor demand, including the large inflows of cross-border workers. Instead, employment growth is more closely linked to the development of regulated financial intermediation and the associated ecosystem of services, including asset management, fund administration, legal, and accounting activities.

Figure A.5: **Economic Divergence of Luxembourg vs all Neighboring Countries**



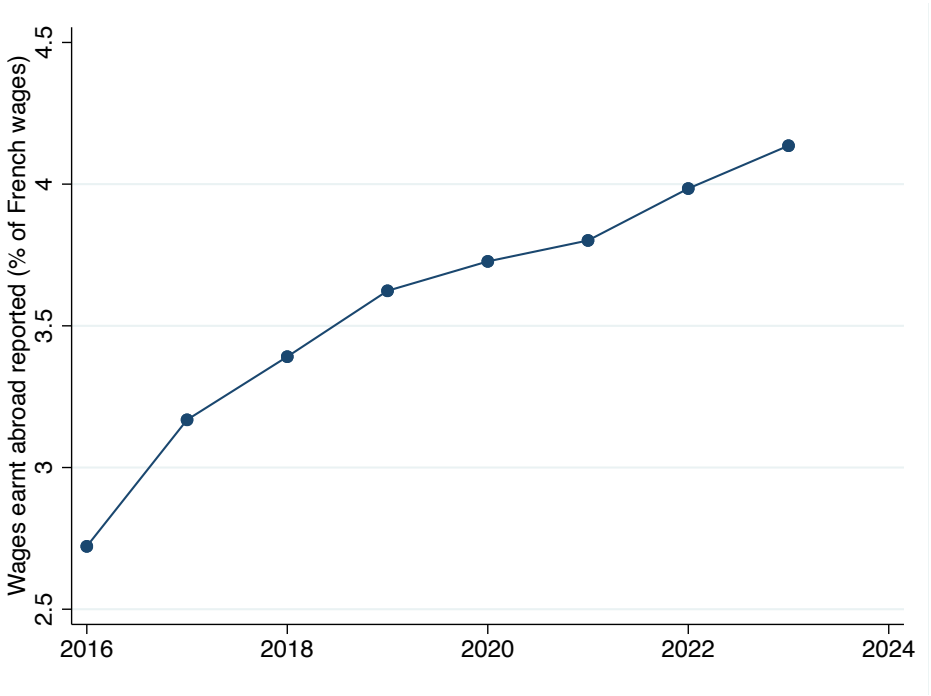

Notes: This figure compares real GDP per capita (expressed in chained PPPs) between Luxembourg and its neighboring countries. We indicate the beginning of the EU-wide episode of financial liberalization by a dashed vertical line, and the single EU passport for investment funds by a solid vertical line. Source: PwT Tables.

Figure A.6: **Ranking of Countries by Remittances**



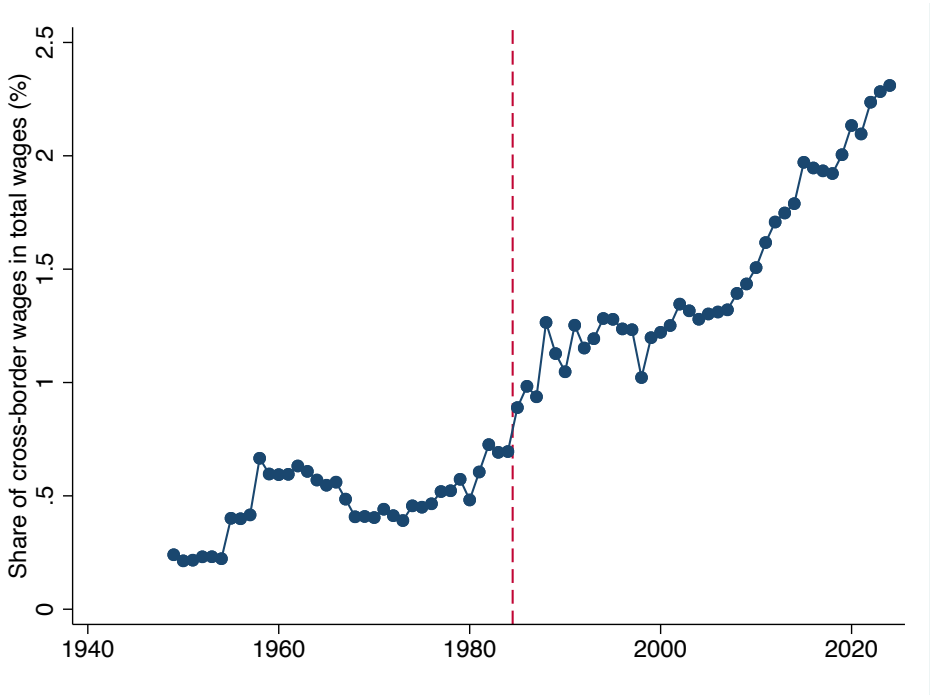

Notes: The figure presents the ranking of the top 10 countries by size of remittances received for the latest year of data available as of 2026, in current USD (billions). Source: World Bank.

Figure A.7: **Share of Foreign Wages on French Tax Returns**



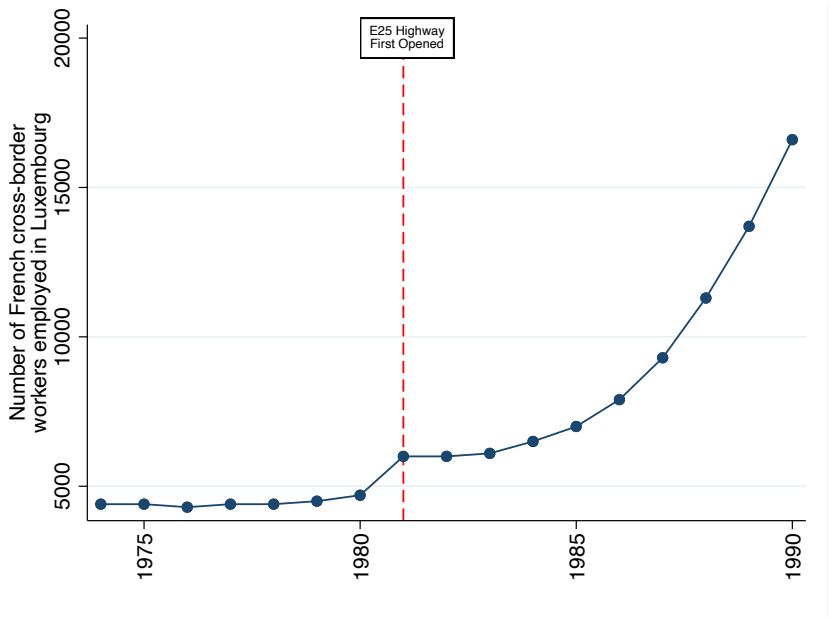

Notes: The figure presents the amount of wages reported on French tax returns as originating from abroad (boxes 1AF, 1BF, 1AC, 1BC, 1AG and 1BG), relative to the overall amount of wages including French wages reported by French taxpayers (boxes 1AJ and 1BJ), using national reports from the tax authorities (*Declarations nationales 2042*) for the years 2016 to 2023.

Figure A.8: **Share of Foreign Wages in French National Accounts**



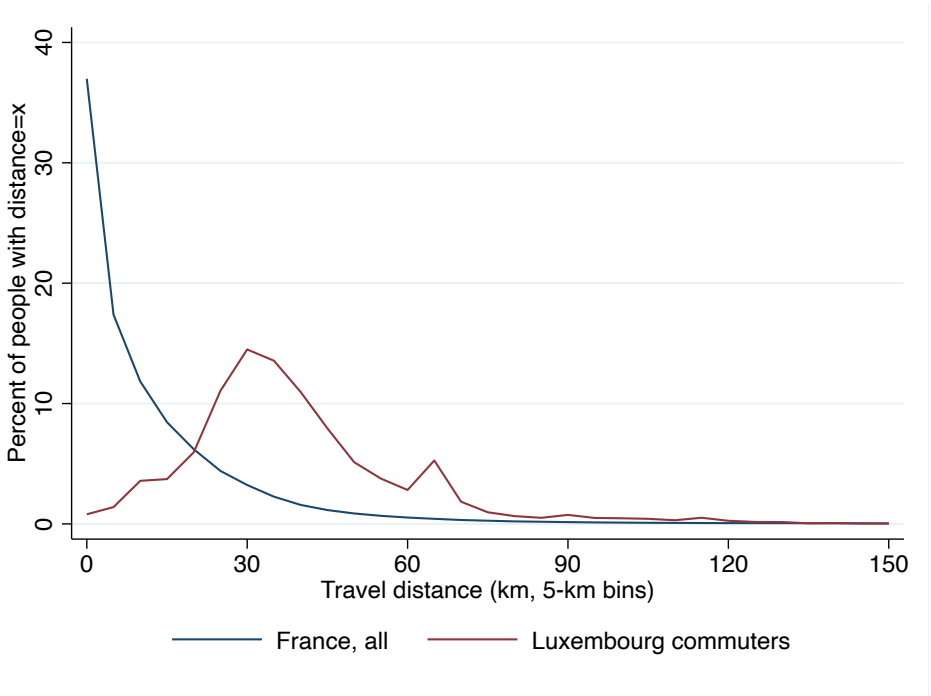

Notes: The figure presents the ratio of compensation of employees received from foreign sources by domestic residents (account D1, "Remuneration des salaries", table 7.601) to total compensation of employees (account D1, "Remuneration des salaries", table 7.401) in the French National Accounts.

Figure A.9: **E25 Highway and Number of Cross-Border Workers, Zooming-in**



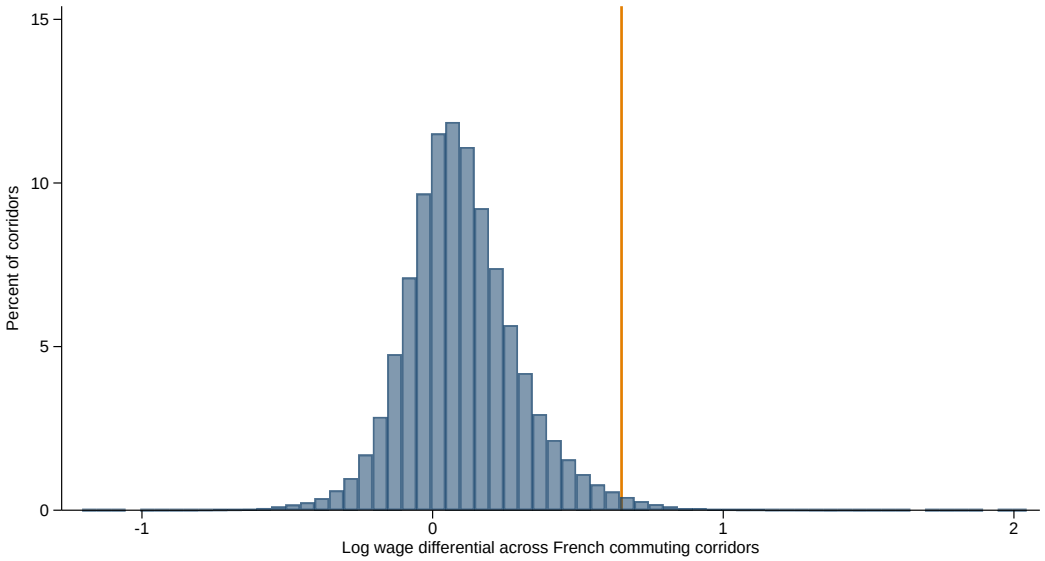

Notes: This figure shows the number of workers in Luxembourg with a residence location in France before and after the construction of the A31/E25 highway. The source is Luxembourg's national statistical institute (STATEC).

Figure A.10: **Commuting patterns for French residents, 2022**




Notes: This figure plots the probability density distribution of commuting distances for all French commuters and for French cross-border commuters working in Luxembourg, separately. The x-axis measures one-way daily commuting distance (driving) in kilometers. Source: French Census.

Figure A.11: **The Luxembourg Wage Premium among French Commuting Corridors**




*Notes:* Distribution across all French commuting corridors (at least ten commuters and origin–destination distance below 100 km) of the mean adjusted-wage gap between destination and origin commune, using 2021 *MOBPRO* commuting flows. Adjusted wages are computed for each French commune from exhaustive *DADS* data for 2022 and 2023 by regressing individual worker wages on age, age squared, and gender and averaging the residuals within the commune. The orange line marks the France–Luxembourg corridor (a mean log wage gap of about 0.65), which lies in the extreme upper tail of the distribution.

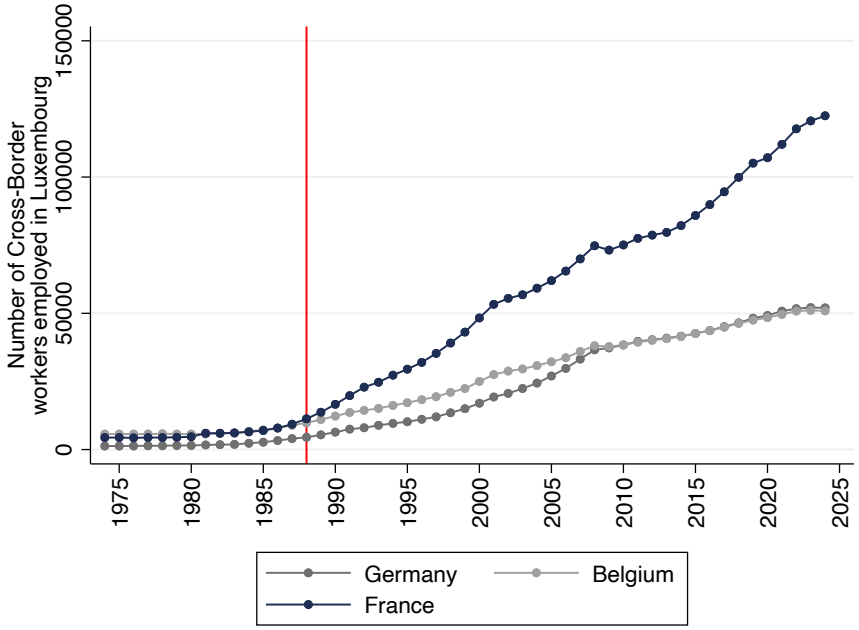
# B Additional Descriptive Evidence

This appendix provides additional descriptive evidence characterizing the treated population and the worker cohorts used in the analysis. It contains:

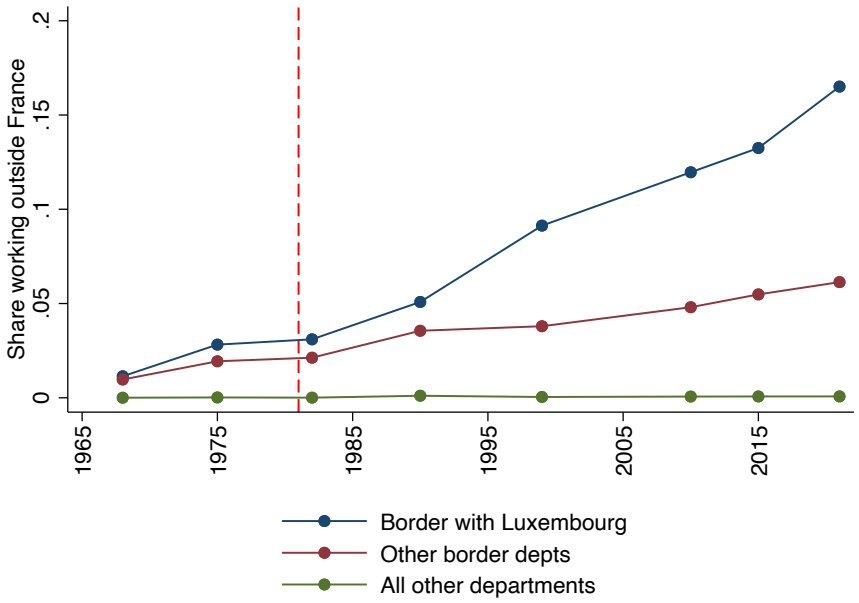
- Descriptive evidence on the surge in cross-border workers towards Luxembourg (figure A.12, panel (a)) and from France (figure A.12, panel(b))
- Demographic and sectoral profile of residents living in the treated area who work in Luxembourg, and its evolution across census waves (Tables A.6–A.7).
- Age, gender, initial-sector composition of the incumbent worker cohorts in the estimation sample (Tables A.8, A.9 and A.10).

Figure A.12: **Surge in Cross-Border Work in Luxembourg**

**(a) Cross-Border Workers in Luxembourg by Origin Country**




**(b) Cross-Border Workers from France by Geography**




Notes: This figure shows the evolution of cross-border work between France and Luxembourg. Panel A shows the evolution of cross-border workers employed in Luxembourg by country of residence, using administrative data from STATEC. Panel B shows the share of French resident employed outside France by French regions (departements), using administrative harmonized Census data from INSEE.

Table A.6: **Characteristics of Cross-Border Workers From Treated Area**

| Census Year | Avg. Age | Male (%) | Female (%) | Born in NE (%) | Bach. (%) | Move to Treated Area (%) |
|---|---|---|---|---|---|---|
| 1968 | 27.49 | 70 | 30 | 67.14 | 2.62 | 0.87 |
| 1975 | 29.66 | 78.68 | 21.32 | 72.32 | 7.35 | 1.18 |
| 1982 | 31.85 | 74.13 | 25.87 | 74.51 | 13.6 | 1.24 |
| 1990 | 31.99 | 66.34 | 33.66 | 80.29 | 18.39 | 1.12 |
| 1999 | 34.91 | 62.15 | 37.85 | 81.86 | 35.93 | 1.77 |
| 2010 | 37.69 | 59.29 | 40.71 | 78.67 | 55.32 | |
| 2015 | 38.86 | 59.26 | 40.74 | 76.49 | 62.26 | 3.65 |
| 2021 | 39.94 | 59.13 | 40.87 | 72.1 | 64.93 | 3.93 |
| | **Age Breakdown** | | | | | |
| | 25-54 (%) | $<25$ (%) | 25-34 (%) | 35-44 (%) | 45-54 (%) | $>54$ (%) |
| 1968 | 46.98 | 50.81 | 23.79 | 17.14 | 6.05 | 2.22 |
| 1975 | 56.44 | 41.83 | 29.58 | 17.6 | 9.26 | 1.72 |
| 1982 | 71.9 | 25.94 | 41.32 | 19.39 | 11.19 | 2.16 |
| 1990 | 72.96 | 25.15 | 39.1 | 24.84 | 9.02 | 1.89 |
| 1999 | 87.89 | 10.46 | 44.09 | 28.76 | 15.04 | 1.65 |
| 2010 | 88.3 | 6.97 | 31.24 | 36.45 | 20.61 | 4.73 |
| 2015 | 88.46 | 5.65 | 28.78 | 33.68 | 25.98 | 5.9 |
| 2021 | 84.63 | 5.91 | 26.72 | 30.66 | 27.25 | 9.47 |

*Notes:* The table reports characteristics of residents living within 50 km of Luxembourg City that work in Luxembourg. Bachelor share includes those with a Baccalaureate degree or higher. Born in the Northeast counts those born in the Hauts-de-France or Grand-Est regions (INSEE codes 32 and 44, respectively.). "Move to treated area" counts those who moved within 50 km of Luxembourg City from elsewhere since the previous census; these values are not annualized, so the recall window differs across census years. Data on moving is not available for 2010. Source: French census (Saphir).

Table A.7: **Sector Characteristics of Residents of Treated Area Working in Luxembourg (%)**

| Census Year | Manufacturing | Services | Construction & Real Estate | Public Sector, Health, Educ. |
|---|---|---|---|---|
| 1968 | 45.56 | 32.66 | 17.74 | 4.03 |
| 1975 | 64.42 | 21.05 | 11.43 | 3.09 |
| 1982 | 56.45 | 27.34 | 9.66 | 6.55 |
| 1990 | 36.21 | 44.26 | 15.21 | 4.36 |
| 1999 | 24.64 | 56.81 | 12.97 | 5.58 |
| 2010 | 16.12 | 65.19 | 10.36 | 8.33 |
| 2015 | 14.48 | 65.69 | 10.32 | 9.51 |
| 2021 | 12.25 | 64.34 | 11.4 | 12 |

*Notes:* The table reports sector characteristics of residents living within 50 km of Luxembourg City that work in Luxembourg. Source: French census (Saphir).

Table A.8: **Age Decomposition by Worker Cohort (in estimation, commune of work)**

| Year Cohort | 25–34 | | 35–44 | | 45–54 | |
|---|---|---|---|---|---|---|
| | N | Percent | N | Percent | N | Percent |
| 1976–1979 | 6,118 | 34.12 | 3,751 | 20.92 | 3,991 | 22.26 |
| 1979–1982 | 6,185 | 34.22 | 4,094 | 22.65 | 3,823 | 21.15 |
| 1982–1985 | 5,826 | 34.89 | 4,525 | 27.1 | 3,423 | 20.5 |

*Notes:* The table reports the decomposition of each worker cohort by age that are in the estimation sample based on their commune of work. Age cohort is assigned based on the worker's age at the end of the cohort range (i.e. for the 1976-1979 workers, we use the age in 1979). Source: DADS worker panel.

Table A.9: **Gender Decomposition by Worker Cohort (in estimation, commune of work)**

| Year Cohort | Male | | Female | |
|---|---|---|---|---|
| | N | Percent | N | Percent |
| 1976–1979 | 12,995 | 72.48 | 4,935 | 27.52 |
| 1979–1982 | 12,684 | 70.17 | 5,392 | 29.83 |
| 1982–1985 | 11,425 | 68.42 | 5,274 | 31.58 |

*Notes:* The table reports the decomposition of each worker cohort by gender that are in the estimation sample based on their commune of work. Source: DADS worker panel.

Table A.10: **Initial Sector Decomposition by Worker Cohort (in estimation, commune of work)**

| Year Cohort | Manufacturing | | Services | | Construction/ Real Estate | | Public | |
|---|---|---|---|---|---|---|---|---|
| | N | Percent | N | Percent | N | Percent | N | Percent |
| 1976–1979 | 9,318 | 51.97 | 5,135 | 28.64 | 1,873 | 10.45 | 1,604 | 8.95 |
| 1979–1982 | 8,981 | 49.68 | 5,342 | 29.55 | 1,879 | 10.39 | 1,874 | 10.37 |
| 1982–1985 | 7,708 | 46.16 | 5,355 | 32.07 | 1,639 | 9.81 | 1,997 | 11.96 |

*Notes:* The table reports the decomposition of each worker cohort by initial sector that are in the estimation sample based on their commune of work. Initial sector is defined as the sector the worker's job was in at the end of the cohort range. Source: DADS worker panel.

# C Research Design: Identification and Robustness

This appendix presents supplementary identification and robustness evidence for the spatial difference-in-differences design. It contains:

- Geographic-spillover analysis with alternative control groups: municipalities near Mons as a placebo control (Figure A.13), controls excluding municipalities within 70 km of treated areas (Figure A.14), and a test of control areas relative to more distant locations (Figure A.15).
- Cross-border employment responses by proximity to the E25 highway (Figure A.17).
- Share of residents working outside the department, with a Mons placebo (Figure A.18).

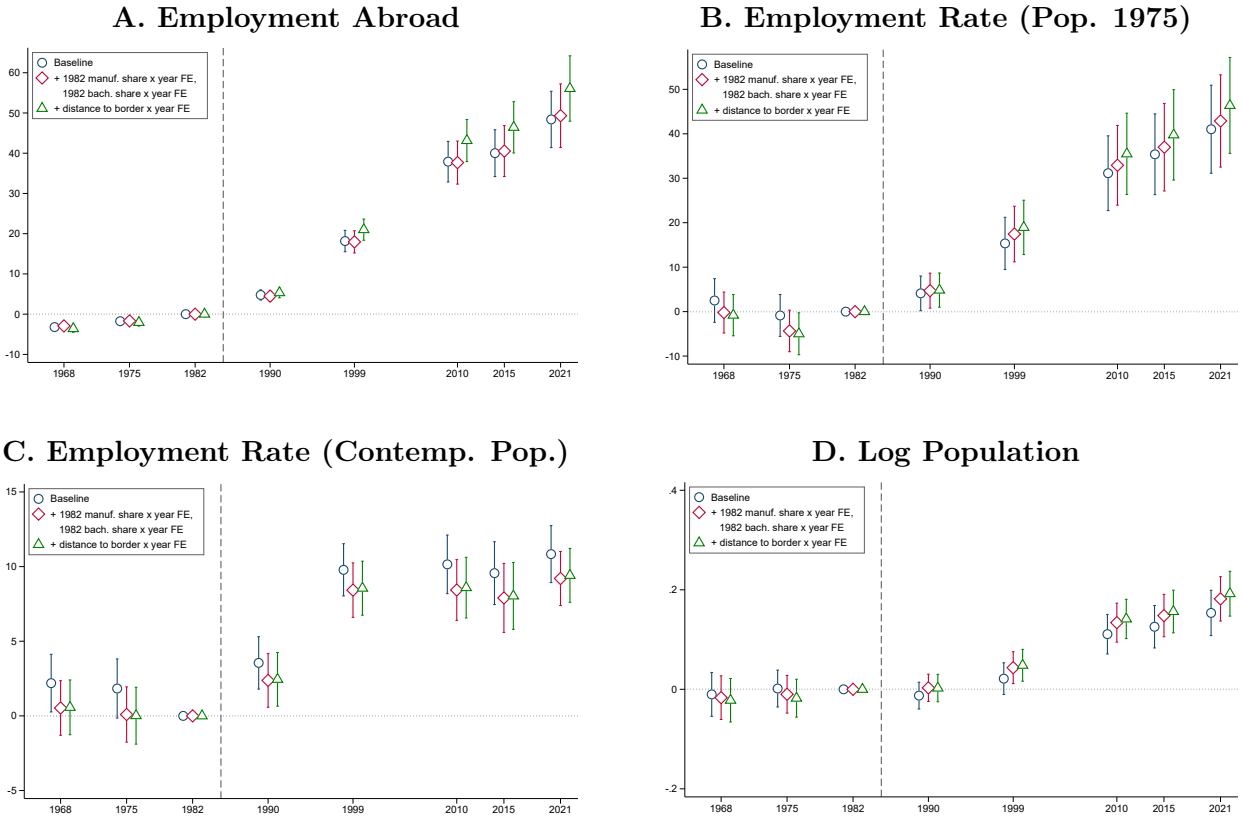
### C.1 Geographic Spillovers

The effects of foreign labor demand may extend beyond directly exposed municipalities through spatial spillovers. Figure 4 suggests that the geographic reach of cross-border commuting expands over time. Furthermore, population inflows into treated areas in the long-run may induce a substantial reallocation of residents across space. As a result, the positive foreign demand shock could also affect welfare in control French regions beyond the initial radius of opportunity and generate SUTVA assumption violations. In this section, we assess the potential geographic spillovers from the foreign labor demand shock.

To assess these spillovers, we first test the robustness of our results to alternative control groups. Using municipalities near Mons as a placebo control group in Figure A.13 yields similar patterns of cross-border employment, employment growth, and population responses. Refining our baseline control group by excluding municipalities where residents can commute to treated areas (i.e., within 70 km of our treatment group), reducing potential contamination from within-France commuting spillovers, also shows similar results (Figure A.14).

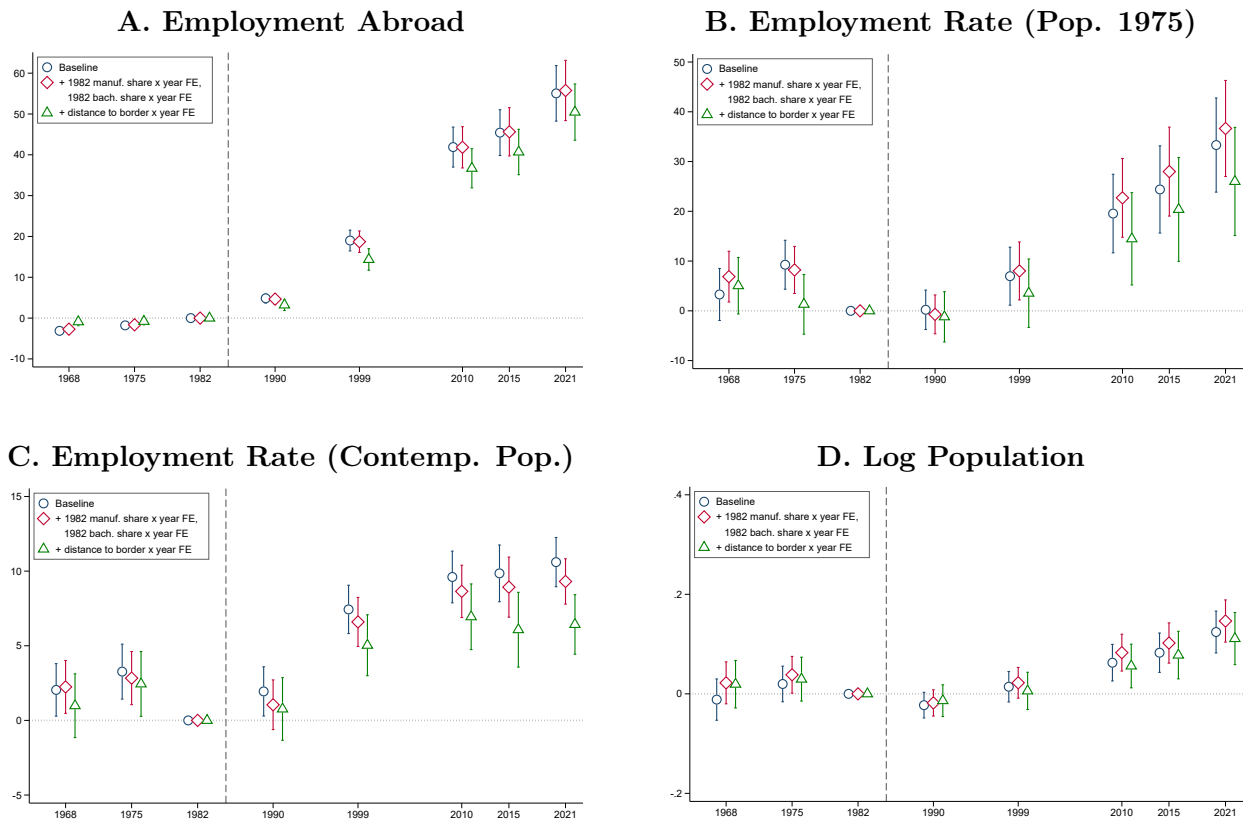
We then directly test for spillovers by defining our former control group (municipalities located 70 to 150 km from Luxembourg) as treated, and comparing them to a "super-control" group of more distant areas (150 to 200 km) in Figure A.15. The results show little evidence of economically meaningful spillovers. Employment remains stable, and population declines modestly, with effects that are economically small (below two percentage points) and imprecise relative to the substantial gains observed in treated municipalities. Overall, these findings together suggest that the benefits of foreign labor demand increases remain spatially concentrated and do not substantially spill over to neighboring control regions. We later show additional evidence that in-migration to treated areas did not disproportionately originate from the control group, and that in-commuting to treated municipalities did not disproportionately came from residents in the control group.

Figure A.13: **Alternative Control: Municipalities 0-50 km from Mons**



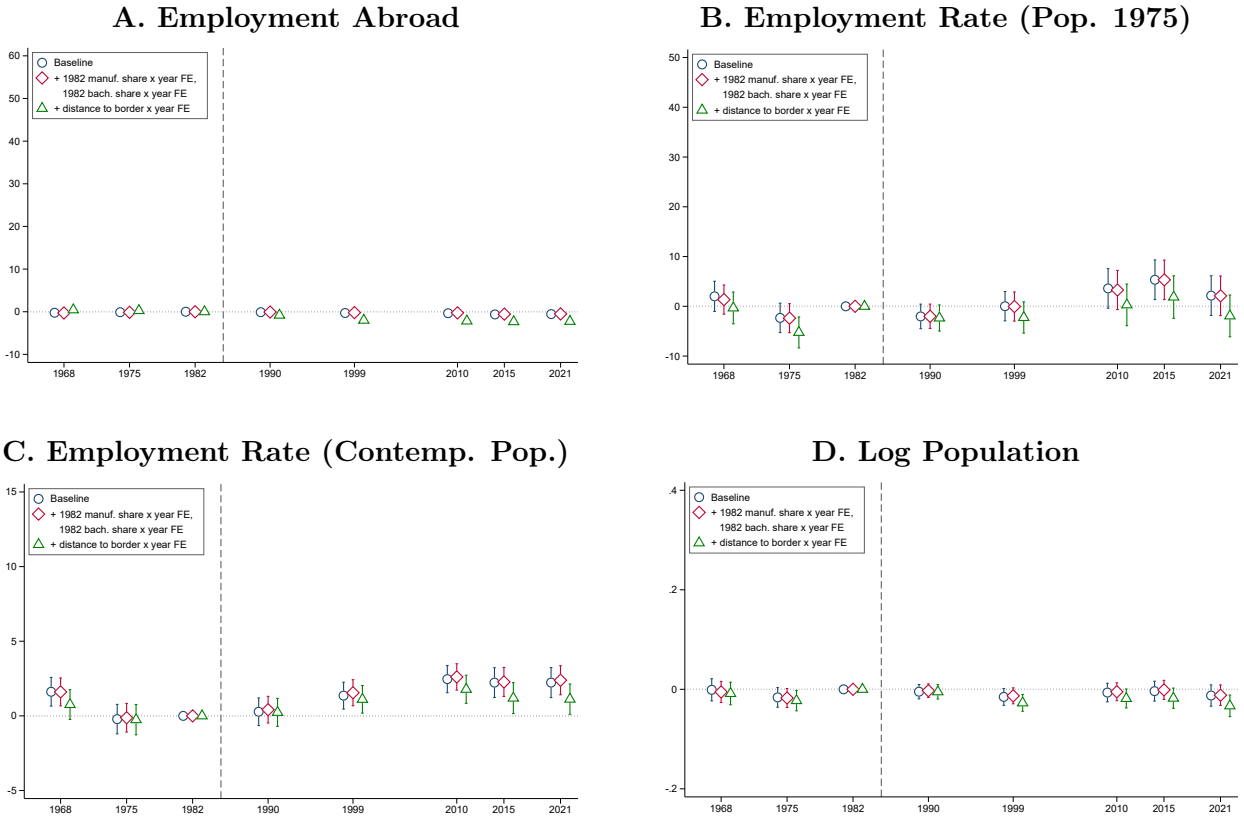

*Notes:* This figure reports event-study estimates using municipalities located within 50 km of Mons (Belgium) as an alternative control group. Treated municipalities are located within 50 km of Luxembourg City. All specifications include municipality and census-year fixed effects, as well as controls based on 1982 municipal characteristics (including manufacturing share, education structure, and distance to the border) interacted with census-year fixed effects. Standard errors are clustered at the commune level. Panels report effects on cross-border employment (A), employment rates (B and C), and log population (D). Panels A and B are shares of 1975 population, while Panels C and D use contemporaneous population.

Figure A.14: **Alternative Controls: Excluding Municipalities within 70 km of Treated Areas**



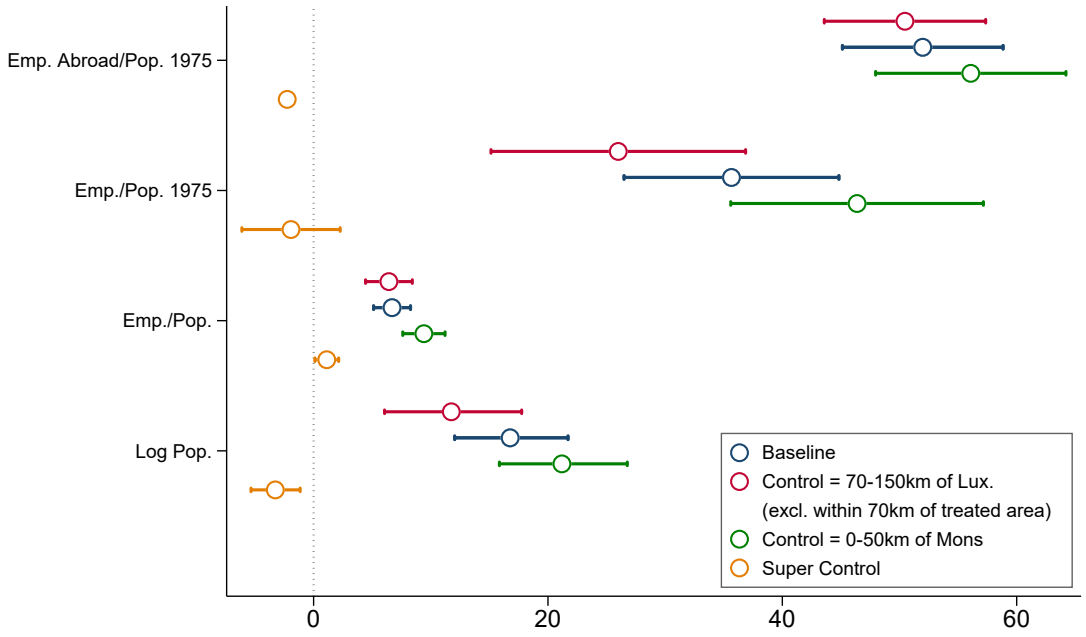

*Notes:* This figure reports event-study estimates using municipalities located 70-150 km from Luxembourg City as the control group, excluding municipalities within 70 km of treated areas to eliminate spillovers from within-France commuting. Treated municipalities are located within 50 km of Luxembourg City. All specifications include municipality and census-year fixed effects, as well as controls based on 1982 municipal characteristics (including manufacturing share, education structure, and distance to the border) interacted with census-year fixed effects. Standard errors are clustered at the commune level. Panels report effects on cross-border employment (A), employment rates (B and C), and log population (D). Panels A and B are shares of 1975 population, while Panels C and D use contemporaneous population.

Figure A.15: **Alternative Test: Control Areas relative to More Distant Locations**



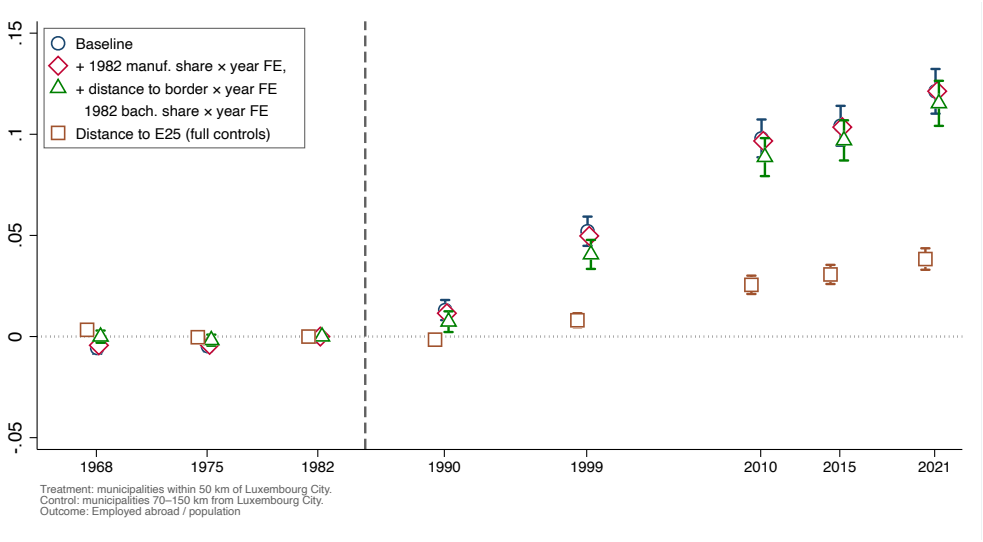

*Notes:* This figure reports event-study estimates defining municipalities located 70-150km of Luxembourg as treated, and those 150-200 km from Luxembourg City as the control group. All specifications include municipality and census-year fixed effects, as well as controls based on 1982 municipal characteristics (including manufacturing share, education structure, and distance to the border) interacted with census-year fixed effects. Standard errors are clustered at the commune level. Panels A-D report effects on cross-border employment, employment rates, and log population. Panels A and B are shares of 1975 population, while Panels C and D use contemporaneous population.

Figure A.16: **Summary of Alternative Tests (Long-Run)**



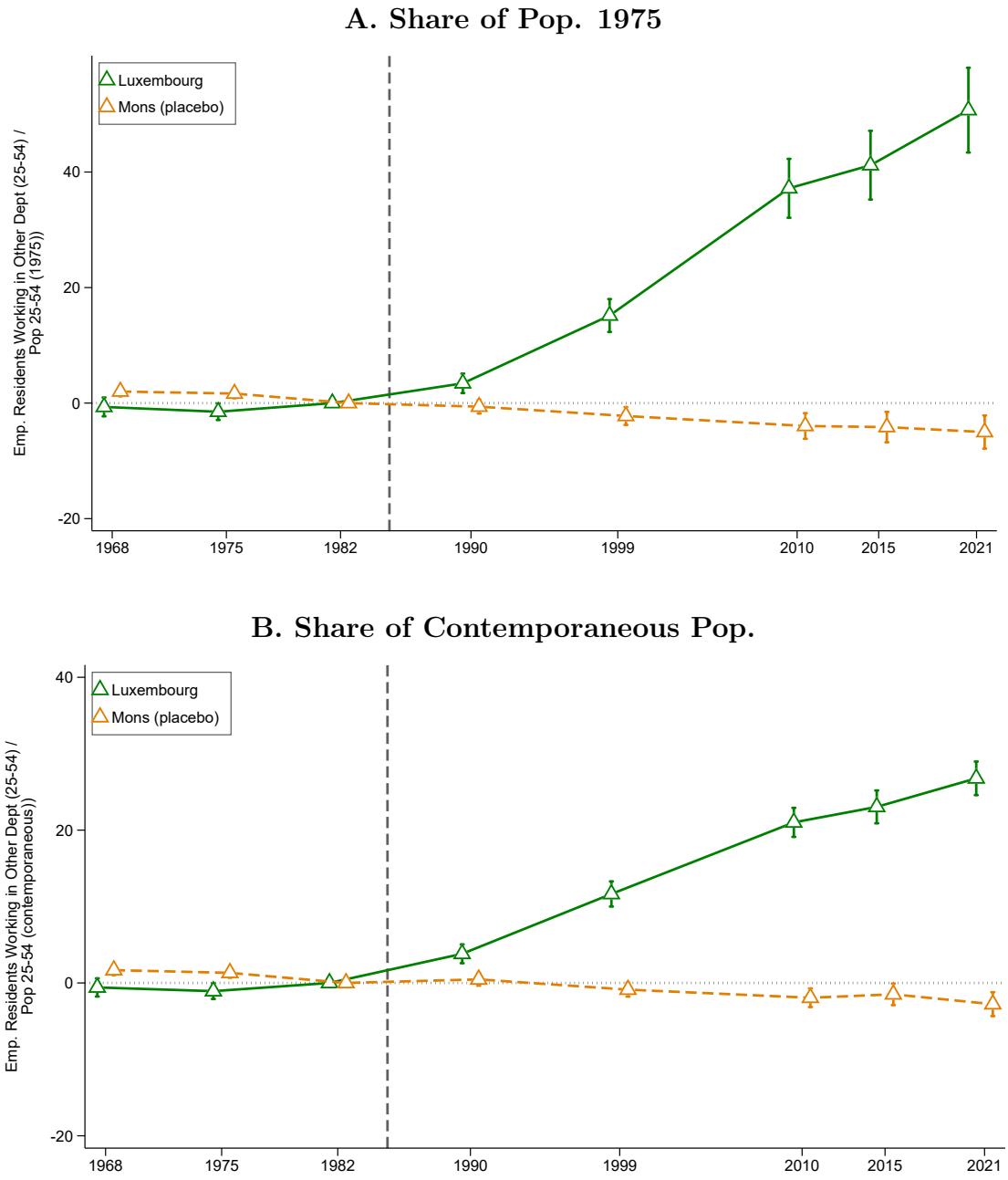

*Notes:* This figure reports the long-run event-study estimate of the baseline specification and each alternative test. All specifications include municipality and census-year fixed effects, as well as controls based on 1982 municipal characteristics (including manufacturing share, education structure, and distance to the border) interacted with census-year fixed effects. Standard errors are clustered at the commune level.

Figure A.17: **Cross-Border Employment Responses by Proximity to Highway**




*Notes:* The figure plots the estimated effect of exposure to Luxembourg's economic pull on the share of residents in French municipalities employed abroad. Exposure is defined by distance to the main highway connecting France and Luxembourg, the E25 road. Treated municipalities are located within X km of E25, while control municipalities lie further away. Estimates come from spatial difference-in-differences specifications with municipality and census-year fixed effects. Alternative specifications vary the set of baseline characteristics (in 1982) that are interacted with census-year fixed effects.

Figure A.18: **Share Working Outside Department**




*Notes:* This figure reports event-study estimates, defining municipalities located 0-50km of Luxembourg as treated, and those 70-150 km from Luxembourg City as the control group. All specifications include municipality and census-year fixed effects, as well as controls based on 1982 municipal characteristics (including manufacturing share, education structure, and distance to the border) interacted with census-year fixed effects. Standard errors are clustered at the commune level.

# D Additional Labor Market and Worker Reallocation Evidence

This appendix collects additional evidence on local employment and the reallocation of incumbent workers. It contains:

- Individual exit dynamics for incumbent workers from the French Rust Belt (Figure A.23).
- Heterogeneous exit dynamics by gender, initial wage, and initial sector (Figure A.25).
- Individual exit dynamics across all sectors (Figure A.26).
- Decomposition of local workers/jobs (relative to 1975 population) by worker origin (in-commuters vs locally employed residents) and by sector of activity (Table A.13), and the same decomposition relative to current population (Table A.14).
- Origin of in-commuters into treated municipalities by distance-to-Luxembourg ring (Table A.16).
- Decomposition of the long-run (30-year) employment effect by sector, occupation, and gender (Table A.11).

### D.1 Worker-Level Exposure Measure and Specification

This section details the exposure measure and the event-study specification used for the incumbent-worker analysis in Section 3. The baseline estimation sample consists of workers aged 25–54 in 1982 who were continuously employed in France between 1979 and 1982; the "young" subsample restricts to those aged 25–34 in 1982. Worker-level residence is only observed from 1993 onward in the DADS panel, whereas the municipality of work is available for the full period. We therefore proxy each worker's exposure using the share of employees in their 1982 workplace municipality who reside in the treated area (within 50 km of Luxembourg City), computed from exhaustive employer-employee DADS records rather than from our worker sample. This out-of-sample, workplace-based measure captures how strongly a given workplace is connected to residents of highly exposed areas, without relying on endogenous individual residence or workplace choices. Workers employed in municipalities more closely connected to the treated area are therefore more likely to have been exposed to the Luxembourg labor market. The earliest year in which this municipality-level measure can be computed in the exhaustive DADS data, when both residence and workplace are observed, is 1996 (and 1988 for a non-exhaustive version); we use the 1996 value, as well as the 1988–2000 average, to assess robustness to measurement error.

We assign to each worker the exposure intensity of their 1982 municipality of work and estimate worker-level event-study specifications of the form

$$y_{wit} = \sum_{k=1976, k\neq 1982}^{2010} \beta_k \times Exp_i^{1982} \times \mathbb{1}(t = k) + \lambda_w + \lambda_t + \varepsilon_{wit}, \tag{3}$$

where $y_{wit}$ is an indicator for whether worker $w$, initially employed in municipality $i$, is employed in France in year $t$; $Exp_i^{1982}$ denotes the exposure intensity of the worker's initial workplace $i$; $\lambda_w$ and $\lambda_t$ are worker and year fixed effects; and 1982 is the omitted reference year. By construction, exposure intensity proxies for the baseline (unobserved) residential exposure: workers initially employed in municipalities where a larger share of workers reside in treated areas are more likely to be exposed to the Luxembourg pull. The coefficients $\beta_k$ trace the dynamic reallocation of incumbent workers into foreign employment between 1976 and 2010.

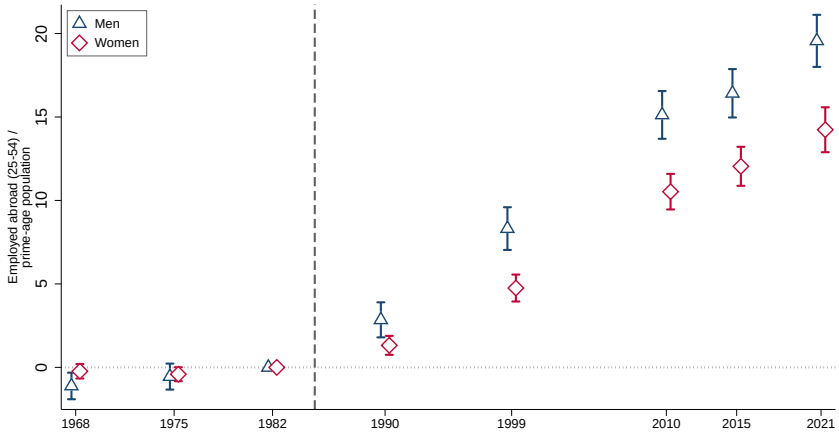
Table A.11: **Decomposition of Long-Run (30 years) Employment Effects**

| | Log Employment (1) | Employment share (pp) (2) | Employment-to-pop (3) |
|---|---|---|---|
| **Sector** | | | |
| Manufacturing | -0.052 | -6.072*** | -1.935 |
| | (0.041) | (1.165) | (0.997) |
| Construction | 0.317*** | 1.626* | 1.524** |
| | (0.057) | (0.645) | (0.487) |
| Services | 0.493*** | 9.733*** | 10.385*** |
| | (0.046) | (1.058) | (0.879) |
| Public, health & education | 0.071 | -5.287*** | -3.281*** |
| | (0.048) | (0.971) | (0.814) |
| **Occupation** | | | |
| Self-employed and business owners | 0.119 | -0.143 | 0.225 |
| | (0.063) | (0.566) | (0.405) |
| Managers and professionals | 0.469*** | 2.422*** | 2.356*** |
| | (0.072) | (0.634) | (0.534) |
| Intermediate occupations | 0.062 | -2.382* | -0.501 |
| | (0.051) | (0.928) | (0.745) |
| Clerical and service workers | 0.266*** | 0.780 | 2.160** |
| | (0.049) | (0.872) | (0.700) |
| Manual workers | 0.182*** | 0.279 | 2.511** |
| | (0.039) | (1.108) | (0.886) |
| Agricultural workers | 0.085 | -0.956 | -0.057 |
| | (0.072) | (1.056) | (0.805) |
| **Gender** | | | |
| Men | 0.244*** | -3.428*** | 2.241** |
| | (0.032) | (0.879) | (0.710) |
| Women | 0.381*** | 3.428*** | 4.452*** |
| | (0.039) | (0.879) | (0.793) |

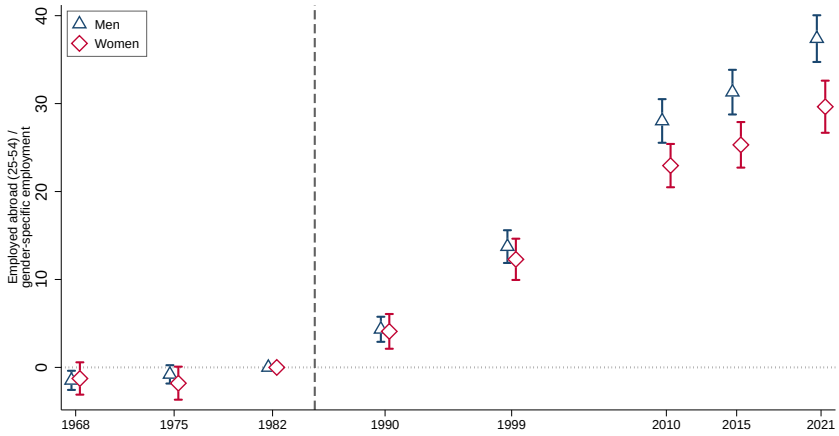
*Notes:* This table reports the decomposition of long-run employment effects by sector, occupation, and gender. Coefficients correspond to estimates of $\beta_k$ for $k = 2021$ from our baseline spatial difference-in-differences specification, using 1982 as the baseline reference year. Each coefficient is estimated from a separate regression. The first column reports effects in log employment levels, the second column reports effects in employment shares and the third column reports effects in employment-to-population ratios. All specifications include municipality and census-year fixed effects, as well as interactions of baseline (1982) municipality characteristics with census-year fixed effects: manufacturing employment share, share of residents with a bachelor degree, and distance to the Northern border. Standard errors, reported in parentheses, are clustered at the municipality level. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure A.19: **Cross-Border Employment by Gender**

**A. Share of the common prime-age population**

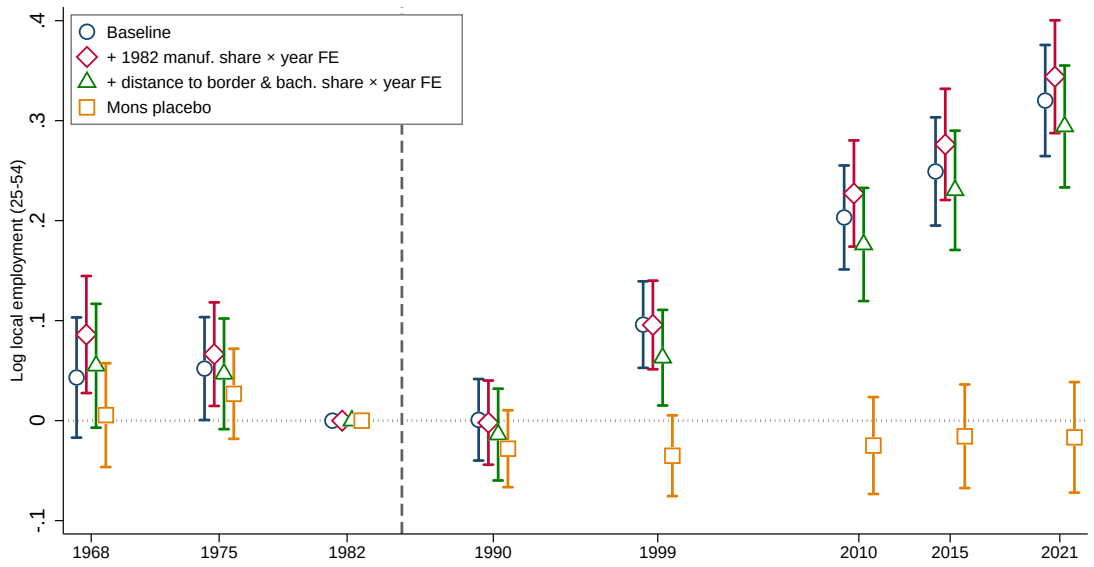



**B. Take-up rate: share of gender-specific employment**




*Notes:* Event-study estimates of the effect of exposure to Luxembourg on the number of prime-age (25–54) residents employed abroad, by sex (navy triangles: men; cranberry diamonds: women). Treated municipalities are within 50 km of Luxembourg City; control municipalities are 70–150 km away. Estimates include municipality and census-year fixed effects with 1982 municipal characteristics interacted with census-year fixed effects; 1982 is the omitted reference year and standard errors are clustered at the municipality level. In Panel A both series are normalized by the same prime-age population, so the male and female effects sum to the total employed-abroad effect: men account for a slight majority (about 58 percent) of the increase. In Panel B each series is instead normalized by its own gender-specific employment, capturing the within-gender propensity to take up cross-border work; relative to their weight in the workforce, men respond more strongly than women.

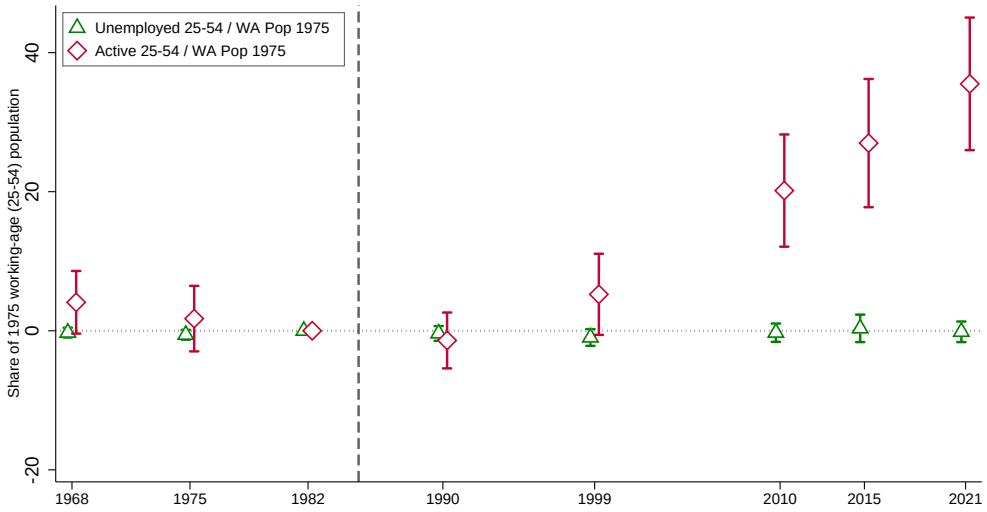
Figure A.20: **Log Local Employment (Ages 25–54): Specifications and Placebo**



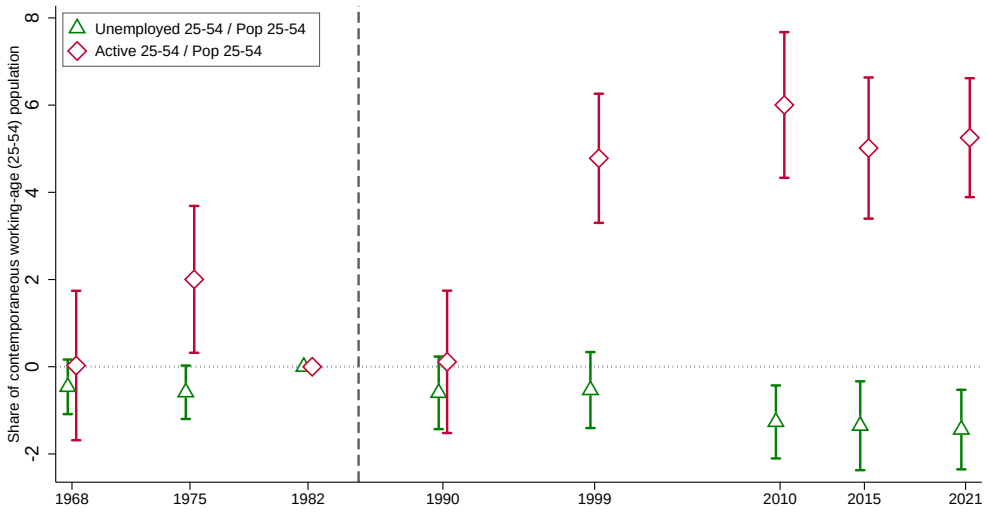

*Notes:* Event-study estimates of the effect of exposure to Luxembourg's labor demand on log local employment among residents aged 25–54. Treated municipalities are within 50 km of Luxembourg City; control municipalities are 70–150 km away. Estimates include municipality and census-year fixed effects, with 1982 the omitted reference year; the three specifications progressively add controls interacted with census-year fixed effects (baseline; 1982 manufacturing share; distance to the border and 1982 bachelor's share). The orange series reports a placebo using municipalities near Mons (Belgium), a geographically similar but non-booming foreign labor market.

Figure A.21: **Unemployment and Labor Force Participation: Fixed vs. Contemporaneous Population Base**

**(a) Relative to initial (1975) working-age population**

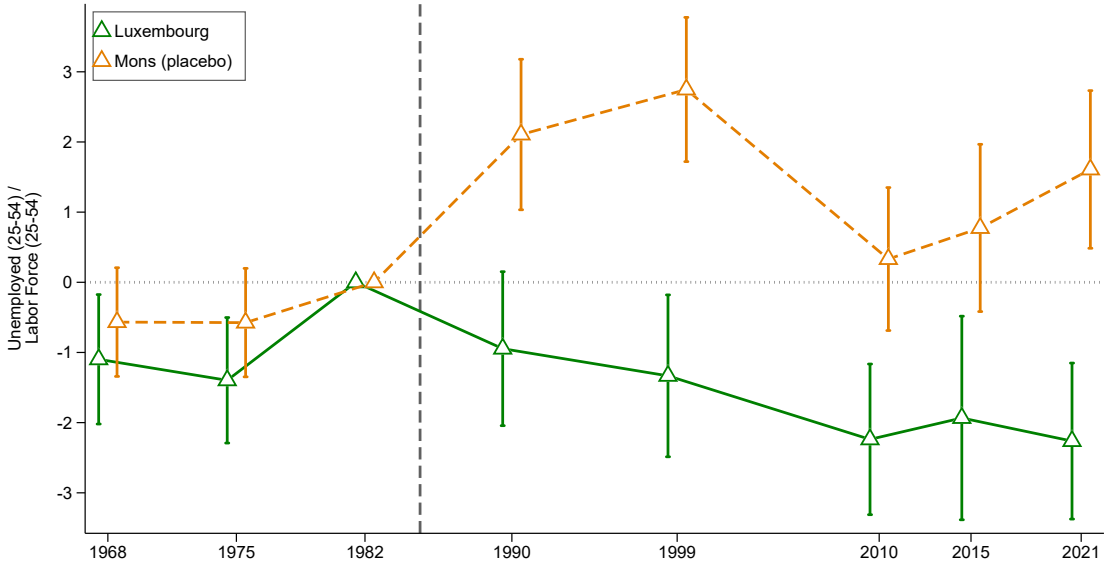



**(b) Relative to contemporaneous working-age population**



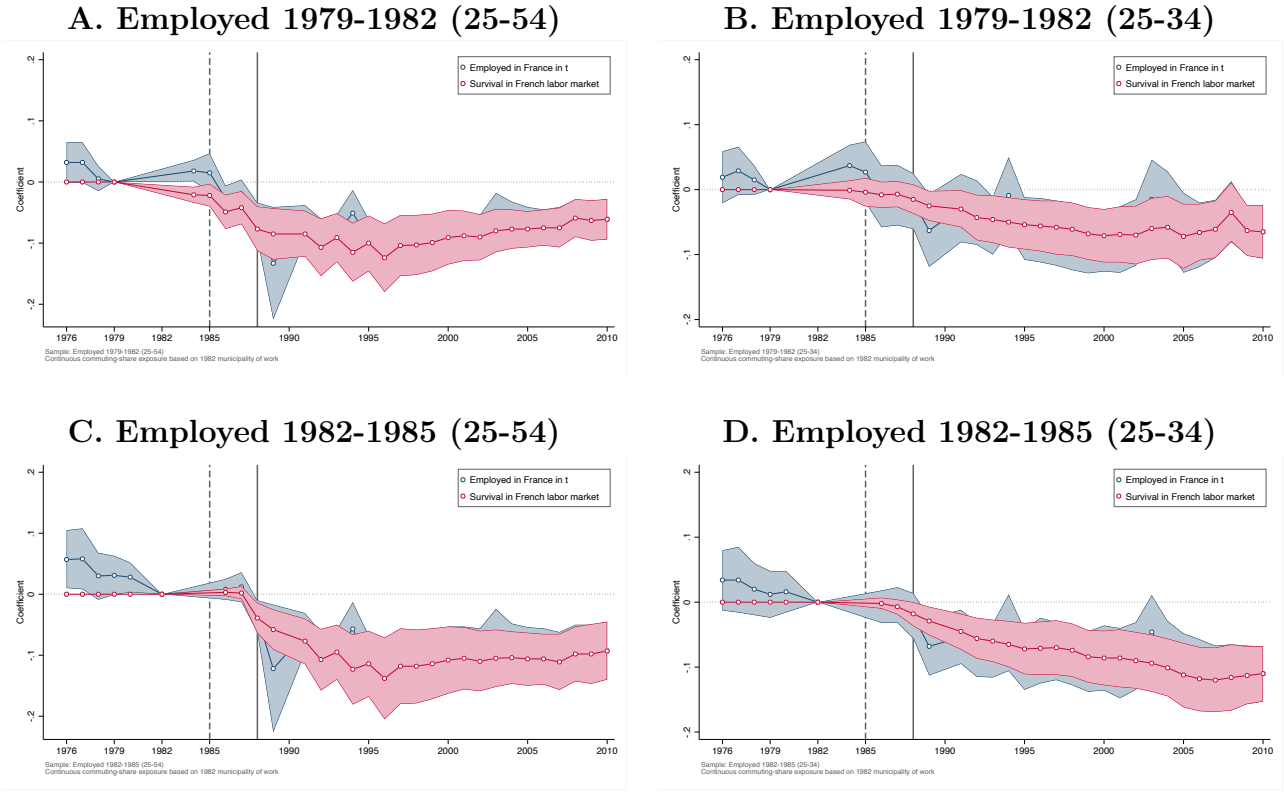

*Notes:* Event-study estimates of unemployment and labor-force participation (activity) for residents aged 25–54 in treated relative to control municipalities. Panel (a) normalizes both series by the initial (1975) working-age (25–54) population, holding the population base fixed, so the activity series captures the absolute expansion of the local labor force. Panel (b) normalizes by the contemporaneous working-age population, so each series is a rate; the wedge between panels reflects the population response. Treated municipalities are within 50 km of Luxembourg City; control municipalities are 70–150 km away. Estimates include municipality and census-year fixed effects (full controls), with 1982 the omitted reference year.

Figure A.22: **Unemployment (share of labor force)**




*Notes:* Event-study estimates of unemployment rate (share of labor-force) for residents aged 25–54 in treated relative to control municipalities. Treated municipalities are within 50 km of Luxembourg City; control municipalities are 70–150 km away. Estimates include municipality and census-year fixed effects (full controls), with 1982 the omitted reference year.

Figure A.23: **Individual Exit Dynamics for Incumbent Workers from French Rust Belt**

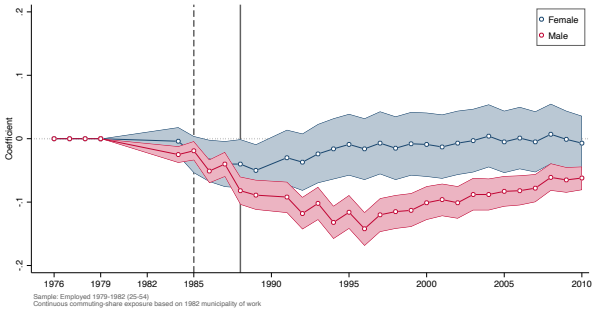



*Notes:* The figure plots the estimated effect of exposure to Luxembourg's economic pull on the probability of remaining in the French labor market for individual incumbent workers who were continuously present in the French employer-employee panel between 1982 and 1985. Exposure is defined using commuting linkages: for each worker, we assign the share of workers in their 1982 municipality of work who reside in treated municipalities (i.e., within commuting distance to Luxembourg), computed from exhaustive French employer-employee DADS data in 1996 (earlier year available). The exposure measure ranges from 0 to 1, with a value of 1 corresponding to workers employed in 1982 in municipalities where all workers reside in treated areas (as measured in 1996). Estimates come from spatial difference-in-differences specifications that interact this continuous exposure measure with year fixed effects and include worker and year fixed effects. The outcome considers permanent exit from the French workforce; it is equal to 1 in year $t$ for workers in the panel who are observed in the French employer-employee data in year $t$ or later, and to 0 for those who do not appear in the panel from year $t$ onward.

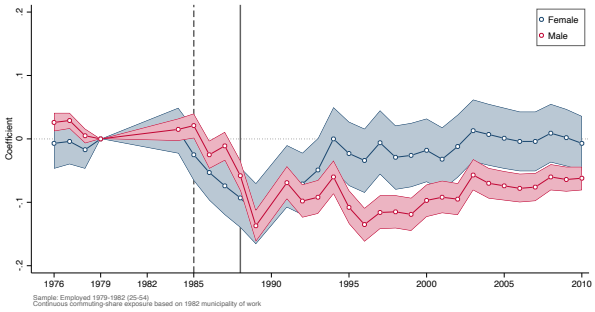
Figure A.24: **Heterogeneous Reallocation Dynamics for Incumbent Workers**

**Panel A. By Gender**

*A1. Survival in French Labor Market*

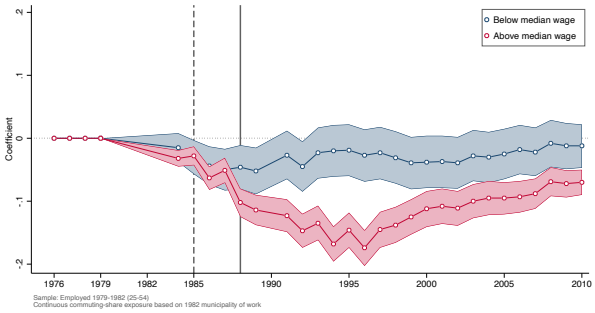



*A2. Employed in France*

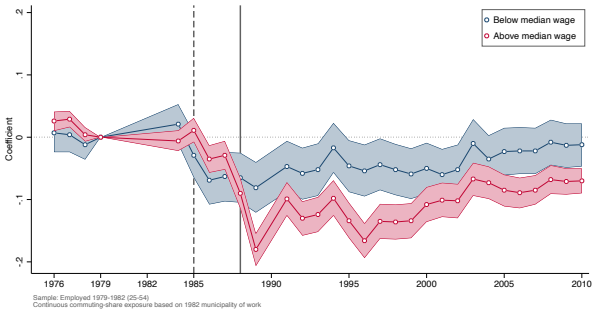



**Panel B. By Initial Wage**

*B1. Survival in French Labor Market*




*B2. Employed in France*

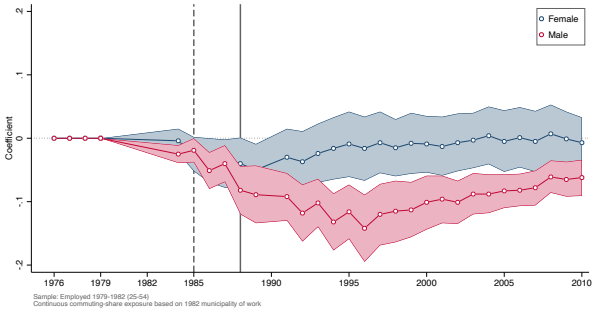



*Notes:* The figure reports event-study estimates from individual-level regressions of incumbent workers' labor-market outcomes on treatment exposure (defined based on 1982 municipality of work) interacted with year fixed-effects. Outcomes are indicators for (i) survival in French labor market and (ii) employment in France in year $t$. The estimation sample is all workers continuously employed in France between 1979 and 1982. Estimates are shown separately by gender (Panel A) and wage in 1982 (Panel B); the corresponding split by sector of work in 1982 is reported in the main text (Figure 6). Standard errors are clustered at the individual level.

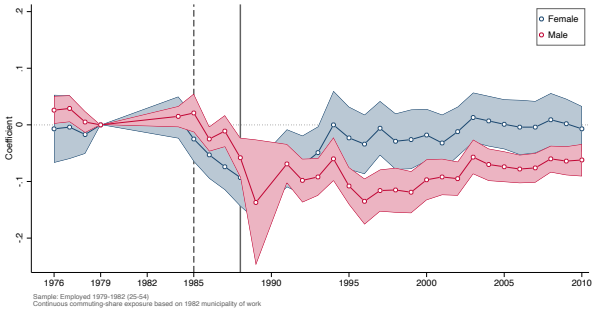
Figure A.25: **Heterogeneous Exit Dynamics for Incumbent Workers: Alternative Clustering**

**Panel A. By Gender**

*A1. Survival in French Labor Market*

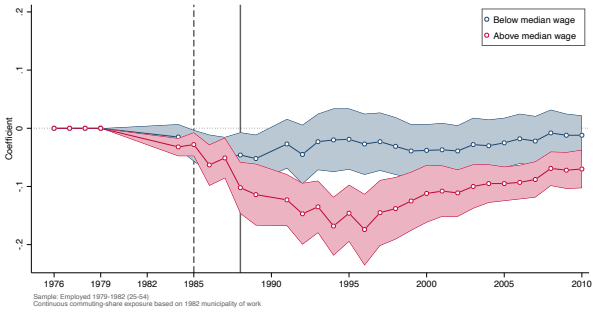



*A2. Employed in France*

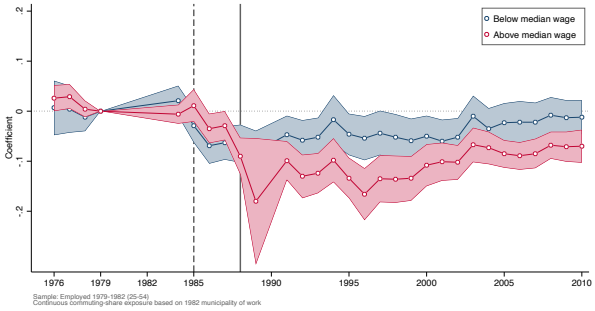



**Panel B. By Initial Wage**

*B1. Survival in French Labor Market*

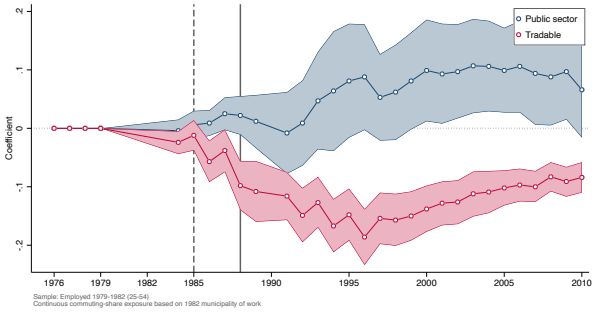



*B2. Employed in France*

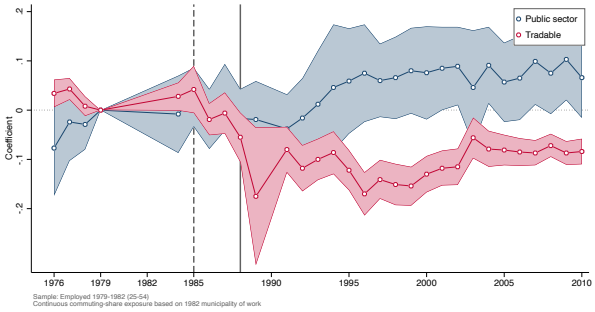



**Panel C. By Initial Sector**

*C1. Survival in French Labor Market*




*C2. Employed in France*

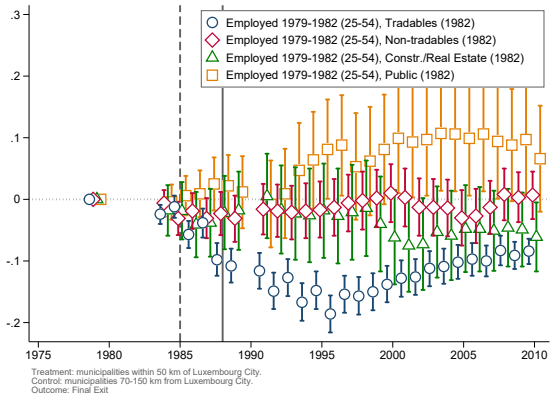



*Notes:* The figure reports event-study estimates from individual-level regressions of incumbent workers' labor-market outcomes on treatment exposure (defined based on 1982 municipality of work) interacted with year fixed-effects. Outcomes are indicators for (i) survival in French labor market and (ii) employment in France in year $t$. The estimation sample is all workers continuously employed in France between 1979 and 1982. Estimates are shown separately by gender (Panel A), wage in 1982 (Panel B), and sector of work in 1982 (Panel C). Standard errors are clustered at the municipality level.

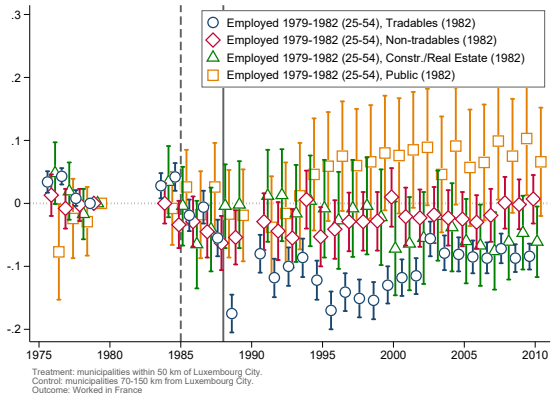
Figure A.26: **Individual Exit Dynamics for Incumbent Workers: All Sectors**

## A. Employed 1979-1982 (25-54)

*A1. Survival in French Labor Market*

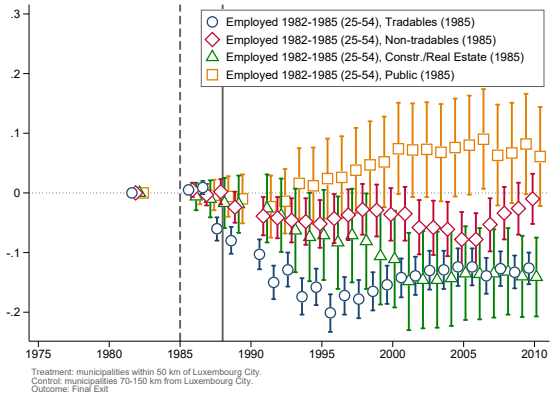



*A2. Employed in France*

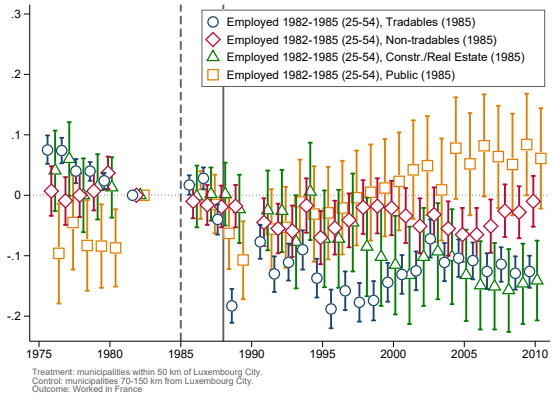



## B. Employed 1982-1985 (25-54)

*B1. Survival in French Labor Market*




*B2. Employed in France*




*Notes:* The figure plots the estimated effect of exposure to Luxembourg's economic pull on the probability of remaining in the French labor market for individual incumbent workers who were continuously present in the French employer-employee panel between 1982 and 1985. Exposure is defined using commuting linkages: for each worker, we assign the share of workers in their 1982 municipality of work who reside in treated municipalities (i.e., within commuting distance to Luxembourg), computed from exhaustive French employer-employee DADS data in 1996 (earlier year available). The exposure measure ranges from 0 to 1, with a value of 1 corresponding to workers employed in 1982 in municipalities where all workers reside in treated areas (as measured in 1996). Estimates come from spatial difference-in-differences specifications that interact this continuous exposure measure with year fixed effects and include worker and year fixed effects. The outcome considers permanent exit from the French workforce; it is equal to 1 in year $t$ for workers in the panel who are observed in the French employer-employee data in year $t$ or later, and to 0 for those who do not appear in the panel from year $t$ onward.

Table A.12: **Definition of Sectors**

| Sector | INSEE NES4 group | Industries included |
|---|---|---|
| Manufacturing | 1–2 | Agriculture and industry (goods production). Labeled "tradables" in the construction code; overwhelmingly manufacturing in the study region, with a negligible agricultural share. |
| Services | 4 (private) | Market services: wholesale and retail trade, transport, hospitality, finance and insurance, business and professional services, and personal services. Includes tradable services such as finance. |
| Construction | 3 | Construction and real estate. |
| Public, health & education | 4 (public) | Public administration, education, and human health and social work. |

*Notes:* Sectors are constructed from harmonized census industry codes and mapped to the INSEE NES4 classification (1 = agriculture, 2 = industry, 3 = construction, 4 = tertiary). The tertiary sector (group 4) is split into private *services* and *public, health, and education* using the detailed industry codes, whose exact ranges vary across census waves and are given in the replication file (`1_clean_census.do`). Because the underlying "tradable/non-tradable" distinction separates goods production from services rather than tradability per se, with finance and other tradable services falling in the services category, we label the goods-producing category *manufacturing* and the private-services category *services* throughout the paper. The corresponding worker-level (DADS) sector classification, based on NAP/NAF activity codes, is detailed in Appendix I.4.

Table A.13: **Prime-Age Local Jobs (Share of 1975 Prime-Age Population)**

| | | By worker origin | | By sector of activity | | | |
|---|---|---|---|---|---|---|---|
| | All (25–54) | In-comm. | Local res. | Manuf. | Services | Constr. | Public |
| 1968 | -3.278 | -0.962 | -2.994* | -1.558 | -0.861 | -0.661 | -0.199 |
| | (2.940) | (1.054) | (1.704) | (2.572) | (0.772) | (0.555) | (0.470) |
| 1975 | 2.767 | 2.064* | -1.614 | 2.010 | 0.332 | -0.418 | 0.843 |
| | (2.411) | (1.124) | (1.526) | (2.043) | (0.682) | (0.500) | (0.536) |
| 1982 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1990 | 2.213 | 2.350 | 0.884 | 3.719 | -1.425** | -0.381 | 0.300 |
| | (3.607) | (2.124) | (1.149) | (3.304) | (0.712) | (0.498) | (0.581) |
| 1999 | 7.337 | 3.847 | 3.023** | 4.201 | 2.342 | -0.393 | 1.188 |
| | (5.008) | (2.892) | (1.338) | (3.594) | (2.187) | (0.566) | (0.945) |
| 2010 | 6.705 | 3.298 | 2.511 | 3.898 | 3.735 | -1.086* | 0.159 |
| | (5.737) | (3.246) | (1.601) | (4.075) | (2.699) | (0.626) | (1.288) |
| 2015 | 7.698 | 4.043 | 3.884** | 2.515 | 4.481 | 0.105 | 0.598 |
| | (5.452) | (3.264) | (1.545) | (3.252) | (2.951) | (0.848) | (1.323) |
| 2021 | 4.392 | 2.125 | 2.087 | 0.358 | 3.748 | -0.601 | 0.887 |
| | (4.879) | (2.866) | (1.358) | (2.773) | (2.822) | (0.696) | (0.963) |
| *Share of total, 2021* | 100% | 48% | 48% | 8% | 85% | -14% | 20% |

*Notes:* Event-study estimates ($\beta_k$ from the baseline spatial difference-in-differences specification: treated within 50 km vs control 70–150 km, commune and census-year fixed effects, full 1982 controls interacted with census-year fixed effects, reference year 1982) for the share of prime-age (25–54) workers/jobs located in a commune over its 1975 prime-age population (×100). The "All (25–54)" column is the total; the remaining columns decompose it two ways. *By worker origin*: domestic in-commuters (reside in a different commune, commute >10 km) and locally employed residents (work in their commune of residence); their sum falls below the total because short-distance (<10 km) in-commuters are not shown separately. *By sector of activity*: manufacturing, services, construction, and public, health, and education (defined in Table A.12), which sum to the total. Each column is estimated from a separate regression. Standard errors clustered by commune in parentheses; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.14: **Local Jobs (Share of Current Prime-Age Population)**

| | | By worker origin | | By sector of activity | | | |
|---|---|---|---|---|---|---|---|
| | All (25–54) | In-comm. | Local res. | Manuf. | Services | Constr. | Public |
| 1968 | -8.024*** | -1.490 | -6.140*** | -5.640** | -1.138 | -1.059** | -0.187 |
| | (2.688) | (1.102) | (1.095) | (2.456) | (0.703) | (0.468) | (0.419) |
| 1975 | 0.584 | 1.696 | -2.071** | 0.298 | 0.098 | -0.520 | 0.709 |
| | (2.220) | (1.136) | (1.052) | (1.948) | (0.639) | (0.475) | (0.441) |
| 1982 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1990 | 1.858 | 2.030 | -0.058 | 2.154 | -0.721 | -0.192 | 0.617 |
| | (3.022) | (1.754) | (0.861) | (2.858) | (0.607) | (0.436) | (0.389) |
| 1999 | 3.399 | 1.488 | 1.602* | 1.335 | 1.705 | -0.329 | 0.689 |
| | (3.326) | (1.779) | (0.905) | (2.576) | (1.642) | (0.467) | (0.495) |
| 2010 | 1.748 | 1.506 | 0.780 | 0.285 | 2.832 | -0.613 | -0.755 |
| | (4.095) | (2.203) | (0.947) | (3.137) | (1.979) | (0.556) | (0.532) |
| 2015 | 0.161 | 1.158 | 0.603 | -0.939 | 2.413 | -0.469 | -0.843 |
| | (4.102) | (2.391) | (0.945) | (2.964) | (2.108) | (0.611) | (0.607) |
| 2021 | -2.758 | -0.754 | -0.040 | -2.313 | 1.534 | -0.871 | -1.109* |
| | (3.863) | (2.241) | (0.931) | (2.648) | (2.129) | (0.591) | (0.624) |

*Notes:* As Table A.13, but normalizing prime-age (25–54) workers/jobs located in a commune by its *current* prime-age population rather than its 1975 prime-age population. Event-study coefficients $\beta_k$ from the baseline spatial difference-in-differences specification (treated within 50 km vs. control 70–150 km, commune and census-year fixed effects, full 1982 controls interacted with census-year fixed effects, reference year 1982). The "All (25–54)" column is the total; the four sectors sum to it; the worker-origin columns report in-commuters (>10 km) and locally employed residents (their sum falls below the total because short-distance in-commuters are not shown separately). Because local employment grows more slowly than the population it serves, the total effect is small and turns negative by 2021. Standard errors clustered by commune in parentheses; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.15: **Relative Sectoral Composition of Local Worplace Employment**

| | Manufacturing | Services | Construction | Public & health |
|---|---|---|---|---|
| 1968 | 2.42 | -0.53 | 0.71 | -2.61** |
| | (2.10) | (1.61) | (1.25) | (1.33) |
| 1975 | 2.87 | -0.56 | -1.86 | -0.45 |
| | (1.99) | (1.66) | (1.27) | (1.45) |
| 1982 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1990 | 5.02** | -4.62*** | -0.61 | 0.21 |
| | (2.01) | (1.49) | (1.25) | (1.43) |
| 1999 | -0.10 | -0.58 | -1.27 | 1.96 |
| | (1.91) | (1.65) | (1.26) | (1.47) |
| 2010 | 0.76 | 1.45 | -1.84 | -0.37 |
| | (2.08) | (1.83) | (1.45) | (1.71) |
| 2015 | -0.26 | -0.13 | -1.27 | 1.67 |
| | (2.30) | (2.07) | (1.52) | (1.90) |
| 2021 | -3.00 | 0.34 | -1.63 | 4.29** |
| | (2.39) | (2.14) | (1.61) | (2.05) |

*Notes:* Event-study coefficients $\beta_k$ for the share of prime-age (25–54) workers located in a commune employed in each sector, expressed as a percentage of the commune's total prime-age workers. Because the four sector shares sum to one, the treatment effects sum to zero: the table reports the *relative* shift in sectoral composition, holding total local employment fixed, and complements the level decomposition in Table A.13. Estimates are from the baseline spatial difference-in-differences specification (treated within 50 km of Luxembourg City vs. control 70–150 km, commune and census-year fixed effects, full 1982 controls interacted with census-year fixed effects, reference year 1982). By the end of the period, local employment shifts away from manufacturing and construction activities and toward public, health, and education services. Standard errors clustered by commune in parentheses; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.16: **In-Commuters into Treated Municipalities by Origin Ring (Counts)**

| Census year | Treated (≤50 km) | Donut (50–70 km) | Control (70–150 km) | Outside (>150 km) |
|---|---|---|---|---|
| 1968 | 7,428 | 3,744 | 612 | 160 |
| 1975 | 13,680 | 5,365 | 1,170 | 330 |
| 1982 | 16,540 | 6,420 | 856 | 584 |
| 1990 | 19,668 | 8,664 | 1,396 | 680 |
| 1999 | 23,221 | 11,502 | 2,496 | 682 |
| 2010 | 25,373 | 13,009 | 3,071 | 732 |
| 2015 | 24,771 | 12,701 | 3,273 | 946 |
| 2021 | 24,249 | 13,244 | 3,300 | 914 |
| Share of 1982–2021 growth | 45% | 39% | 14% | 2% |

*Notes:* Number of prime-age domestic in-commuters (working in a treated municipality, residing in a different commune more than 10 km away) by the distance-to-Luxembourg ring of their residence, summed across treated municipalities (≤50 km of Luxembourg City), by census year. This is a descriptive tabulation of the treated municipalities' in-commuter pool (not a treated-control contrast). The final row reports the share of the total 1982–2021 growth in in-commuters attributable to each origin ring. The bulk of the growth originates in the treated zone and the adjacent 50–70 km donut (both excluded from the control group), with the 70–150 km control band contributing a small share.

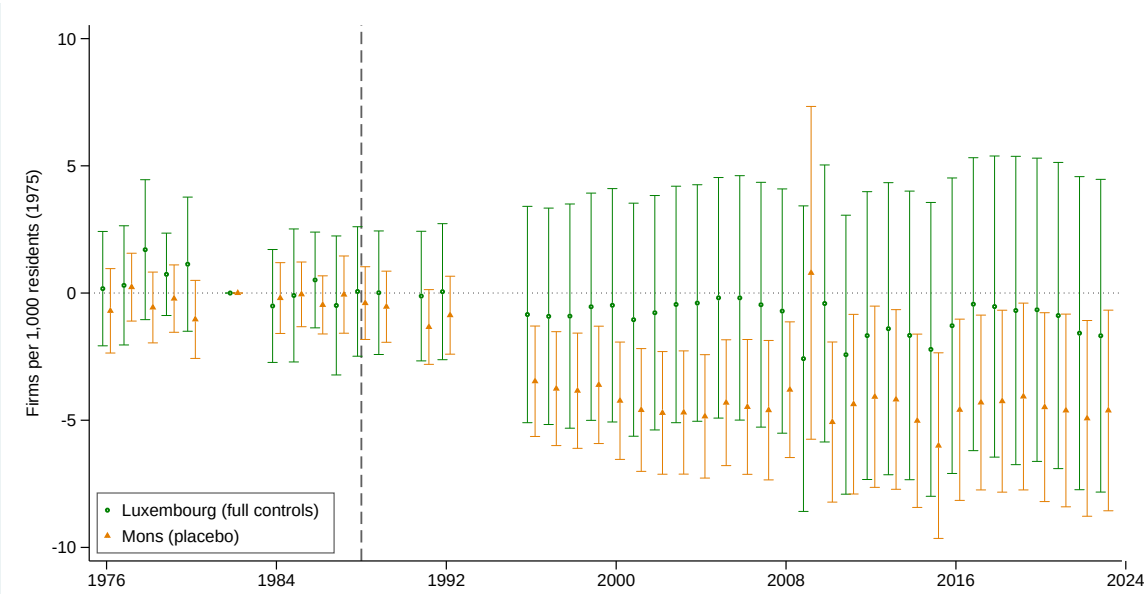
Table A.17: **Effect on the Number of Firms Located in Treated Municipalities**

| | Log no. of firms | Firms per 1,000 pop. (1975) |
|---|---|---|
| Total | -0.028 | -1.68 |
| | (0.093) | (3.13) |
| Manufacturing | -0.209* | -1.23** |
| | (0.118) | (0.58) |
| Services | 0.028 | 0.79 |
| | (0.173) | (2.24) |
| Construction | -0.078 | -0.70 |
| | (0.114) | (0.61) |
| Public & health | -0.158 | -0.54 |
| | (0.206) | (0.79) |

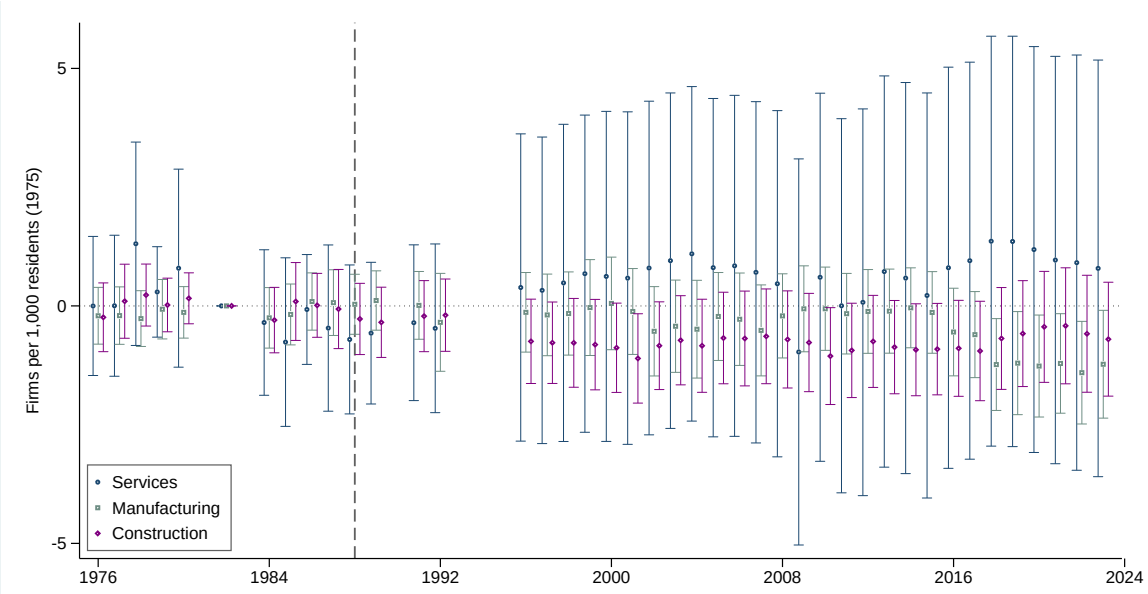
*Notes:* Long-run (2023) difference-in-differences treated–control effects on the number of firms located in treated municipalities, in total and by sector of activity. Column 1 reports the effect on the log number of firms; column 2 the effect on the number of firms per 1,000 (1975) residents. Estimates are from the baseline spatial difference-in-differences specification (treated within 50 km of Luxembourg City versus control 70–150 km, commune and year fixed effects, full 1982 controls interacted with year fixed effects). The total number of firms does not change, and the number of manufacturing firms declines slightly, consistent with an expansion of local labor demand that operates through existing establishments rather than net firm entry. Standard errors clustered by commune in parentheses; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure A.27: **Number of Firms Located in Treated Municipalities: Event Studies**

**A. Total Number of Firms**




**B. By Sector**



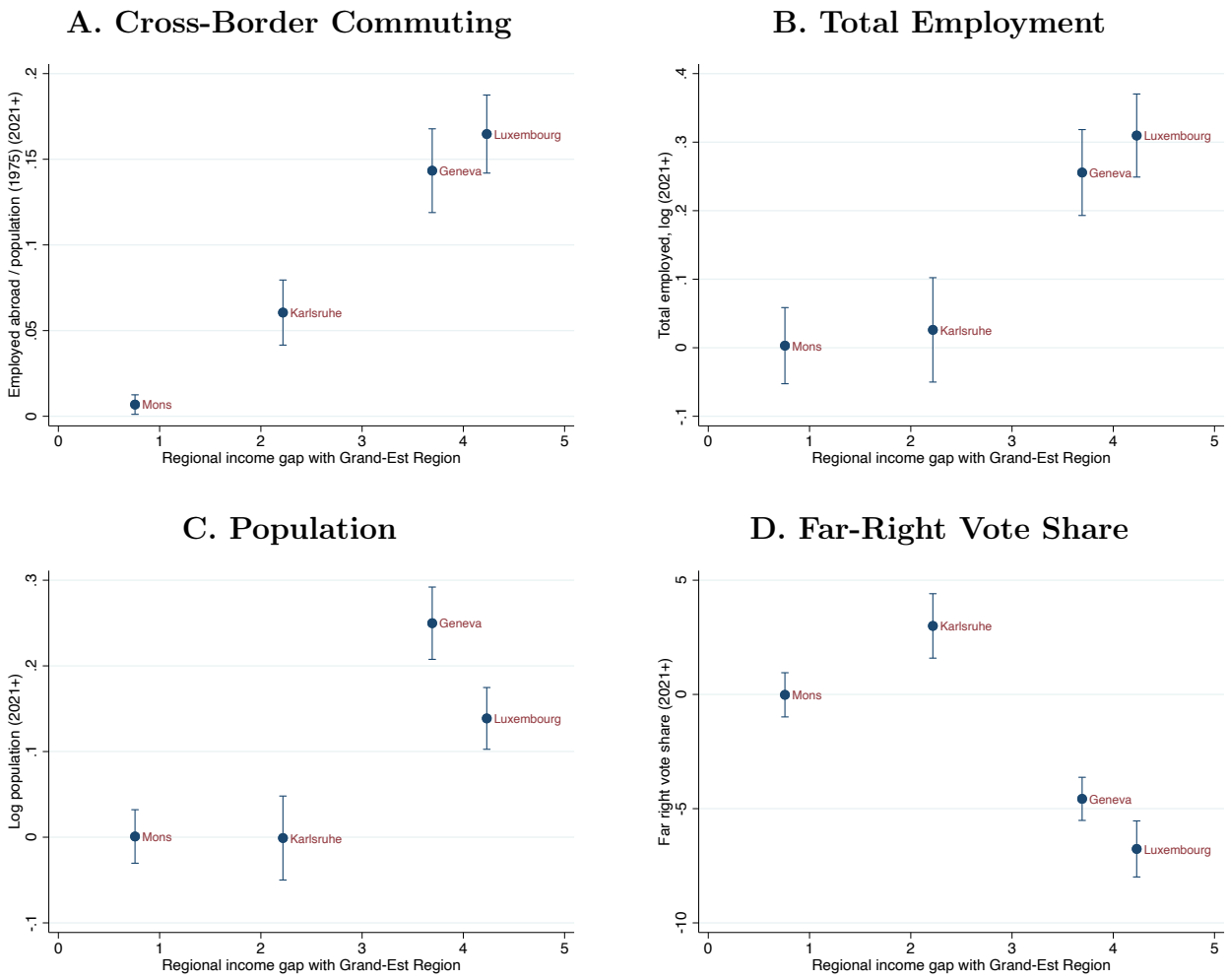

*Notes:* Event-study estimates of the effect of exposure to Luxembourg on the number of firms located in a municipality per 1,000 (1975) residents, from the baseline difference-in-differences specification (treated within 50 km of Luxembourg City versus control 70–150 km, commune and year fixed effects, full 1982 controls interacted with year fixed effects). The firm data are annual over 1976–2023; the vertical dashed line marks the late-1980s onset of Luxembourg's expansion. Panel A reports the total number of firms for the Luxembourg design (green) and the Mons placebo (orange). Panel B decomposes the response by sector (services, manufacturing, construction) for the Luxembourg design. Markers are point estimates and bars are 95% confidence intervals for standard errors clustered at the municipality level.

### D.2 External Validity: Regional Adjustment across Borders

To probe the external validity of our findings, we replicate the baseline empirical design around all foreign labor markets bordering northeastern France (Belgium, Germany, Switzerland and Luxembourg). For each of these foreign labor markets, we pick the first big city located on the highway connecting France to the foreign labor market (e.g. Mons, Karlsruhe, Geneva, and Luxembourg City). We then re-estimate our design, comparing the evolution of local economic or political outcomes for French municipalities located within 50km of the foreign economic center to control municipalities located between the 70-150km bandwidth.

For each foreign market, we obtain a serie of coefficients that capture the differential evolution of French municipalities in the Northeast within commuting distance, versus control, and we relate each margin of regional adjustment to the size of the foreign income gap. Figure A.28 reports the results. Because each point is a difference-in-differences treated-control effect rather than a level, the relationship is not driven by the endogenous prosperity of border areas. The estimated effects are near zero at the low-gap borders, consistent with our placebo exercises. The positive local effects appear to scale with the size of the employment opportunity abroad. Luxembourg lies at the upper end of the income-gap distribution, reflecting the exceptionally large wage premium available to French workers commuting there.

Figure A.28: **Regional Adjustment and Foreign Income Gaps across Borders**




*Notes:* Each point corresponds to a border in northeastern France (Mons, Karlsruhe, Geneva, Luxembourg) where we replicate the baseline empirical design using the nearby foreign labor market as the destination. The horizontal axis plots the income gap between the foreign labor market and the neighboring French (Grand-Est) municipalities; each panel reports the corresponding long-run treated–control effect.

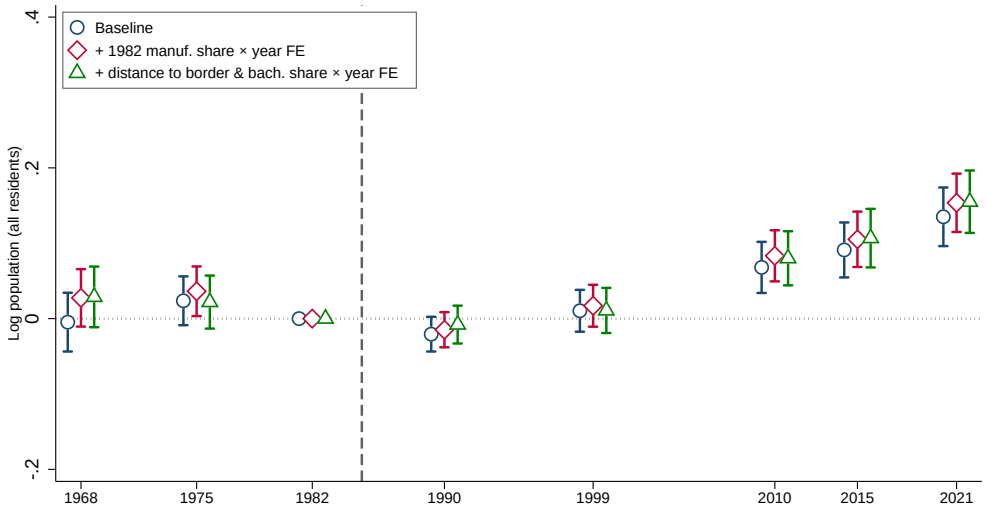
# E Population and Long-Run Regional Adjustment

This appendix provides additional evidence on demographic and long-run regional adjustment. It contains:

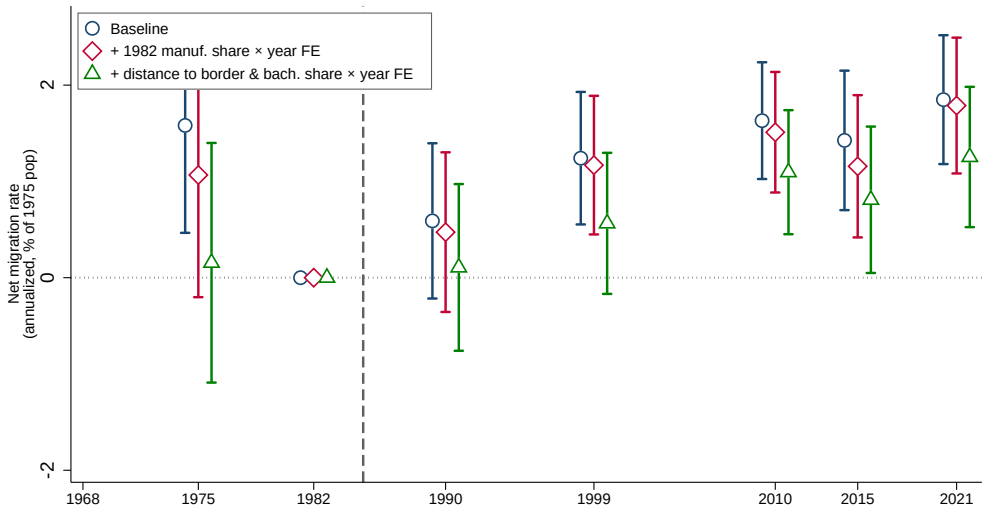
- Treatment effects on the composition of the population, by age, sex, working age, and education (Figure A.30).
- Average migration distance for inflows and outflows of municipalities in the estimation sample.
- Decomposition of net migration (population-accounting rate vs. gross inflows minus outflows), gross inflows and outflows, and inflows by geographic origin (Table A.19); the graphical decomposition into retention and inflows by origin over time appears in the main text (Figure 9).
- Origin of movers into treated municipalities by distance-to-Luxembourg ring: descriptive counts (Table A.20).

Figure A.29: **Population Responses: Robustness Across Control Specifications**

**(a) Log population (all residents)**

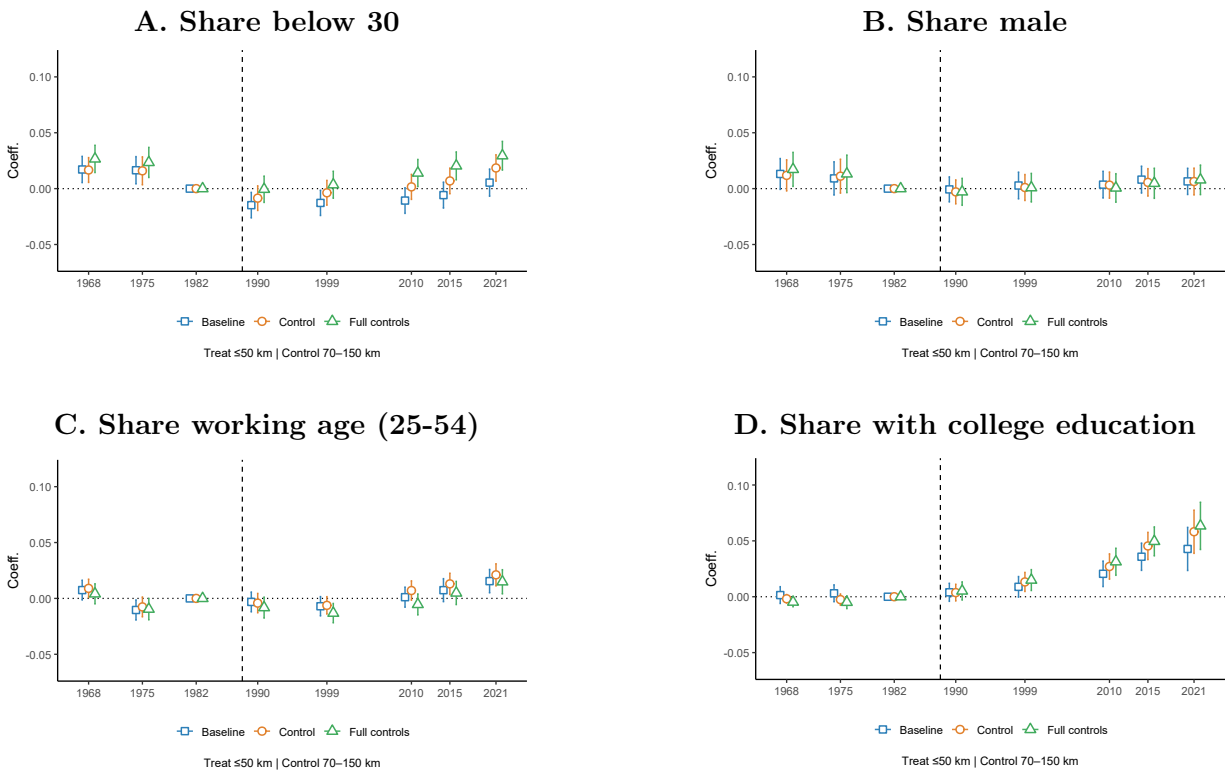



**(b) Net migration rate**




*Notes:* Robustness companion to Figure 9. Each panel plots the Luxembourg event-study estimates under three progressively richer sets of controls interacted with census-year fixed effects (baseline; 1982 manufacturing share; distance to the border and 1982 bachelor's share). Panel (a) is log municipal population (all residents); panel (b) is the annualized inter-census net migration rate (per 1975 population). Treated municipalities are within 50 km of Luxembourg City; control municipalities are 70–150 km away. Estimates include municipality and census-year fixed effects, with 1982 the omitted reference year.

Figure A.30: **Treatment Effects on Population Composition**




*Notes:* This figure reports event-study estimates on the composition of population, according to equation 1. Treated municipalities are located within 50 km of Luxembourg City. Control municipalities are from 70 to 150km. All specifications include municipality and census-year fixed effects, as well as controls based on 1982 municipal characteristics (including manufacturing share, education structure, and distance to the border) interacted with census-year fixed effects. Standard errors are clustered at the commune level. Panels A-D report effects on the share of younger residents, the share of men, the share of working-age residents, and the share of residents with a college education.

Table A.18: **Average Migration Distance (km)**

| | Inflows | Outflows |
|---|---|---|
| 1968 | 104.21 | 77.87 |
| 1975 | 112.1 | 81.58 |
| 1982 | 102.13 | 73.96 |
| 1990 | 111.23 | 110.5 |
| 1999 | 121.71 | 118.44 |
| 2015 | 94.91 | 94 |
| 2021 | 99.92 | 98.35 |

*Notes:* The table reports the average migration distance for inflows and outflows of communes in estimation sample, 0-50km or 70-150km from Luxembourg City

Table A.19: **Net Migration and Gross Flows: Decomposition**

| | Per 1975 population | | | | Per cur. pop |
|---|---|---|---|---|---|
| | 1990 | 1999 | 2015 | 2021 | 2021 |
| *Net migration* | | | | | |
| Net rate (Δpop) | 0.11 | 0.56 | 0.81** | 1.25*** | – |
| | (0.44) | (0.37) | (0.39) | (0.37) | |
| Net (inflows − outflows) | -0.02 | 0.31 | 0.86 | 0.76 | 0.63 |
| | (0.23) | (0.23) | (0.66) | (0.60) | (0.47) |
| *Gross flows* | | | | | |
| Inflows | -0.34* | -0.17 | 1.45*** | 1.26** | -0.03 |
| | (0.18) | (0.17) | (0.51) | (0.52) | (0.34) |
| Outflows | -0.32** | -0.48*** | 0.59 | 0.51 | -0.66** |
| | (0.15) | (0.16) | (0.52) | (0.48) | (0.32) |
| *Inflows by origin (sum to inflows)* | | | | | |
| Within department | -0.37** | -0.39** | 0.32 | 0.37 | -0.54** |
| | (0.16) | (0.16) | (0.40) | (0.40) | (0.27) |
| Across department | -0.02 | 0.07 | 0.66** | 0.21 | 0.09 |
| | (0.07) | (0.07) | (0.31) | (0.22) | (0.17) |
| *of which: across region* | -0.02 | 0.04 | 0.10 | -0.12 | -0.10 |
| | (0.05) | (0.05) | (0.10) | (0.12) | (0.08) |
| From abroad | 0.05 | 0.16*** | 0.47*** | 0.69*** | 0.42*** |
| | (0.03) | (0.05) | (0.11) | (0.13) | (0.08) |

*Notes:* Event-study coefficients $\beta_k$ from the baseline spatial difference-in-differences specification (treated within 50 km of Luxembourg City vs. control 70–150 km, commune and census-year fixed effects, 1982 municipal characteristics interacted with census-year fixed effects, reference year 1982). All migration measures are annualized. The first four columns normalize by the 1975 population; the last column by current population. *Net rate* (Δpop) is the population-accounting net migration rate, (Δpop − births + deaths)/$\text{pop}_{1975}$, defined on total population only. *Net (inflows − outflows)* is reconstructed from the gross flows, with standard error approximated by the root-sum-of-squares of the inflow and outflow standard errors. Under *inflows by origin*, within-department, across-department, and from-abroad are mutually exclusive and sum to gross inflows; *across region* is the long-distance subset of across-department moves, shown as a memo line and not added. Standard errors clustered by commune in parentheses; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

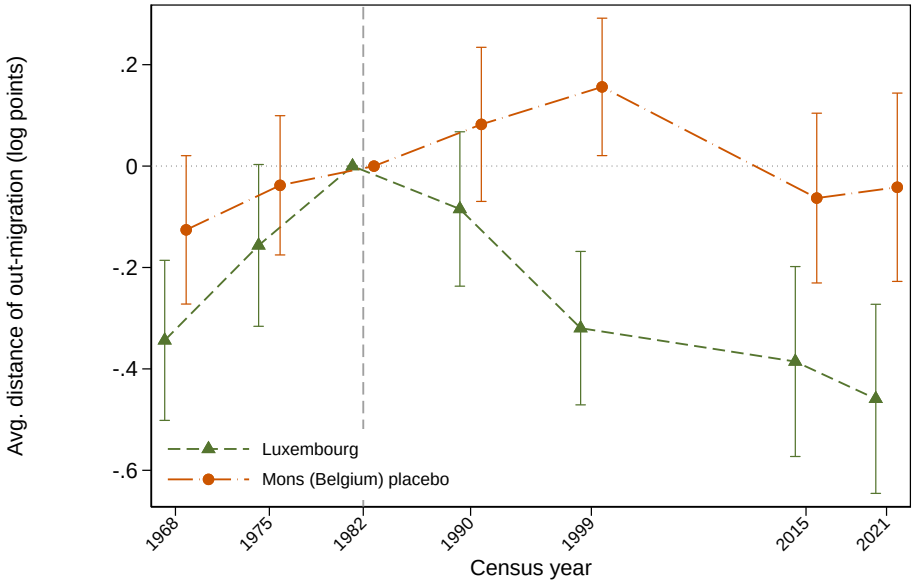
**Origin of movers into treated municipalities.** As a check on contamination of the control group, we tabulate movers into treated municipalities by the distance-to-Luxembourg ring of their previous residence, mirroring the in-commuter exercise in Appendix D (Table A.16). Table A.20 reports the descriptive counts: the 70–150 km control band supplies only about 7% of the 1982–2021 growth in movers into treated municipalities—the smallest of all origin rings—so in-migration does not disproportionately draw from the control group.

Table A.20: **Movers into Treated Municipalities by Origin Ring (Counts)**

| Census year | Treated (≤50 km) | Donut (50–70 km) | Control (70–150 km) | Outside (>150 km) | Abroad |
|---|---|---|---|---|---|
| 1968 | 15,500 | 2,693 | 2,147 | 3,004 | 4,757 |
| 1975 | 14,605 | 2,051 | 1,474 | 2,689 | 3,075 |
| 1982 | 13,771 | 1,881 | 881 | 1,643 | 1,354 |
| 1990 | 11,351 | 2,032 | 928 | 1,709 | 970 |
| 1999 | 9,995 | 2,016 | 1,038 | 2,141 | 1,255 |
| 2015 | 23,825 | 4,601 | 2,255 | 3,473 | 3,162 |
| 2021 | 21,376 | 4,101 | 2,019 | 3,884 | 4,408 |
| Share of 1982–2021 growth | 47% | 14% | 7% | 14% | 19% |

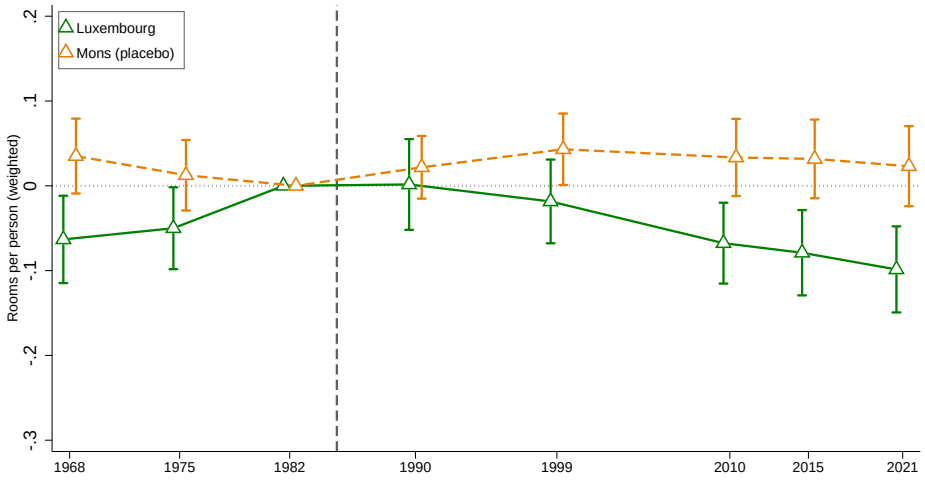
*Notes:* Number of movers by the distance-to-Luxembourg ring of their previous residence, summed across treated municipalities (≤50 km of Luxembourg City), by census year. This is a descriptive tabulation of the treated municipalities' mover pool (not a treated-control contrast). The final row reports the share of the total 1982–2021 growth in movers attributable to each origin ring. Overseas departments are categorized as moves from abroad. The bulk of the growth originates in the treated zone and those coming from abroad. Data on movers is annualized prior to 2010. Information on previous residence is not available for the 2010 census.

Figure A.31: **Distance of Out-Migration: Luxembourg vs. Mons Placebo**




*Notes:* Event-study estimates of the effect of exposure to Luxembourg on the average distance of out-migration from the municipality (in log points; reference year 1982). Treated municipalities are within 50 km of Luxembourg City and control municipalities are 70–150 km away; estimates include municipality and census-year fixed effects, with 1982 municipal characteristics (manufacturing share, bachelor's share, and distance to the border) interacted with census-year fixed effects. The green series is the Luxembourg estimate; the orange series reports the Mons (Belgium) placebo, where treated municipalities lie within 50 km of Mons. We show 95% confidence intervals, with standard errors clustered at the commune level.

Figure A.32: **Housing Consumption: Rooms per Person**




*Notes:* Event-study estimates of the effect of exposure to Luxembourg on the weighted-average number of rooms per person in the municipal housing stock (reference year 1982). Treated municipalities are within 50 km of Luxembourg City and control municipalities are 70–150 km away; estimates include municipality and census-year fixed effects, with controls for 1982 manufacturing share, bachelor's share, and distance to the border interacted with census-year fixed effects. The solid green series is the Luxembourg estimate; the dashed orange series reports the Mons (Belgium) placebo. We show 95% confidence intervals, with standard errors clustered at the commune level.

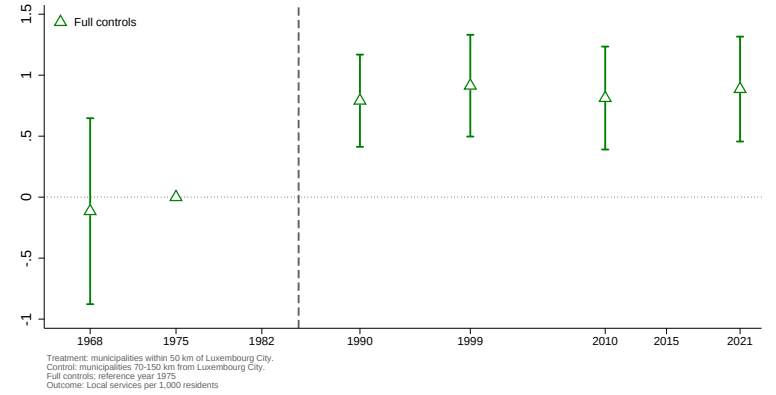
# F Local Public Services and Amenities

This appendix presents evidence on access to local public services and amenities. It contains:

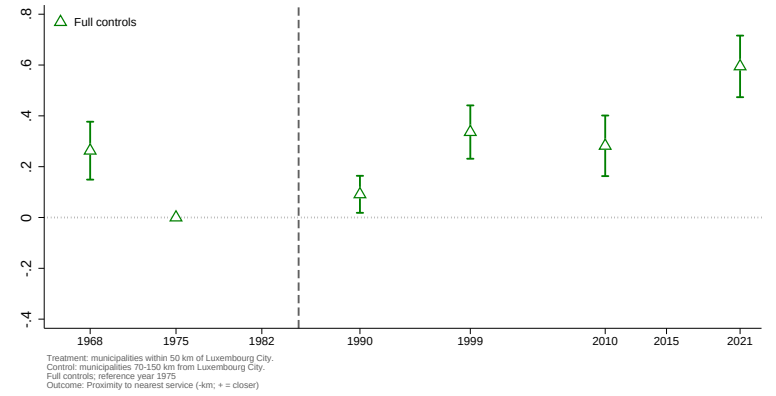
- Event-study estimates of access to local services, measured as provision per capita, proximity to the nearest service, and catchment access (Figure A.33).
- Data sources and the construction of the local-service access measures.
- Interpretation in terms of levels and preservation, with the three access measures by census wave (Table A.21).
- Decomposition of which services drive the local-service effect (Figure A.34).

Figure A.33: **Access to Foreign Labor Markets and Local Services**

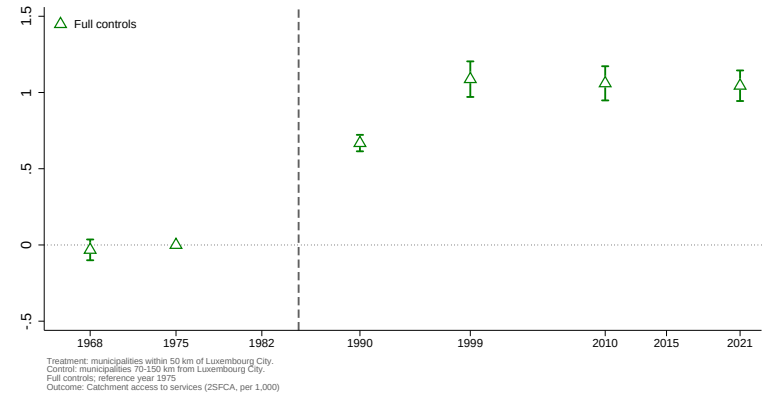
**A. Local services per 1,000 residents (provision per capita)**




**B. Proximity to the nearest service (km closer)**




**C. Catchment access to services**




*Notes:* This figure reports event-study estimates (Equation 1) of access to the Luxembourg labor market on access to six local services (doctors, pharmacies, banks, grocery stores, kindergartens, and primary schools). Panel A is the number of services per 1,000 residents, Panel B is proximity to the nearest service (the negative mean distance in kilometers, so that positive values mean residents are closer), and Panel C is a two-step floating catchment area index of services reachable within 20 km relative to the local population. Appendix F.1 describes the data and the construction of each measure. The reference census year is 1975. All specifications include municipality and census-year fixed effects, as well as 1982 municipal characteristics (manufacturing share, education structure, and distance to the border) interacted with census-year fixed effects. Standard errors are clustered at the commune level.

### F.1 Local Services: Data and Measurement

This appendix describes the data and the construction of the local-service access measures used in Section 5 and Figure A.33.

### F.2 Data

We consider six local services: doctors, pharmacies, banks, grocery stores, kindergartens, and primary schools. Facility counts at the municipality level come from two sources. For the earlier waves we use the *inventaire communal* (1969, 1979, and 1988), and for the later waves we use the *base permanente des équipements* (BPE) for 2007, 2010, and 2021. We map these to census years 1968, 1975, 1990, 1999, 2010, and 2021. The 1982 and 2015 census waves have no corresponding facility inventory and are therefore excluded from the event studies. Because the source changes between the 1990 and 1999 waves, comparisons that span this break should be read with caution. All counts are harmonized to constant municipal boundaries.

### F.3 Access measures

We report three measures, each in natural units.

*Provision per capita.* The number of the six services located in the municipality, divided by population and scaled per 1,000 residents.

*Proximity.* The negative of the mean road distance (in kilometers) to the nearest of the six services, averaged across them. A service located within the municipality enters at a distance of zero, so the measure captures both having a service locally and being close to one in a neighboring municipality. We report the negative distance so that a positive coefficient means residents are closer.

*Catchment access (2SFCA).* We use a two-step floating catchment area index, a standard accessibility measure that captures both the supply of services nearby and the population competing for them. We compute it on municipality centroids, using a 20 km catchment, in two steps. In the first step, for each municipality that supplies a given service, we divide its number of facilities by the total population of all municipalities whose centroid lies within 20 km. In the second step, for each municipality of residence we sum these supply-to-demand ratios over all municipalities within 20 km. We do this separately for each of the six services

and sum across them, scaling the result per 1,000 residents. Facilities are recorded at the municipality level, so each municipality acts both as a supplier (its own facilities) and as a source of demand (its population). The supply and demand universe includes all municipalities within 200 km of Luxembourg City, so that catchments near the edge of the estimation sample are not truncated within France.

### F.4 Interpretation: absolute versus relative effects

The event-study coefficients measure the change in access for treated municipalities relative to control municipalities, both expressed relative to 1975. Table A.21 reports the three reported access measures averaged over treated and control municipalities in each wave.

Over the sample period the absolute provision of local services declined in both treated and control municipalities, consistent with a broad decline of local services in rural and peri-urban France. Per-capita provision, proximity to the nearest service, and catchment access[39] all fell in both groups, but the decline is consistently steeper in control municipalities. By 2021, for example, per-capita provision has fallen by 2.7 (treated) versus 3.4 (control) services per 1,000 relative to 1975, and the nearest service is 0.7 km further (treated) versus 1.5 km (control).

The positive treated-control coefficients in Figure A.33 therefore reflect a slower decline near Luxembourg rather than an absolute improvement in access. Treated municipalities lost access more slowly than comparable declining areas.

### F.5 Heterogeneity by amenity type

Figure A.34 decomposes the aggregate result by service type, on the two access measures: per-capita provision (Panel A) and proximity (Panel B). For each service we run the same event study as the composite (full controls, 1975 reference year) and report the 2021 treated-control effect. Both panels point to the same drivers: the effect is concentrated in banks and kindergartens, which are large and statistically significant on both margins. Grocery stores contribute mainly to the per-capita gap and primary schools mainly to the proximity gap, while doctors and pharmacies show no significant differential access effect.

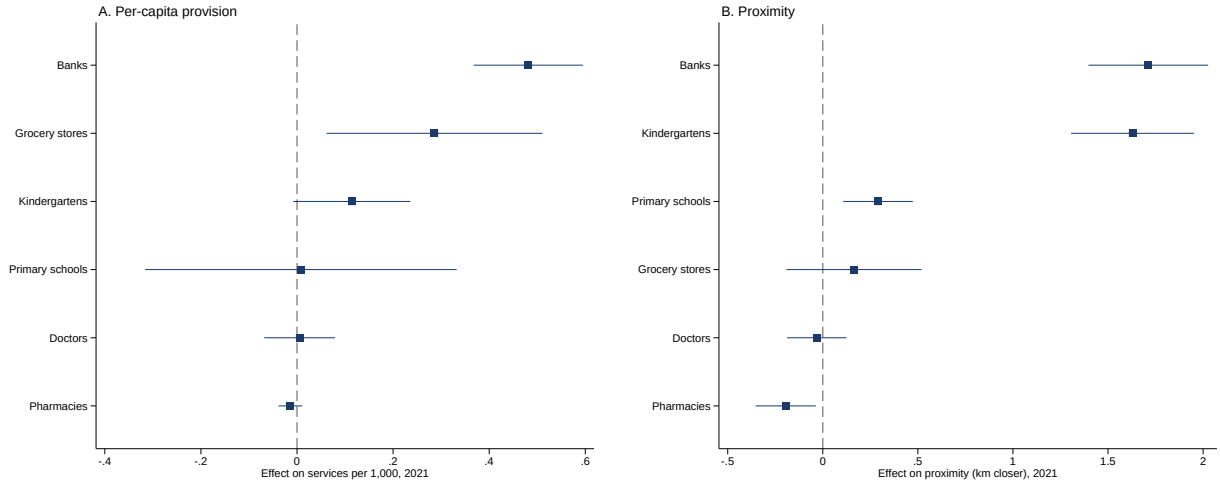
[39] Because we only observe French infrastructures and French population, distance and catchment measures are mechanically incomplete close to the border.

Table A.21: **Local-Service Access by Census Wave: Levels in Treated and Control Municipalities**

| | Per 1,000 residents | | Proximity (−km) | | 2SFCA access | |
|---|---|---|---|---|---|---|
| Wave | Treated | Control | Treated | Control | Treated | Control |
| 1968 | 4.39 | 5.89 | -2.78 | -4.11 | 1.78 | 3.33 |
| 1975 | 4.35 | 4.91 | -2.23 | -3.43 | 2.66 | 3.97 |
| 1990 | 3.50 | 3.07 | -2.17 | -3.44 | 2.75 | 3.48 |
| 1999 | 2.71 | 2.42 | -2.37 | -4.01 | 2.83 | 3.13 |
| 2010 | 2.27 | 2.14 | -2.54 | -4.11 | 2.58 | 2.95 |
| 2021 | 1.70 | 1.54 | -2.97 | -4.92 | 2.04 | 2.43 |
| Δ 1975–2021 | -2.66 | -3.37 | -0.74 | -1.49 | -0.62 | -1.53 |

*Notes:* Mean of each access measure by census wave, over treated (≤50 km) and control (70–150 km) municipalities in the estimation sample. Per 1,000 residents: number of the six services per 1,000 inhabitants. Proximity: negative mean road distance (km) to the nearest service (higher = closer). 2SFCA: two-step floating catchment index. Final row: 1975–2021 change. Waves 1982 and 2015 lack a facility inventory.

Figure A.34: **Which Services Drive the Local-Service Effect**




*Notes:* 2021 event-study effect on each service's access, estimated separately by service; same specification and sample as Figure A.33 (reference 1975). Panel A: facilities per 1,000 residents. Panel B: proximity to the nearest facility (positive = closer). Horizontal lines are 95% confidence intervals (standard errors clustered by commune).

# G Spatial Gradient Estimates

This appendix presents the spatial-gradient estimates and the welfare outcomes measured along the distance gradient to Luxembourg. It contains:

- Spatial-gradient specifications and functional-form robustness (Table A.23).
- The spatial-gradient implied treated–control gap (Section G.2).
- Bandwidth sensitivity of the 2005 referendum "No" vote gradient (Table A.25) and the geography of cross-border exposure over time (Table A.26).
- Distributional effects of access to foreign labor demand on the D9/D1 ratio (Figure A.35).
- Economic distress and reliance on income-support transfers (Figure A.36).
- Reliance on the social safety net: unemployment and major transfer programs (Figure A.37).
- Fiscal externalities for the central French government (Figure A.38).

### G.1 Spatial Gradient Approach

This section reports the full set of spatial-gradient estimates underlying the results discussed in the main text, together with robustness to alternative specifications and functional forms. For each outcome we estimate the reduced-form relationship between the outcome and distance to Luxembourg City, exploiting the kinked, "censored gravity" structure of cross-border commuting: distance predicts a gradient in outcomes *within* the feasible commuting zone (inside 70 km) but is uninformative beyond it.

Let $Y_i$ denote an outcome in commune $i$, $D_i$ its distance to Luxembourg City, and $W_i = \mathbb{1}[D_i \leq 70]$ an indicator for lying inside the feasible commuting zone. Table A.23 reports, for every outcome, the within-zone gradient under three identification strategies (columns 1–3) and four functional forms of the baseline (columns 4–7). Each cell is the effect of being 10 km *closer* to Luxembourg, i.e. $-10$ times the estimated slope. The columns correspond to the following regressions, all estimated with robust standard errors on all French municipalities within 150 km:

- **Column (1), Baseline.** The kink regression

$$Y_i = \alpha + \beta_1 D_i + \beta_2 W_i + \beta_3 (D_i \times W_i) + \varepsilon_i,$$

  whose inside-the-zone slope is $\beta_1 + \beta_3$; the reported estimate is $-10(\beta_1 + \beta_3)$. This is our preferred specification.

- **Column (2), Placebo.** The same kink regression, but with $D_i$ and $W_i$ measured relative to *Mons* (Belgium) instead of Luxembourg, where no comparable foreign labour-demand shock occurred. A near-zero slope here indicates the within-commuting-range Luxembourg gradient is not a generic distance or rust-belt fact.

- **Column (3), Pooled.** The Luxembourg and Mons samples are stacked and fully interacted with a Luxembourg dummy $L_i$,

$$Y_i = \alpha + \beta_1 D_i + \beta_2 W_i + \beta_3 (D_i \times W_i) + \beta_4 L_i + \beta_5 (D_i \times L_i) + \beta_6 (W_i \times L_i) + \beta_7 (D_i \times W_i \times L_i) + \varepsilon_i.$$

The reported estimate, $-10(\beta_5 + \beta_7)$, is the placebo-adjusted difference between the Luxembourg and Mons inside-zone slopes (the triple-difference).

- **Column (4), Linear.** An OLS regression of $Y_i$ on $D_i$ on the restricted sample $D_i \leq 70$. This recovers the same inside-zone slope as the baseline kink and is reported as $-10\,\hat{\beta}$; columns (1) and (4) therefore coincide and document that the preferred estimate is the linear one.

- **Columns (5)–(6), Quadratic.** An OLS regression of $Y_i$ on $D_i$ and $D_i^2$ on the $D_i \leq 70$ sample. Because the slope of a quadratic varies with distance, we report the *marginal* slope, $-10(\hat{\beta}_1 + 2\hat{\beta}_2 d)$, evaluated at two interior points: the nearest commune (column 5), where the relationship is steepest, and the mean distance of the treated communes (column 6). The near-commune slope is systematically larger than the linear average, indicating that the effect is concentrated close to the border and flattens with distance.

- **Column (7), Local-linear.** An OLS regression of $Y_i$ on $D_i$ on the narrower bandwidth $D_i \leq 30$ km, reported as $-10\,\hat{\beta}$. This drops the far half of the commuting zone and checks that the gradient is not an artefact of the bandwidth.

The preferred per-10km effects, together with their semi-log (percent-change) counterparts and the implied treated–control gap, are reported in Table A.22.

### G.2 Spatial-gradient implied treated–control gap

The per-10km gradient effects are not directly comparable to the difference-in-differences event-study coefficients, which contrast *treated* and *control* municipalities. To put the spatial-gradient design on the same footing, we report in columns (3)–(4) of Table A.22 an *implied cross-sectional treated–control gap* attributable to the extra effect of distance in the feasible commuting range. This is the average treated–control contrast in outcomes causally explained by proximity to commuting opportunities as implied by the fitted gradient, rather than the contrast between a municipality exactly at the border and one exactly at the 70 km cutoff.

We compute it as follows. For each outcome $Y_i$ we estimate the preferred baseline kink

Table A.22: **Spatial Gradients at the Luxembourg Commuting Threshold**

| Outcome | Effect per 10 km closer | | Implied T–C gap | |
|---|---|---|---|---|
| | Level units (1) | % change (2) | Level units (3) | % of control (4) |
| *A. Far-right voting (pp)* | | | | |
| Far-right vote, 2022 | -1.67*** | -3.9%*** | -5.99*** | -12.6% |
| | (0.21) | (0.5) | (0.47) | |
| Far-right vote, 2017 | -1.70*** | -4.5%*** | -6.34*** | -15.0% |
| | (0.20) | (0.6) | (0.45) | |
| Le Pen runoff, 2002 | -0.86*** | -5.3%*** | -3.36*** | -18.2% |
| | (0.14) | (0.8) | (0.27) | |
| Le Pen runoff, 2017 | -2.25*** | -7.5%*** | -7.24*** | -20.0% |
| | (0.18) | (0.6) | (0.42) | |
| Le Pen runoff, 2022 | -2.15*** | -5.9%*** | -6.60*** | -15.8% |
| | (0.19) | (0.5) | (0.43) | |
| *B. Income* | | | | |
| Taxable income, 2021 (k€) | 1.86*** | 5.2%*** | 5.87*** | 19.2% |
| | (0.24) | (0.6) | (0.51) | |
| Median disposable income, 2021 (k€) | 0.58*** | 3.9%*** | 1.78*** | 10.9% |
| | (0.11) | (0.6) | (0.25) | |
| Taxable income growth, 1999–2021 (%) | 39.35*** | – | 95.48*** | 76.2% |
| | (3.52) | | (8.10) | |
| *C. Labour market (pp)* | | | | |
| Share working abroad, 2021 | 12.40*** | 50.3%*** | 38.24*** | 1573.3% |
| | (0.36) | (2.1) | (1.20) | |
| Unemployment rate 25–54, 2021 | -0.32* | -9.4%*** | -0.79** | -10.2% |
| | (0.18) | (1.9) | (0.33) | |
| Share with baccalauréat, 2021 | 0.51 | 2.4%** | 4.85*** | 11.4% |
| | (0.48) | (1.2) | (0.88) | |
| *D. Safety-net reliance, amount per capita (€)* | | | | |
| Total transfers (all programs) | -2.02*** | -16.8%*** | -6.22*** | -27.4% |
| | (0.42) | (2.2) | (0.82) | |
| Income-support transfers (RSA, AL, PPA) | -0.90** | -14.3%*** | -2.66*** | -20.5% |
| | (0.36) | (2.9) | (0.64) | |
| *E. Housing rents (€/m²)* | | | | |
| Rent index, 2022 | 0.77*** | 8.4%*** | 2.48*** | 34.0% |
| | (0.03) | (0.3) | (0.09) | |
| *F. Income inequality (ratio)* | | | | |
| D9/D1 labour-income ratio, 2021 | 0.29*** | 8.3%*** | 0.87*** | 30.7% |
| | (0.01) | (0.3) | (0.04) | |

*Notes:* Each estimate is the preferred baseline spatial gradient, i.e. the within-zone (inside the 70 km commuting threshold) linear slope of the outcome in distance to Luxembourg City, estimated on French communes within 150 km and expressed as the effect of being 10 km *closer* to Luxembourg. Columns (1)–(2) report this per-10km effect: column (1) in the outcome's own units (percentage points; thousands of euros for income levels; euros per capita for social-transfer amounts; euros per square metre for rents; and, for taxable-income growth, percentage points of cumulative growth), and column (2) as an approximate *percent* change from a semi-log specification in which the outcome enters in logs (communes with a zero outcome dropped; omitted for the taxable-income-growth row, which is already a rate). Columns (3)–(4) report the implied cross-sectional treated–control gap. The baseline kink model (outcome on distance, the 70 km commuting-zone indicator, and their interaction) is fit on communes within 150 km, predicted values $\hat{Y}_i$ are formed for every municipality, and the gap is the difference between the average predicted outcome among treated municipalities ($\leq$ 50 km) and control municipalities (70–150 km) – the same partition as the difference-in-differences sample, with the 50–70 km transition band informing the gradient but excluded from the contrast. Column (3) reports this gap in the units of column (1); column (4) expresses it as a percent of the control-group mean. Because it averages the gradient over the actual spatial distribution of municipalities (rather than contrasting the border with the 70 km cutoff), the gap is the spatial-gradient quantity most directly comparable to the difference-in-differences event-study coefficient. Standard errors in parentheses are HC1 robust for columns (1)–(2) and from a 500-replication municipality bootstrap for the gap in column (3). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.23: **Spatial Gradients: Specifications and Functional-Form Robustness**

| | Specification | | | Functional form (baseline) | | | |
|---|---|---|---|---|---|---|---|
| Outcome | Baseline (1) | Placebo (2) | Pooled (3) | Linear (4) | Quad. (near) (5) | Quad. (mean) (6) | Local-lin. (7) |
| *A. Far-right voting (pp)* | | | | | | | |
| Far-right vote, 2022 | -1.67*** | 0.17 | -1.84*** | -1.67*** | -5.75*** | -2.81*** | -6.72*** |
| | (0.21) | (0.23) | (0.31) | (0.21) | (0.91) | (0.29) | (1.09) |
| Far-right vote, 2017 | -1.70*** | 0.29 | -1.99*** | -1.70*** | -5.54*** | -2.77*** | -4.11*** |
| | (0.20) | (0.21) | (0.29) | (0.20) | (0.90) | (0.28) | (1.15) |
| Le Pen runoff, 2002 | -0.86*** | 0.37*** | -1.23*** | -0.86*** | -1.68*** | -1.09*** | -2.51*** |
| | (0.14) | (0.11) | (0.18) | (0.14) | (0.57) | (0.17) | (0.74) |
| Le Pen runoff, 2017 | -2.25*** | 0.09 | -2.34*** | -2.25*** | -6.25*** | -3.37*** | -4.86*** |
| | (0.18) | (0.19) | (0.26) | (0.18) | (0.74) | (0.24) | (0.93) |
| Le Pen runoff, 2022 | -2.15*** | -0.06 | -2.09*** | -2.15*** | -5.88*** | -3.19*** | -6.46*** |
| | (0.19) | (0.22) | (0.29) | (0.19) | (0.81) | (0.26) | (0.93) |
| *B. Income* | | | | | | | |
| Taxable income, 2021 (k€) | 1.86*** | 0.14 | 1.72*** | 1.86*** | 5.88*** | 2.96*** | 8.01*** |
| | (0.24) | (0.22) | (0.32) | (0.24) | (1.04) | (0.38) | (2.91) |
| Median disposable income, 2021 (k€) | 0.58*** | -0.09 | 0.67*** | 0.58*** | 1.15** | 0.74*** | 2.12** |
| | (0.11) | (0.12) | (0.16) | (0.11) | (0.55) | (0.19) | (0.86) |
| Taxable income growth, 1999–2021 (%) | 39.35*** | 1.07 | 38.28*** | 39.35*** | 169.89*** | 75.00*** | 212.08*** |
| | (3.52) | (0.78) | (3.60) | (3.53) | (15.01) | (5.71) | (41.97) |
| *C. Labour market (pp)* | | | | | | | |
| Share working abroad, 2021 | 12.40*** | 2.45*** | 9.95*** | 12.40*** | 23.93*** | 15.55*** | 21.47*** |
| | (0.36) | (0.29) | (0.46) | (0.36) | (1.67) | (0.54) | (2.27) |
| Unemployment rate 25–54, 2021 | -0.32* | 0.19 | -0.51* | -0.32* | -0.35 | -0.33 | -0.54 |
| | (0.18) | (0.20) | (0.27) | (0.18) | (0.80) | (0.22) | (0.77) |
| Share with baccalauréat, 2021 | 0.51 | 1.16*** | -0.65 | 0.51 | 4.78** | 1.68** | 11.71*** |
| | (0.48) | (0.43) | (0.64) | (0.48) | (2.29) | (0.74) | (3.08) |
| *D. Safety-net reliance, amount per capita (€)* | | | | | | | |
| Total transfers (all programs) | -2.02*** | 0.80 | -2.82*** | -2.02*** | -2.99 | -2.29*** | -8.59*** |
| | (0.42) | (0.91) | (1.00) | (0.42) | (1.82) | (0.53) | (2.14) |
| Income-support transfers (RSA, AL, PPA) | -0.90** | 0.87 | -1.78** | -0.90** | -0.58 | -0.81* | -6.21*** |
| | (0.36) | (0.76) | (0.85) | (0.36) | (1.57) | (0.46) | (1.88) |
| *E. Housing rents (€/m²)* | | | | | | | |
| Rent index, 2022 | 0.77*** | -0.13*** | 0.90*** | 0.77*** | 1.81*** | 1.06*** | 1.39*** |
| | (0.03) | (0.04) | (0.05) | (0.03) | (0.11) | (0.04) | (0.17) |
| *F. Income inequality (ratio)* | | | | | | | |
| D9/D1 labour-income ratio, 2021 | 0.29*** | 0.02*** | 0.28*** | 0.29*** | 0.70*** | 0.40*** | 0.49*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.05) | (0.02) | (0.10) |
| Bandwidth (km) | 0–70 | 0–70 | 0–70 | 0–70 | 0–70 | 0–70 | 0–30 |
| Evaluated at | | | | | nearest | treated mean | |

*Notes:* Each cell reports the spatial gradient per −10 km of additional distance toward Luxembourg City (the effect of being 10 km *closer*), estimated on French communes within 150 km. Column (1) is the within-zone (inside the 70 km threshold) linear slope around the Luxembourg cutoff; column (2) is the analogous slope around the placebo Mons (Belgium) cutoff; column (3) is the placebo-adjusted triple difference (Luxembourg minus Mons inside slope). Columns (4)–(7) probe the functional form of the baseline (Luxembourg) specification: linear; quadratic with the marginal slope evaluated at the nearest commune (col. 5) and at the mean distance of treated communes (col. 6); and local-linear on a 30 km bandwidth (col. 7). Units are percentage points, except income (thousands of euros), social-transfer amounts (euros per capita), and rents (euros per square metre). HC1 robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

model on all French communes within 150 km of Luxembourg City,

$$Y_i = \alpha + \beta_1 D_i + \beta_2 W_{70,i} + \beta_3 (D_i \times W_{70,i}) + \varepsilon_i, \qquad W_{70,i} = \mathbb{1}[D_i \leq 70],$$

and form a fitted value $\hat{Y}_i$ for every municipality. We then take the difference between the average fitted outcome among treated and control municipalities,

$$\widehat{\Delta}_{TC} \;=\; \frac{1}{|T|} \sum_{i \in T} \hat{Y}_i \;-\; \frac{1}{|C|} \sum_{i \in C} \hat{Y}_i,$$

where the treated set $T$ and control set $C$ use the same partition as our difference-in-differences sample: $T = \{i : D_i \leq 50\}$ and $C = \{i : 70 < D_i \leq 150\}$. The 50–70 km transition band thus informs the estimated gradient but is excluded from the summary contrast, exactly as in the event-study design. Because $\widehat{\Delta}_{TC}$ averages the gradient over the *actual* spatial distribution of municipalities, it is the spatial-gradient quantity directly comparable to the event-study coefficient; the border-to-cutoff effect (which equals $-70$ times the within-zone slope) is larger because it contrasts the two extremes of the distribution.

We quantify uncertainty with a nonparametric municipality bootstrap: we resample communes (within 150 km) with replacement, re-estimate the kink model, and recompute $\widehat{\Delta}_{TC}$ on each of 500 replications; the reported standard error is the standard deviation of the bootstrap distribution, so that the uncertainty reflects estimation error in the gradient. The resulting gaps line up closely with the event-study estimates: for example, the implied far-right gap of roughly $-6$ percentage points is comparable to the event-study endpoint and to the raw difference-in-differences contrast, and the implied +4.9 pp gap in the share with a baccalauréat matches the event-study increase in the share of college-educated residents.

Table A.24 compares this fitted (gradient-implied) gap with the *simple* treated–control gap—the raw difference in average outcomes between treated ($\leq$ 50 km) and control (70–150 km) communes, with no gradient model—for every outcome shown in the spatial-gradient figures. The two are close for all outcomes; the fitted gap is slightly larger in magnitude because it weights the steeper near-border portion of the gradient, whereas the raw mean dilutes the effect over the whole 0–50 km treated band. We use the fitted gap as the baseline treated–control statistic: the spatial-gradient figures annotate it as a percentage of the control

mean (in percentage points for the far-right vote-share panels), while Table A.24 reports it in each outcome's level units.

Table A.24: Treated–Control Gap: Simple vs. Fitted (Gradient-Implied)

| Outcome | Simple T–C (raw mean diff.) | Fitted T–C (gradient-implied) |
|---|---|---|
| Far-right vote share, 2022 (pp) | -5.39 | -5.99 |
| | (0.50) | (0.46) |
| Avg. taxable income, 2021 (k€) | 5.12 | 5.87 |
| | (0.51) | (0.56) |
| Median disposable income, 2021 (k€) | 1.47 | 1.78 |
| | (0.25) | (0.24) |
| Taxable income growth, 1999–2021 (pp) | 82.97 | 95.48 |
| | (7.04) | (8.27) |
| Composite rent, 2022 (euro/$m^2$) | 2.35 | 2.48 |
| | (0.09) | (0.09) |
| Social transfers per capita (euro) | -5.44 | -6.22 |
| | (0.91) | (0.79) |
| Share employed abroad (pp) | 37.03 | 38.24 |
| | (1.35) | (1.22) |
| Unemployment rate (pp) | -0.61 | -0.79 |
| | (0.42) | (0.34) |

*Notes:* Each row is a 2021/2022 cross-sectional treated–control contrast in the outcome's own units (treated $\leq$ 50 km of Luxembourg City; control 70–150 km). *Simple T–C* is the raw difference in group means (HC1 robust standard error). *Fitted T–C* is the gradient-implied gap from the preferred piecewise-linear kink fit within 150 km (500-replication municipality bootstrap standard error), as defined above. This table reports the gap in each outcome's own level units. The spatial-gradient figures annotate the same gap as a percentage of the control mean, except the far-right vote-share panels (first and second round), which annotate it in percentage points. Standard errors in parentheses.

### G.3 Bandwidth sensitivity of the 2005 referendum gradient

The 2005 "No" gradient is concentrated in municipalities closest to Luxembourg (Figure 14). This pattern reflects the geography of exposure at the time of the referendum. As Table A.26 shows, cross-border employment was already substantial within roughly 40 km of Luxembourg in the mid-2000s, where 30–60% of workers were employed abroad, but remained close to control-area levels beyond 40 km, where only around 10% worked across the border. Municipalities farther from the border were therefore only weakly exposed to Luxembourg's labor

market in 2005.

Consistent with this pattern, a polynomial test rejects linearity within the commuting zone ($\chi^2_2 = 43.3$, $p < 0.001$), indicating that the relationship is highly concentrated near the border. As shown in Table A.25, municipalities located within 30–40 km of Luxembourg exhibited a 3–5 pp lower "No" vote share per 10 km closer to the border. However, the gradient attenuates beyond 50 km and becomes positive when estimated over the full 0–70 km commuting zone. The implied treated–control difference nevertheless remains non-negative throughout, suggesting that pro-European attitudes were concentrated in the municipalities most exposed to cross-border employment opportunities.

Table A.25: **Bandwidth Sensitivity of the 2005 "No" Vote Gradient**

| Treated bandwidth (km) | Within-zone gradient (per 10 km closer, pp) | Implied T–C gap (treated vs 70–150, pp) |
|---|---|---|
| 0–30 | -5.76** | 1.81** |
| | (2.35) | (0.89) |
| 0–40 | -3.52*** | 1.33* |
| | (1.07) | (0.76) |
| 0–50 | -0.52 | 0.84 |
| | (0.68) | (0.61) |
| 0–70 | 0.76** | -0.14 |
| | (0.30) | (0.47) |

*Notes:* Outcome is the commune share of "No" votes in the 2005 referendum on the European Constitutional Treaty. The within-zone gradient is the OLS slope of the No share on distance to Luxembourg City, estimated on communes within the stated bandwidth and expressed per 10 km *closer* (HC1 standard errors). The implied T–C gap is the average treated–control prediction contrast from the preferred kink model (fit within 150 km), with treated communes set by the bandwidth and controls at 70–150 km (500-replication municipality bootstrap). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.26: **Geography of Cross-Border Exposure over Time**

| Census year | 0–20 km | 20–40 km | 40–70 km | 70–150 km |
|---|---|---|---|---|
| 1990 | 41.3 | 15.1 | 3.1 | 1.9 |
| 1999 | 57.3 | 27.7 | 9.4 | 2.7 |
| 2010 | 65.0 | 36.8 | 12.9 | 2.2 |
| 2021 | 78.2 | 47.0 | 15.0 | 2.4 |

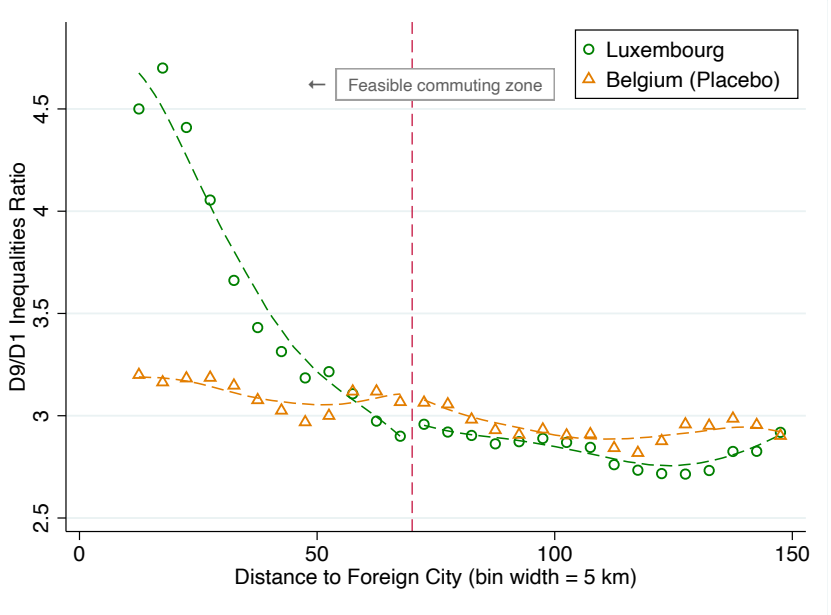
*Notes:* Mean share of employed residents working abroad (percent) by distance to Luxembourg City and census year. In the mid-2000s (between the 1999 and 2010 waves) cross-border employment was confined to the communes nearest Luxembourg: it exceeded 30% within 40 km but was only about 10% in the 40–70 km band, barely above the 70–150 km control level. The exposed zone widened only later, as the share working abroad in the 40–70 km band rose toward 15% by 2021.

### G.4 Distributional effects

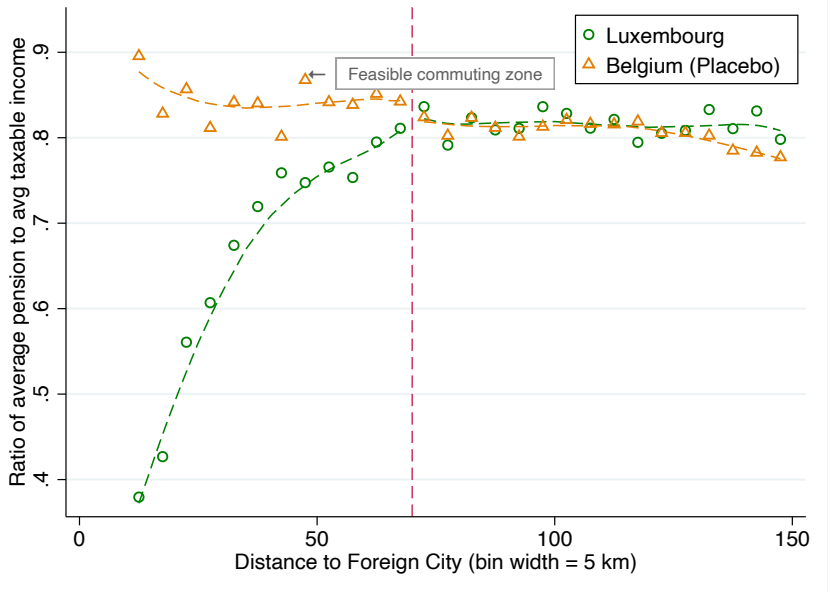
Access to high-wage foreign employment is unevenly distributed across local residents, raising income inequality along two margins: dispersion within the labour market (the interdecile ratio of labour income) and the gap between working-age residents and those outside the labour force (the ratio of average pension to average taxable income). Figure A.35 reports the spatial gradient of both measures around Luxembourg and the Mons placebo.

Figure A.35: **Distributional Effects of Access to Foreign Labor Demand**

**A. Labor Income Inequality (D9/D1 Ratio)**

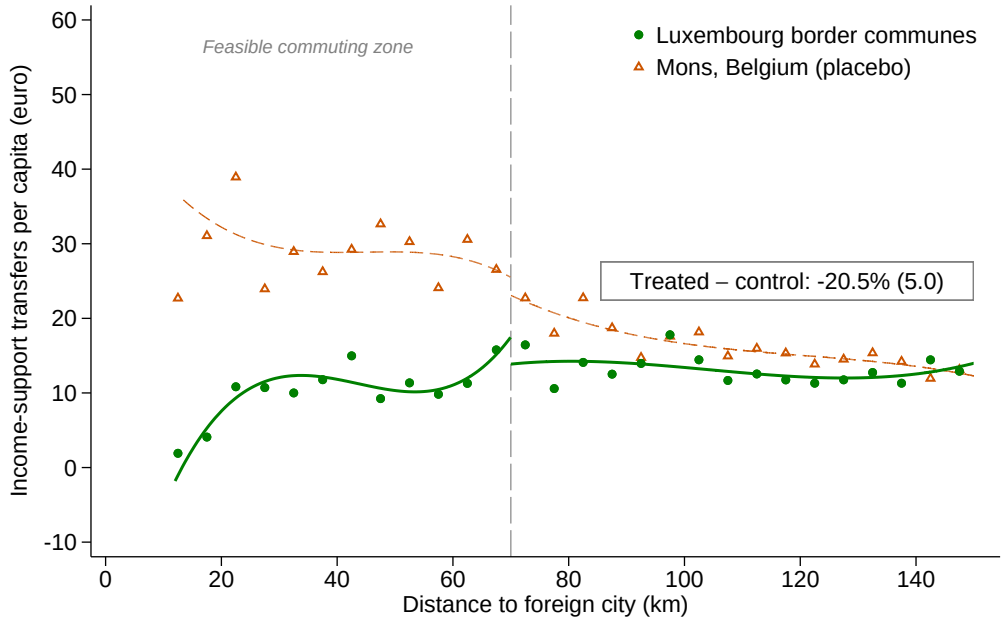



**B. Income Gap Between Workers and Non-Workers**



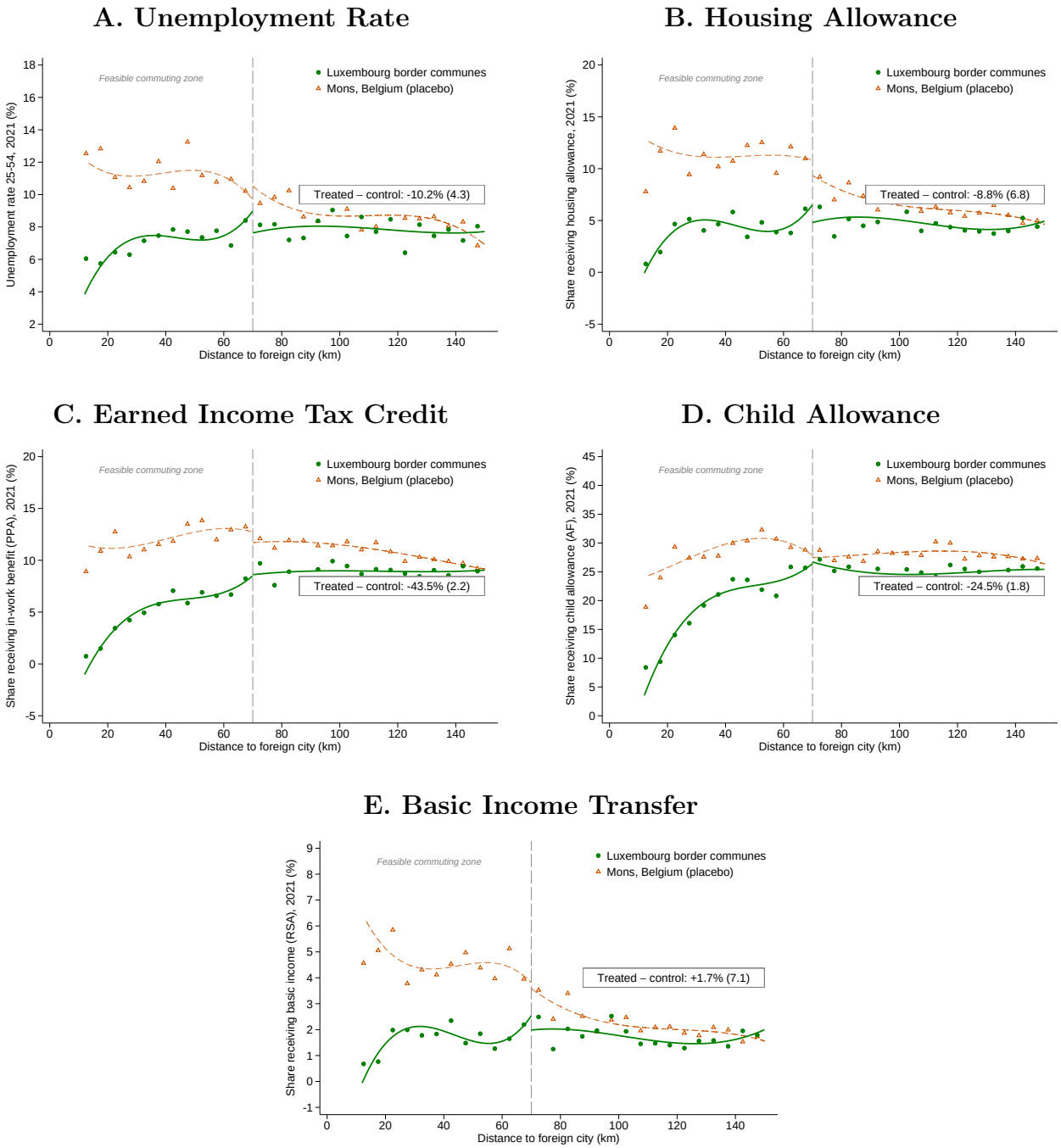

*Notes:* The figure plots measures of income inequality as a function of distance to Luxembourg City. Panel A shows the ratio of the 9th to the 1st decile (D9/D1) of labor income in 2021. Panel B reports the ratio of average pension income to average taxable income. Dots represent 5 km distance bins; lines are local polynomial fits (bandwidth = 10 km). The vertical line marks the boundary of the feasible commuting zone (70 km). Yellow series report the corresponding gradients around Mons (Belgium), a geographically similar but non-booming labor market.

Figure A.36: **Economic Distress: Income-Support Transfers**



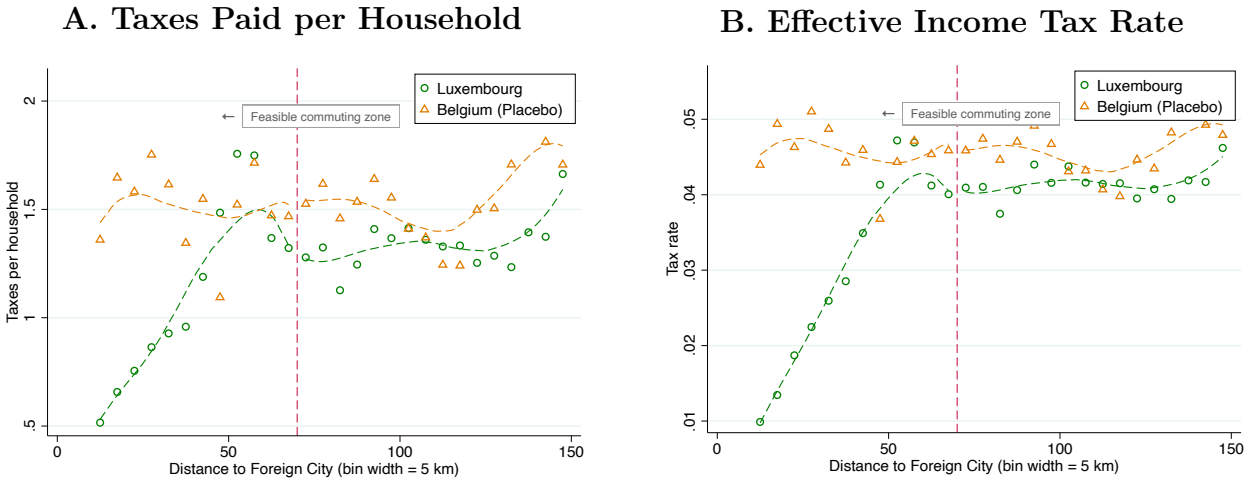

*Notes:* Spatial gradient of reliance on income-support transfers, measured as the total amount received per capita (euros) summing the basic income (RSA), housing allowance, and in-work benefit (PPA); this restricts the safety-net index of Figure 11, Panel D, to the poverty- and low-income-targeted programs, excluding the family allowance (AF). The series in green plots the gradient in distance to Luxembourg City (solid circles, cubic fit); the orange series is the placebo gradient around Mons, Belgium (open triangles, dashed). Dots are 5 km distance-bin means; the long-dashed vertical line marks the 70 km feasible-commuting threshold. The annotated estimate is the implied treated–control gap, expressed as a percentage of the control mean (treated municipalities within 50 km of Luxembourg vs. control municipalities 70–150 km away), from a 500-replication municipality bootstrap.

Figure A.37: **Foreign Opportunity and Reliance on the Social Safety Net**




*Notes:* The figure plots fiscal and labour-market outcomes against distance to Luxembourg City, shown in green (solid circles, cubic fit). The orange series (open triangles, dashed) reports the corresponding gradient around Mons, Belgium, a geographically similar but non-booming labor market. Dots are 5 km distance-bin means; the long-dashed vertical line marks the 70 km feasible-commuting threshold. The annotated estimate is the implied treated–control gap, expressed as a percentage of the control mean (treated municipalities within 50 km of Luxembourg vs. control municipalities 70–150 km away), from a 500-replication municipality bootstrap. Panels A–E report the unemployment rate and the share of households covered by major transfer programs.

Figure A.38: **Fiscal Externalities for the Central French Government**




*Notes:* Municipal tax outcomes plotted against distance to Luxembourg City (green) and the Mons placebo (orange). Panel A reports average taxes paid per household and Panel B the effective income tax rate. Both decline with proximity to Luxembourg, reflecting the taxation of cross-border workers at source in Luxembourg and the reallocation of employment away from France.

# H Political Consequences: Classification, Mechanisms, and Robustness

This appendix collects supplementary evidence on the political consequences of the local revival. It contains:

- Classification of presidential candidates into political families, with national first-round vote shares and the full candidate classification (Tables A.27–A.28).
- Robustness of the far-right results to alternative classifications, for both the event study and the spatial gradient (Tables A.29–A.30).
- Gelbach decomposition of the far-right gap into mediating channels (Table A.32).
- Effects of local exposure on voter turnout (Figure A.47).
- Within-municipality political fragmentation (Figure A.48).

### H.1 The Political Environment in France

This appendix documents the political setting underlying our analysis of far-right support. We first describe how we classify French presidential candidates into political families and define our baseline far-right measure (Section H.1). We then show that our event-study and spatial-gradient estimates are robust to alternative ways of grouping far-right candidates (Section H.1).

**Classification of Presidential Candidates** Our political outcomes are built from first-round French presidential election results, harmonized to constant municipal boundaries. The first round is well-suited to studying political preferences because voters choose among the full range of candidates rather than coordinating between two blocs, and the same broad political parties are present across elections. We assign each first-round candidate in each election to one of five political families: far left, left, center, right, and far right.

A small number of idiosyncratic, single-issue or anti-system candidates do not map cleanly onto a single family (e.g. the hunting-and-rural lists of Saint-Josse and Nihous, the ecologist Lepage, or Cheminade and Lassalle). Rather than force these candidates into one party, we treat them as *fractional*: each such candidate's votes are split evenly (one-fifth, i.e. 20%) across all five groups. Because these candidates are individually small, this choice has a negligible effect on the party-level aggregates, and Section H.1 shows our results are unchanged when the fractional rule is dropped entirely.

Our **baseline far-right measure** is the combined first-round vote share of all far-right candidates expressed as a share of valid votes (*exprimés*). It pools the radical right (Le Pen / Front National – Rassemblement National; Zemmour / Reconquête; Mégret / MNR) with the souverainiste right (de Villiers / MPF; Dupont-Aignan / Debout la France; Asselineau / UPR), plus the fractional contribution. Table A.28 lists the candidates in every first-round presidential election over the full panel, 1965–2022, and the family to which our harmonized voting panel assigns them. Candidate-level returns are available for every election from the commune-level source files, and the family assignment for the pre-1995 elections is the one embedded in the harmonized panel that produces our results; minor single-issue candidates enter through the fractional rule. The far right is absent from the first round in 1969 and 1981

and is represented by a single far-right candidate in 1965 (Tixier-Vignancour), 1974 and 1988 (Le Pen).

Table A.27 reports the resulting national first-round vote share of each political family, as a share of valid votes, for every election in our panel. The far right rises from about 2% in 1981 to roughly a third of valid votes by 2022, while the traditional governing left and right lose voting shares.

Table A.27: **National First-Round Vote Share by Political Family**

| Election | Far left | Left | Center | Right | Far right (all) | Total |
|---|---|---|---|---|---|---|
| 1981 | 20.0 | 26.9 | 3.0 | 48.0 | 2.1 | 100.0 |
| 1988 | 12.3 | 34.8 | 0.8 | 36.7 | 15.4 | 100.0 |
| 1995 | 14.3 | 26.5 | 0.1 | 38.7 | 20.5 | 100.0 |
| 2002 | 15.5 | 29.5 | 8.2 | 25.6 | 21.2 | 100.0 |
| 2007 | 9.5 | 27.0 | 18.9 | 31.1 | 13.5 | 100.0 |
| 2012 | 13.1 | 30.1 | 9.2 | 26.9 | 20.7 | 100.0 |
| 2017 | 21.6 | 6.4 | 23.7 | 19.9 | 28.4 | 100.0 |
| 2022 | 25.5 | 6.9 | 28.2 | 5.4 | 34.1 | 100.0 |

*Notes:* National first-round presidential vote shares, as a percentage of valid votes (*exprimés*), computed from our harmonized commune-level panel. Each candidate is assigned to one political family as in Table A.28; fractional (single-issue) candidates are split evenly across the five families, so the rows sum to 100. "Far right (all)" is our baseline far-right measure.

Table A.28: **First-Round Presidential Candidates and Their Classification**

| Election | Political family | Candidates |
|---|---|---|
| 1965 | Far left | Barbu |
| | Left | Mitterrand |
| | Center | Lecanuet |
| | Right | de Gaulle, Marcilhacy |
| | Far right | Tixier-Vignancour |
| 1969 | Far left | Duclos, Rocard, Krivine |
| | Left | Defferre |
| | Center | Ducatel |
| | Right | Pompidou, Poher |
| 1974 | Far left | Laguiller, Dumont, Krivine |
| | Left | Mitterrand |
| | Center | Muller, Sebag, Héraud |

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*Table A.28 continued from previous page*

| Election | Political family | Candidates |
|---|---|---|
| | Right | Giscard d'Estaing, Chaban-Delmas, Royer |
| | Far right | Le Pen, Renouvin |
| 1981 | Far left | Marchais, Laguiller |
| | Left | Mitterrand |
| | Right | Giscard d'Estaing, Chirac |
| | Fractional | Lalonde, Crépeau, Debré, Garaud, Bouchardeau |
| 1988 | Far left | Lajoinie, Juquin, Laguiller, Boussel |
| | Left | Mitterrand |
| | Right | Chirac, Barre |
| | Far right | Le Pen |
| | Fractional | Waechter |
| 1995 | Far left | Hue, Laguiller |
| | Left | Jospin, Voynet |
| | Right | Chirac, Balladur |
| | Far right | Le Pen, de Villiers |
| | Fractional | Cheminade |
| 2002 | Far left | Laguiller, Besancenot, Hue, Gluckstein |
| | Left | Jospin, Chevènement, Mamère, Taubira |
| | Center | Bayrou |
| | Right | Chirac, Madelin, Boutin |
| | Far right | Le Pen, Mégret |
| | Fractional | Saint-Josse, Lepage |
| 2007 | Far left | Besancenot, Buffet, Laguiller, Bové, Schivardi |
| | Left | Royal, Voynet |
| | Center | Bayrou |
| | Right | Sarkozy |
| | Far right | Le Pen, de Villiers |
| | Fractional | Nihous |
| 2012 | Far left | Mélenchon, Poutou, Arthaud |
| | Left | Hollande, Joly |
| | Center | Bayrou |

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*Table A.28 continued from previous page*

| Election | Political family | Candidates |
|---|---|---|
| | Right | Sarkozy |
| | Far right | Le Pen, Dupont-Aignan |
| | Fractional | Cheminade |
| 2017 | Far left | Mélenchon, Poutou, Arthaud |
| | Left | Hamon |
| | Center | Macron |
| | Right | Fillon |
| | Far right | Le Pen, Dupont-Aignan, Asselineau |
| | Fractional | Lassalle, Cheminade |
| 2022 | Far left | Mélenchon, Roussel, Poutou, Arthaud |
| | Left | Jadot, Hidalgo |
| | Center | Macron |
| | Right | Pécresse |
| | Far right | Le Pen, Zemmour, Dupont-Aignan |
| | Fractional | Lassalle |

*Notes:* First-round candidates in each French presidential election, 1965–2022, grouped by the political family we assign them. Candidates are listed in descending order of national first-round vote share within each family; families with no candidate in a given year are omitted. "Fractional" candidates are idiosyncratic single-issue or anti-system candidates whose votes are split evenly across the five families (see text). For all years, candidate returns are taken from the commune-level source files, and the family assignment is the one embedded in our harmonized voting panel; the first round had no far-right candidate in 1969 and 1981 (Le Pen did not secure the required sponsorships in 1981).

**Robustness to Far-Right Classification** Our baseline pools all far-right candidates and applies the fractional rule. We verify that the decline in far-right support is not an artifact of which fringe candidates are pooled by re-estimating both the event study and the spatial gradient under four alternative groupings:

- **Far-right (all) − baseline.** Le Pen + Zemmour + Mégret + Asselineau + Dupont-Aignan + de Villiers, plus the 0.2×fractional shares.
- **Far-right (all) − fractional.** The same broad bloc with the fractional rule *removed* (so it keeps the souverainistes but drops the even-split heuristic).

- **Standard radical right (PopuList/CHES).** Le Pen + Zemmour + Mégret (+ Tixier), excluding the souverainistes *and* the fractional rule.
- **Le Pen / RN only.** The single most consistent series across the whole period (Front National – Rassemblement National).

Table A.29 reports the 2022 event-study coefficient and Table A.30 the spatial gradient, both for the far-right share of valid votes. The 2022 event-study effect ranges from −5.7 to −6.4 percentage points in the baseline specification, and the per-10km gradient from −1.55 to −1.66, across all four groupings. Dropping the fractional rule changes essentially nothing; the headline result is invariant to classification.

Table A.29: **Event Study: 2022 Far-Right Effect by Classification**

| | | Unweighted | | Electorate-weighted | |
|---|---|---|---|---|---|
| Classification | Ref. | Baseline | Full controls | Baseline | Full controls |
| Far-right (all) – baseline | 1981 | −6.43 | −6.89 | −6.54 | −7.51 |
| | | (0.62) | (0.63) | (1.30) | (0.83) |
| Far-right (all) − fractional | 1988 | −5.73 | −3.45 | −4.37 | −3.61 |
| | | (0.63) | (0.67) | (1.24) | (1.05) |
| Standard radical right | 1988 | −6.08 | −3.79 | −4.82 | −4.08 |
| | | (0.63) | (0.67) | (1.18) | (0.99) |
| Le Pen / RN only | 1988 | −6.06 | −3.45 | −4.63 | −3.94 |
| | | (0.65) | (0.70) | (1.21) | (0.94) |

*Notes:* 2022 treated-vs-control event-study coefficient (percentage points) for the far-right share of valid votes, treated communes within 50 km of Luxembourg City vs. controls 70–150 km, commune and year fixed effects, standard errors clustered by commune in parentheses. "Baseline" includes no further controls; "Full controls" adds 1982 manufacturing share, 1982 baccalauréat share, and distance-to-border each interacted with year fixed effects. Electorate-weighted columns weight by the number of registered voters. The narrower groupings use 1988 as the reference year because Le Pen did not stand in 1981. A placebo around Mons (Belgium) is statistically insignificant for every classification. Source: `paper/code/_rerun/consolidated`.

Table A.30: **Spatial Gradient: Far-Right Vote by Classification**

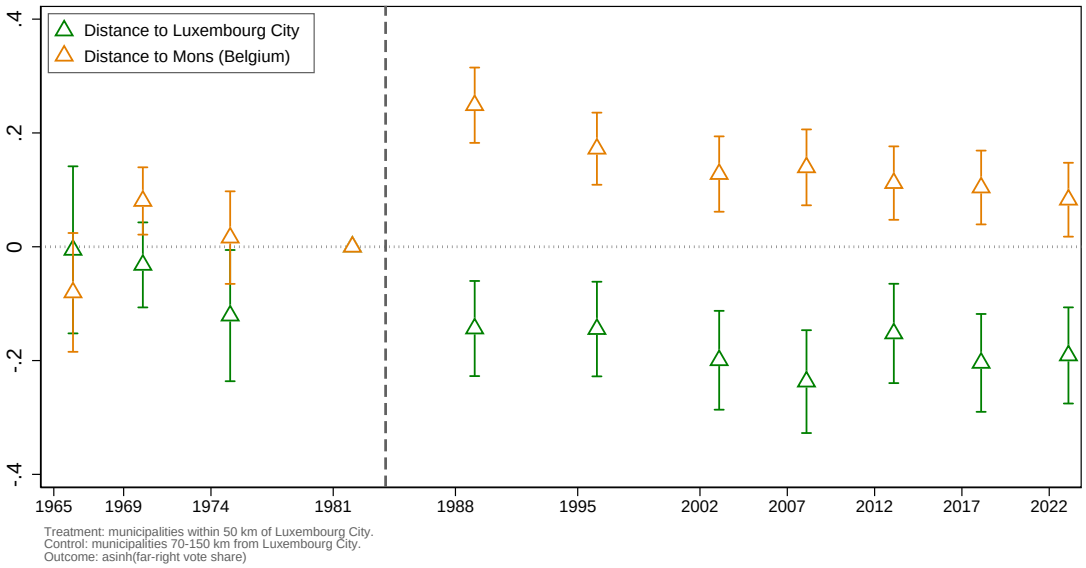
| | 2022 | | 2017 | |
|---|---|---|---|---|
| Classification | Gradient/10km | Impl. T–C gap | Gradient/10km | Impl. T–C gap |
| Far-right (all) – baseline | −1.66 (0.21) | −5.99 | −1.70 (0.20) | −6.33 |
| Far-right (all) − fractional | −1.63 (0.21) | −5.85 | −1.67 (0.20) | −6.34 |
| Standard radical right | −1.60 (0.21) | −5.34 | −1.49 (0.20) | −5.18 |
| Le Pen / RN only | −1.55 (0.21) | −5.36 | −1.49 (0.20) | −5.12 |

*Notes:* Spatial gradient in the far-right share of valid votes per 10 km *closer* to Luxembourg City (HC1 robust standard errors in parentheses), from the preferred within-zone kink regression on communes within 150 km, as in Appendix G.1. The implied treated–control gap is the average fitted-outcome contrast between treated ($\leq$ 50 km) and control (70–150 km) communes. The baseline far-right (all) gradient matches the main-text estimate in Table A.22 up to sample construction. Source: `paper/code/_rerun/diagnostics`.

## H.2 Inverse hyperbolic sine specification

The far-right vote share is close to zero in the early elections and rises to about a third of total votes by 2022. The level event study expresses the effect in vote points, which vary dramatically during the period. As a complement, Figure A.39 re-estimates the event study with the outcome in inverse hyperbolic sine, which approximates a proportional change at the vote shares observed after 1988. The estimated effect is a roughly 15 to 20 percent reduction in far-right support that is stable across the post-period, consistent with the level estimate. The placebo gradient around Mons remains flat or positive.

Figure A.39: **Far-Right Event Study, Inverse Hyperbolic Sine Outcome**




*Notes:* Event-study estimates with the far-right vote share in inverse hyperbolic sine, relative to 1981. The green series is the gradient in distance to Luxembourg City; the orange series is the placebo gradient around Mons, Belgium. Treated municipalities are within 50 km and control municipalities 70 to 150 km of the respective city. All specifications include municipality and election-year fixed effects, and 1982 municipal characteristics interacted with election-year fixed effects. Standard errors are clustered at the commune level.

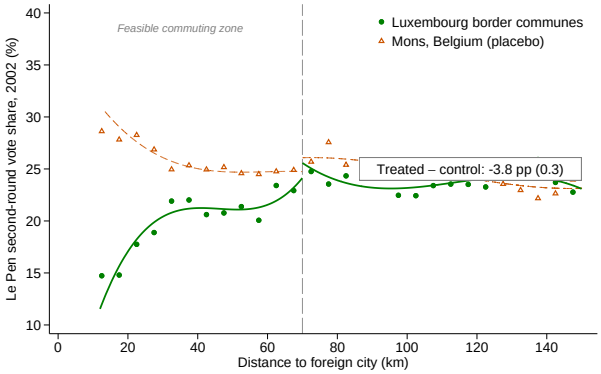
### H.3 Second-Round (Runoff) Far-Right Vote Share

The decline in far-right support near Luxembourg is not restricted to the first round. Figure A.40 plots the spatial gradient of the far-right candidate's *second-round* (runoff) vote share for the three presidential elections in which the far right reached the runoff: Jean-Marie Le Pen against Jacques Chirac in 2002, and Marine Le Pen against Emmanuel Macron in both 2017 and 2022. In each case, we evidence that the runoff far-right share rises with distance from Luxembourg within the feasible commuting zone and flattens beyond it, with no comparable gradient visible around the Mons placebo border. The far-right share here is the candidate's share of *valid* votes in the two-candidate runoff (Le Pen versus the centrist opponent), consistent with the first-round baseline. The fitted treated–control gap is −3.8 pp in 2002, −7.9 pp in 2017, and −5.6 pp in 2022. The 2017 and 2022 gaps are comparable to, or larger than, the first-round gap, consistent with a stronger local rejection of the far right when voters face a direct head-to-head choice and decreases in the share of non-far-right voters in the first round turning to the far-right in the runoff in treated regions.

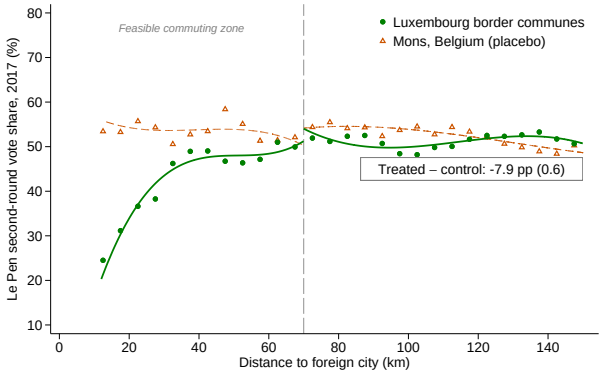
Because the runoff is a two-candidate race, the same gradient also moves municipalities across the 50% line that decides *who wins*. Figure A.41 plots the Le Pen and Macron runoff shares together for 2017 and 2022, with the decisive 50% threshold and the implied simple majority winner. In 2017 the contrast flips the winner: inside the commuting zone Macron carries the typical municipality (with a mean Le Pen vote share of 44%), while in the surrounding control band Le Pen wins (51%), the two curves crossing near 25 km from the border. In 2022 the national tide carries both zones into Le Pen victory margin, but exposure still roughly halves her margin and pulls the most exposed municipalities back toward or below the 50% line. The level shift is therefore similar across two elections despite opposite national trends, and is large enough to change the local winning bloc in the most exposed municipalities. Table A.31 reports these magnitudes: mean and vote-weighted Le Pen shares, the winning bloc and its margin, the share of municipalities won by Le Pen, and the share of competitive municipalities, for treated and control municipalities in each election.

Figure A.40: **Le Pen Second-Round (Runoff) Vote Share: Spatial Gradient**

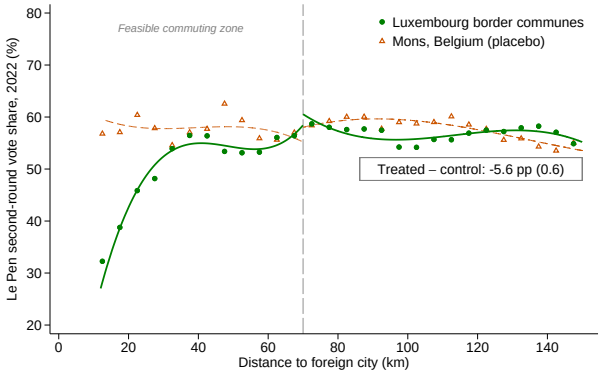
**A. 2002 (J.-M. Le Pen vs. Chirac)**




**B. 2017 (M. Le Pen vs. Macron)**

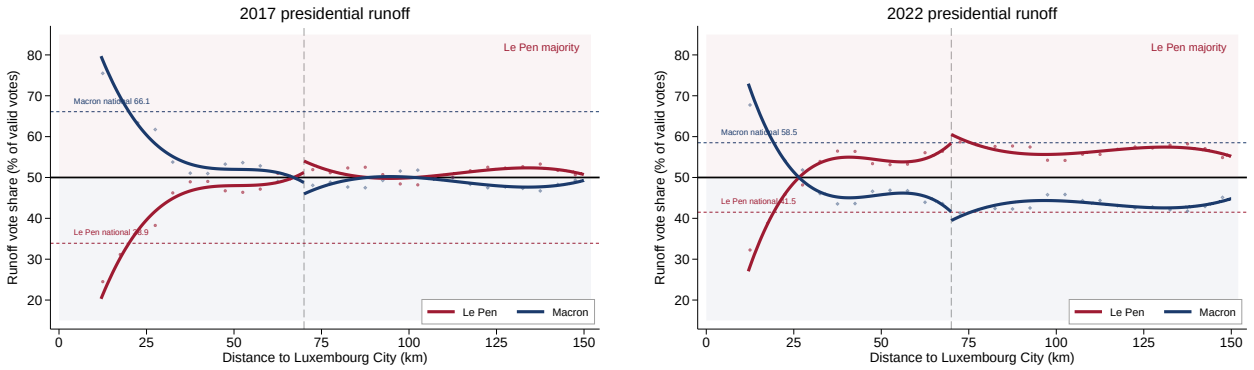



**C. 2022 (M. Le Pen vs. Macron)**




*Notes:* Each panel plots the far-right candidate's share of valid votes in the presidential *runoff* against distance to Luxembourg City (green, solid circles, within-zone cubic fit) and around Mons, Belgium (orange, open triangles, dashed). Dots are 5 km distance-bin means; the long-dashed vertical line marks the 70 km feasible-commuting threshold. The annotated statistic is the fitted (gradient-implied) treated–control gap in percentage points—average treated (within 50 km) minus control (70–150 km) contrast implied by the piecewise-linear distance fit—with a 500-replication municipality-bootstrap standard error in parentheses.

Figure A.41: **Who Wins the Runoff? Le Pen vs. Macron by Distance to Luxembourg**




*Notes:* Presidential-runoff vote shares of Marine Le Pen (cranberry) and Emmanuel Macron (navy) as shares of valid votes, plotted against distance to Luxembourg City for 2017 (left) and 2022 (right). Dots are 5 km distance-bin means; thick lines are within-zone cubic fits estimated separately on each side of the 70 km feasible-commuting threshold (long-dashed vertical line). The bold solid horizontal line at 50% is the threshold that decides which candidate wins the municipality; the faint red region above it marks a Le Pen majority and the faint blue region below it a Macron majority. The short-dashed horizontal lines mark the official national second-round results (Le Pen 33.9% / Macron 66.1% in 2017; Le Pen 41.5% / Macron 58.5% in 2022). By construction the two shares sum to 100%, so Macron's share is the mirror image of Le Pen's.

Table A.31: Substantive magnitude of the Luxembourg effect on the presidential runoff

| | 2017 | | 2022 | |
|---|---|---|---|---|
| | Treated (≤50 km) | Control (70–150 km) | Treated (≤50 km) | Control (70–150 km) |
| Municipalities | 286 | 2,363 | 286 | 2,364 |
| Mean Le Pen share (%) | 44.3 | 51.3 | 52.1 | 56.7 |
| vote-weighted (%) | 40.3 | 45.6 | 49.1 | 51.5 |
| Winning bloc (margin, pts) | Macron +11.4 | Le Pen +2.6 | Le Pen +4.1 | Le Pen +13.5 |
| Municipalities won by Le Pen (%) | 28.0 | 55.4 | 59.4 | 76.2 |
| Competitive, margin ≤5 pts (%) | 15.7 | 20.1 | 18.2 | 15.0 |
| Competitive, margin ≤10 pts (%) | 26.2 | 38.9 | 35.7 | 29.9 |

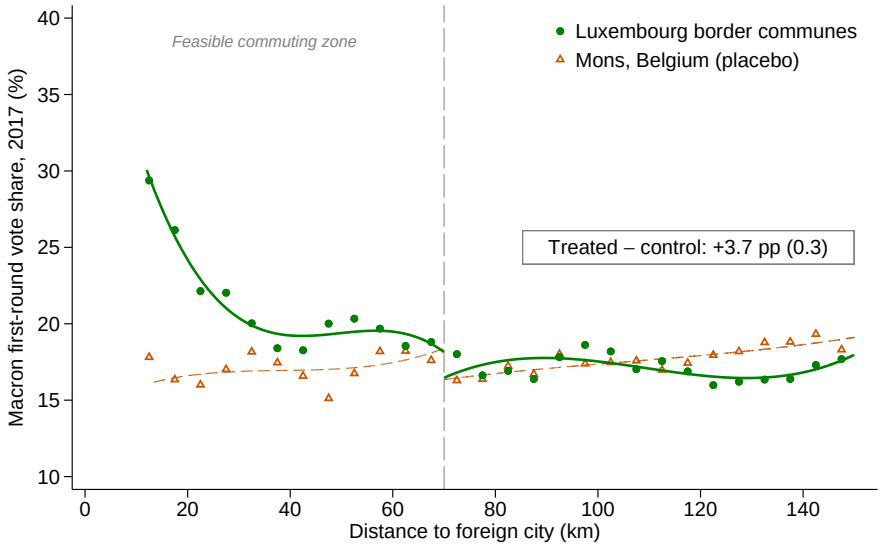
*Notes.* Le Pen share is computed over valid runoff votes, 100 × LePen/(LePen + centrist). Treated municipalities lie within 50 km of Luxembourg City; control municipalities lie 70–150 km away in the same region (the 50–70 km transition band is excluded). The margin is the gap between the two candidates (LePen% − Macron%). "Competitive" counts municipalities whose two-candidate margin is within 5 (10) points. National vote-weighted Le Pen runoff shares are 35.3% (2017) and 42.6% (2022), within ∼1 pt of the official results.

### H.4 Political Realignment Toward Mainstream Parties

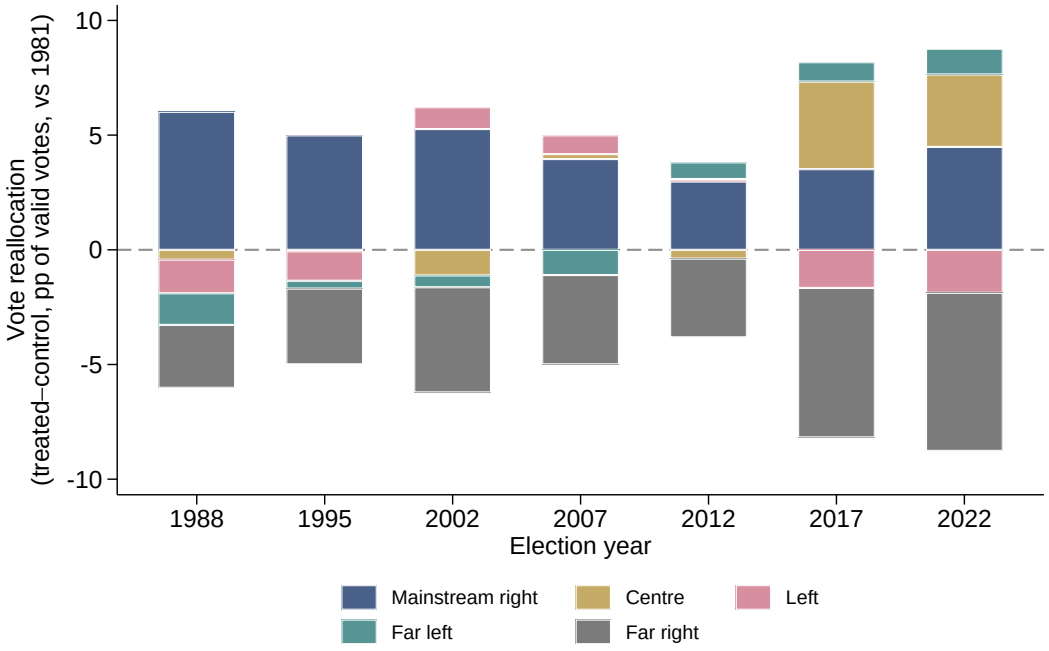
The figures below present evidence on the spatial gradient in first-round support for Macron in the 2017 presidential election (Figure A.42, Panel A), the year Macron first ran and was not an incumbent. Panel B decomposes the treated-minus-control change in vote shares relative to 1981 across the five political blocs (far left, left, centre, mainstream right, and far right), from event-study regressions of each bloc's vote share. Figure A.43 reproduces the spatial gradient exercise for the 2022 election. The pattern is the same: the first-round Macron vote share rises with proximity to Luxembourg, with no comparable gradient around the Mons placebo.

Figure A.42: **Political Realignment Toward Mainstream Parties**

**(a) Pro-Integration Centrist (Macron) Vote Share**

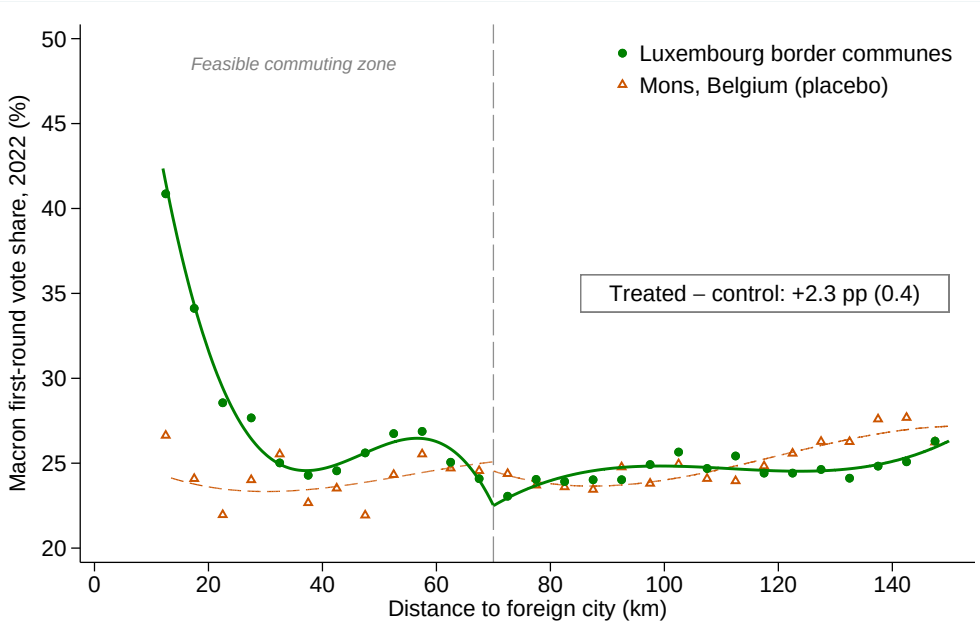



**(b) Political Reallocation Over Time**




*Notes:* Panel (a) plots the 2017 first-round Macron vote share by distance to Luxembourg City (green) and to Mons, Belgium (orange); points are 5 km bin means and lines are within-zone cubic fits. The annotated figure is the treated-minus-control gap (treated $\leq$ 50 km, control 70–150 km) in percentage points, with a 500-replication municipality-bootstrap standard error in parentheses. Panel (b) decomposes the treated-minus-control change in vote shares relative to 1981 across the five political blocs (far left, left, centre, mainstream right, and far right), from event-study regressions of each bloc's vote share on treated $\times$ year indicators with municipality and year fixed effects and the 1982 manufacturing share, 1982 baccalauréat share, and distance to the border interacted with year fixed effects; standard errors are clustered by municipality. Vote shares sum to one, so the five blocs sum to zero: the grey far-right block below the axis is exactly offset by the gains of the other blocs above it, showing where the far-right losses are reallocated. The far-right bloc aggregates all far-right candidates in the first round.

Figure A.43: **First-Round Macron Vote Share, 2022: Spatial Gradient**



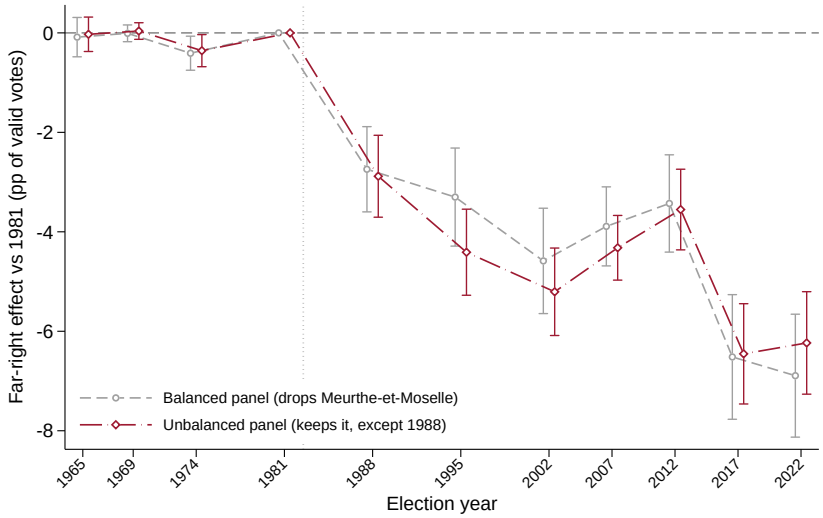

*Notes:* First-round Macron vote share in the 2022 presidential election by distance to Luxembourg City (green, solid circles with cubic fit) and, as a placebo, to Mons, Belgium (orange, open triangles with dashed fit). Points are 5 km distance-bin means; the long-dashed vertical line marks the 70 km feasible-commuting threshold. The annotated estimate is the fitted treated–control gap (treated $\leq$ 50 km, control 70–150 km) in percentage points, from a 500-replication municipality bootstrap. This is the 2022 counterpart to the 2017 gradient in the main text (Figure A.42, Panel A).

### H.5 1988 Data Gap and Balanced Panel

The 1988 presidential first round data is missing for a single department, Meurthe-et-Moselle (INSEE code 54), in our harmonized voting panel: only 1 of its 538 communes is recorded in 1988, against 538 of 538 in every other election year. Because Meurthe-et-Moselle lies directly on the Luxembourg border, these are core treated municipalities: 97 of our 286 treated communes (34%) have no 1988 observation. Our baseline event study uses a balanced panel (municipalities observed in all eleven elections), which therefore drops Meurthe-et-Moselle from *every* year, leaving 2,101 of 2,650 communes.

Figure A.44 compares the baseline balanced event study with an unbalanced version that retains Meurthe-et-Moselle in every year except 1988. The two series are very close, showing flat pre-trends and a steady post-1981 decline to about −6 percentage points by 2022, so our headline result is unaffected by the panel restriction. The unbalanced 2022 effect (−6.2) is slightly smaller than the balanced one (−6.9) and lines up more closely with the cross-sectional and spatial-gradient samples, which use all 2,650 communes.

Figure A.44: **Far-Right Event Study: Balanced versus Unbalanced Panel**




*Notes:* Treated-vs-control far-right event study for the far-right share of valid votes (full controls), treated communes within 50 km of Luxembourg City vs. controls 70–150 km, with commune and election-year fixed effects and 95% confidence intervals from commune-clustered standard errors. The grey series uses the baseline balanced panel (municipalities observed in all eleven elections), which excludes Meurthe-et-Moselle because its 1988 returns are missing; the cranberry series uses an unbalanced panel that retains Meurthe-et-Moselle in every year except 1988. Full controls add the 1982 manufacturing share, 1982 baccalauréat share, and distance-to-border, each interacted with election-year fixed effects. Source: `paper/code/_rerun/cand_decomp`.

### H.6 Gelbach Decomposition of the Far-Right Gap

Table 5 in the main text adds groups of controls sequentially, so the share of the far-right gap attributed to each channel depends on the order in which the controls enter the regression. The Gelbach (2016) decomposition removes this ambiguity: it assigns each channel an order-invariant contribution $\delta_k = \sum_{j \in k} \gamma_j \varphi_j$, where $\gamma_j$ is the coefficient on mediator $j$ in the full regression and $\varphi_j$ the coefficient on *treated* in the auxiliary regression of $j$ on *treated*; the contributions sum exactly to the raw gap minus the unexplained residual ($\beta_{\text{base}} - \beta_{\text{full}}$). Table A.32 and Figure 13 report this decomposition for the preferred specification. Income alone accounts for 42% of the gap and population density for a further 20%; education, unemployment, and sectoral composition contribute little, and age structure works weakly in the opposite direction. Together the observable channels explain about 56% of the gap.

Table A.32: **What Explains the Far-Right Gap? Gelbach Decomposition**

| Channel | $\delta_k$ (pp) | Bootstrap SE | % of gap |
|---|---|---|---|
| Income | -2.30*** | (0.27) | 42.3 |
| Density | -1.08*** | (0.25) | 19.9 |
| Education | -0.19*** | (0.06) | 3.5 |
| Unemployment | -0.01 | (0.02) | 0.1 |
| Sectoral composition | 0.10 | (0.09) | -1.8 |
| Age structure | 0.41*** | (0.11) | -7.6 |
| Total explained | -3.06 | | 56.4 |
| Unexplained ($\beta_{\text{full}}$) | -2.37*** | (0.48) | 43.6 |
| Far-right gap ($\beta_{\text{base}}$) | -5.43 | | 100.0 |
| Municipalities | | 2616 | |

*Notes:* Gelbach (2016) order-invariant decomposition of the far-right treated–control gap into observable channels. The dependent variable is the first-round far-right vote share (percentage points) in the 2022 presidential election; treated communes are within 50 km of Luxembourg City and control communes are 70–150 km away. The raw gap is $\beta_{\text{base}}$ (no controls); $\beta_{\text{full}}$ is the gap remaining after conditioning on all channels (2021 census values). Each channel's contribution is $\delta_k = \sum_{j \in k} \gamma_j \varphi_j$; the contributions are order-invariant and sum to $\beta_{\text{base}} - \beta_{\text{full}}$. A negative $\delta_k$ means the channel *narrows* the gap. "% of gap" is $100\,\delta_k / \beta_{\text{base}}$. Bootstrap standard errors (500 municipality resamples) in parentheses. Figure 13 plots the same decomposition. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

### H.7 Economic Exposure and the Role of Composition

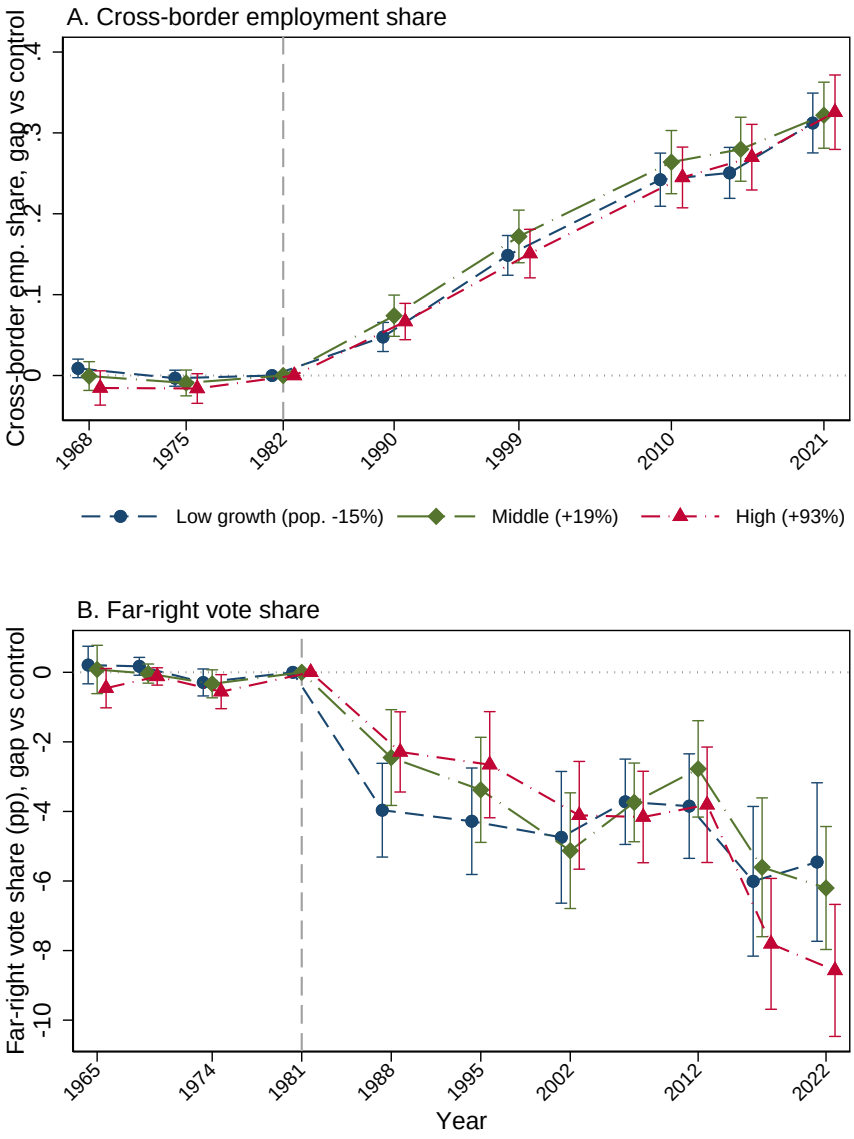
This section reports the two exhibits underpinning the mechanism discussion in the main text. Figure A.46 and Table A.34 relate far-right support to the realized intensity of cross-border employment, instrumenting exposure with the distance kink. Figure A.45 and Table A.33 estimate the cross-border employment and far-right event studies separately by tercile of treated-municipality ex-post population change, showing that the economic shock is common to all terciles while the political decline appears even where the population fell. This indicates that our headline finding is not exclusively driven by municipalities that experienced large changes in their population composition.

**Heterogeneity by population change.** We sort treated municipalities into terciles of population change between 1975 and 2021 and estimate, for each tercile $g$ (on its treated municipalities and all controls), the event study

$$Y_{it} = \alpha_i + \delta_t + \sum_{k \neq k_0} \beta_k^g \left(\text{Treated}_i \times \mathbb{1}[t = k]\right) + \sum_{k \neq k_0} (\mathbf{Z}_i' \boldsymbol{\gamma}_k) \mathbb{1}[t = k] + \varepsilon_{it}, \tag{4}$$

with municipality ($\alpha_i$) and year ($\delta_t$) fixed effects and 1982 characteristics $\mathbf{Z}_i$ (manufacturing share, bachelor share, distance to the northern border) interacted with year fixed effects. The reference year $k_0$ is 1982 for the cross-border employment share and 1981 for the far-right vote share. Figure A.45 plots the coefficient paths $\beta_k^g$, and Table A.33 reports the final-period coefficients $\beta_{2021}^g$ (cross-border share) and $\beta_{2022}^g$ (far-right).

Figure A.45: **Cross-Border Employment and Far-Right Support, by Population-Change Tercile**




*Notes:* Event studies estimated separately for terciles of treated-municipality population change between 1975 and 2021 (−15%, +19%, and +93% on average), each relative to all control municipalities. Panel A: cross-border employment share (employed residents aged 25–54 working abroad), relative to 1982. Panel B: first-round far-right vote share, relative to 1981. All specifications include municipality and year fixed effects and 1982 municipal characteristics (manufacturing share, bachelor share, and distance to the northern border) interacted with year fixed effects; standard errors are clustered at the municipality level; 95% confidence intervals are shown, horizontally offset across terciles for legibility. The increase in cross-border employment is essentially identical across the three terciles, whereas far-right support declines in all of them, including the tercile whose population fell.

Table A.33: **Cross-Border Employment and Far-Right Support by Population-Change Tercile**

| Tercile | Population change (%) | Cross-border emp. share (pp), 2021 | Far-right vote share (pp), 2022 |
|---|---|---|---|
| Low | -15 | 31.2*** | -5.45*** |
| | | (1.9) | (1.16) |
| Middle | +19 | 32.2*** | -6.20*** |
| | | (2.1) | (0.90) |
| High | +93 | 32.6*** | -8.57*** |
| | | (2.3) | (0.97) |

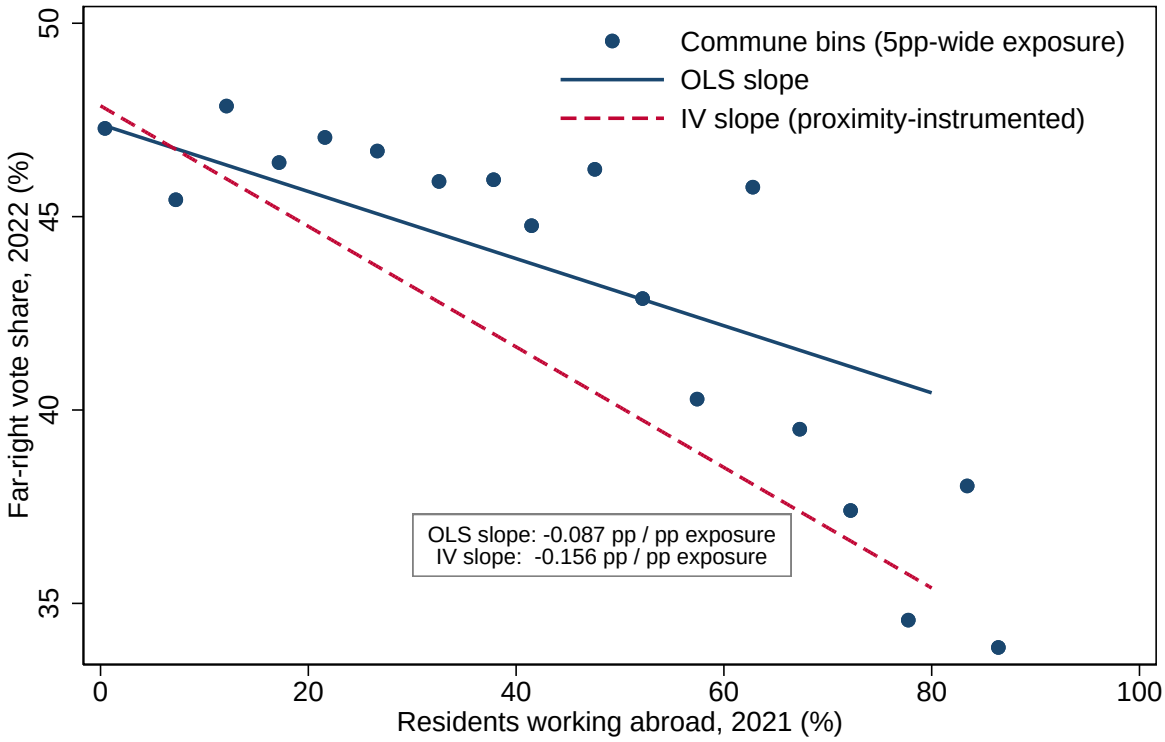
*Notes:* Final-period coefficients from equation equation (4), estimated separately for each tercile of treated-municipality population change between 1975 and 2021 (mean change in column 1), each relative to all control municipalities. Column 2 reports the 2021 effect on the cross-border employment share (employed residents aged 25–54 working abroad, percentage points; reference year 1982); column 3 the 2022 effect on the first-round far-right vote share (percentage points; reference year 1981). Standard errors clustered at the municipality level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

**Dose-response.** Across the French municipalities within 150 km of Luxembourg City, we relate the 2022 far-right vote share to realized cross-border exposure,

$$\text{FarRight}_i = \pi_0 + \pi_1 \,\text{Exposure}_i + \mathbf{X}_i'\boldsymbol{\pi}_2 + u_i, \tag{5}$$

where $\text{Exposure}_i$ is the share of resident workers employed abroad in 2021 and $\mathbf{X}_i$ a vector of demographic controls. Because exposure is endogenous, column (3) of Table A.34 instruments it with the distance kink, $\{D_i,\ \mathbb{1}[D_i \le 70],\ D_i \cdot \mathbb{1}[D_i \le 70]\}$, where $D_i$ is distance to Luxembourg City. The coefficient $\pi_1$ is the effect on the far-right vote share of a one–percentage-point increase in cross-border employment.

Figure A.46: **Far-Right Support and the Intensity of Cross-Border Exposure**



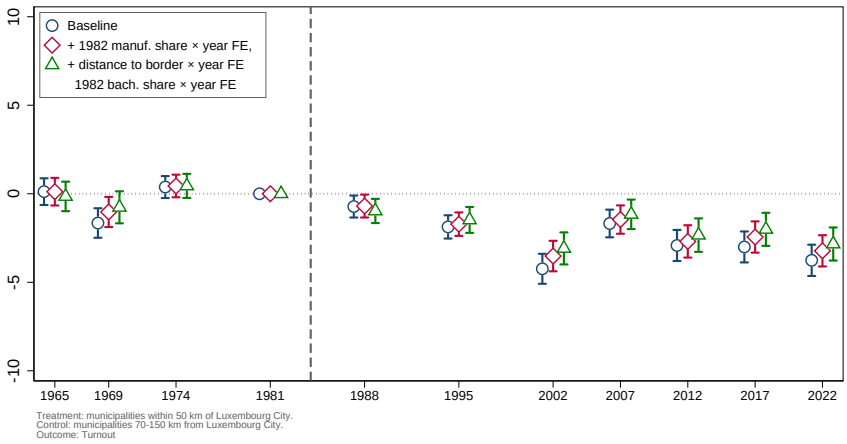

*Notes:* 2022 first-round far-right vote share against the share of resident workers employed abroad in 2021, for French municipalities within 150 km of Luxembourg City. Dots are unweighted means within 5 percentage-point (equal-width) exposure bins; bins with fewer than three municipalities are omitted. The navy line is the OLS fit; the dashed line instruments realized exposure with the distance kink (distance to Luxembourg City, the 70 km commuting-zone indicator, and their interaction; first-stage $F \approx 740$). A ten percentage-point increase in cross-border employment lowers far-right support by about 1.6 percentage points. Standard errors are heteroskedasticity-robust.

Table A.34: **Far-Right Support and Cross-Border Exposure: OLS and IV**

| | (1) OLS | (2) OLS + controls | (3) IV (proximity) |
|---|---|---|---|
| Cross-border employment share (pp) | -0.087 | -0.075 | -0.156 |
| | (0.011) | (0.010) | (0.011) |
| Demographic controls | No | Yes | No |
| First-stage F | | | 744 |
| Municipalities | 2,947 | 2,928 | 2,947 |

*Notes:* Estimates of equation equation (5). The dependent variable is the 2022 first-round far-right vote share (percentage points); the regressor is the 2021 share of resident workers employed abroad (percentage points), for the French municipalities within 150 km of Luxembourg City. Column (2) adds demographic controls (age 0–14 and 60+ shares, male share, higher-education share, manufacturing-employment share, density). Column (3) instruments exposure with the distance kink (first-stage $F$ reported). Heteroskedasticity-robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

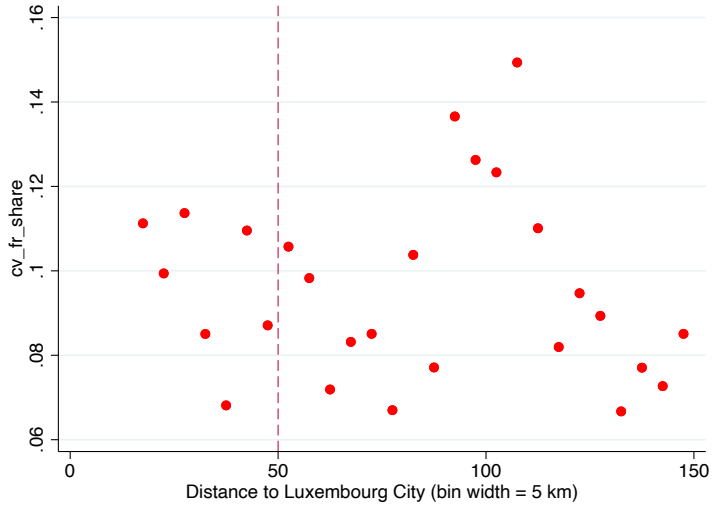
Figure A.47: **Effects of Local Exposure on Voter Turnout**



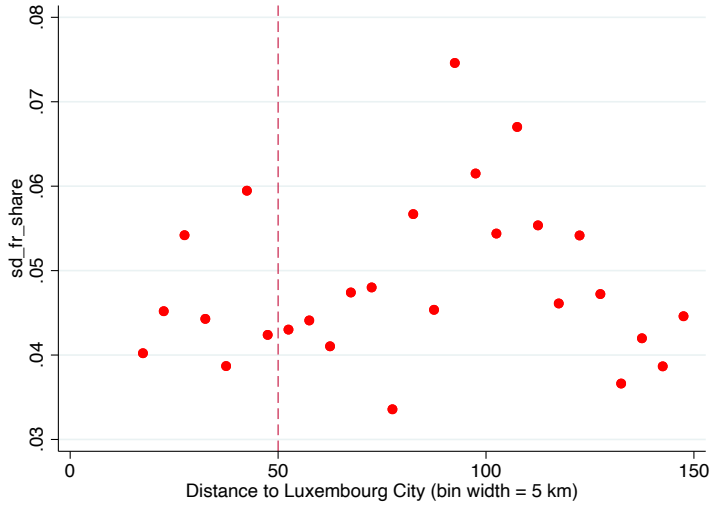

Notes: The figure reports event-study coefficients for voter turnout in presidential elections, using the baseline difference-in-differences specification. Coefficients measure the differential evolution of turnout in municipalities within commuting distance of Luxembourg relative to control municipalities, normalized to the pre-1988 period. See Figure 5 for specification details.

Figure A.48: **Within-Municipality Political Fragmentation**

**A. Coefficient of Variation of Far-Right Vote Share**




**B. Standard Deviation of Far-Right Vote Share**

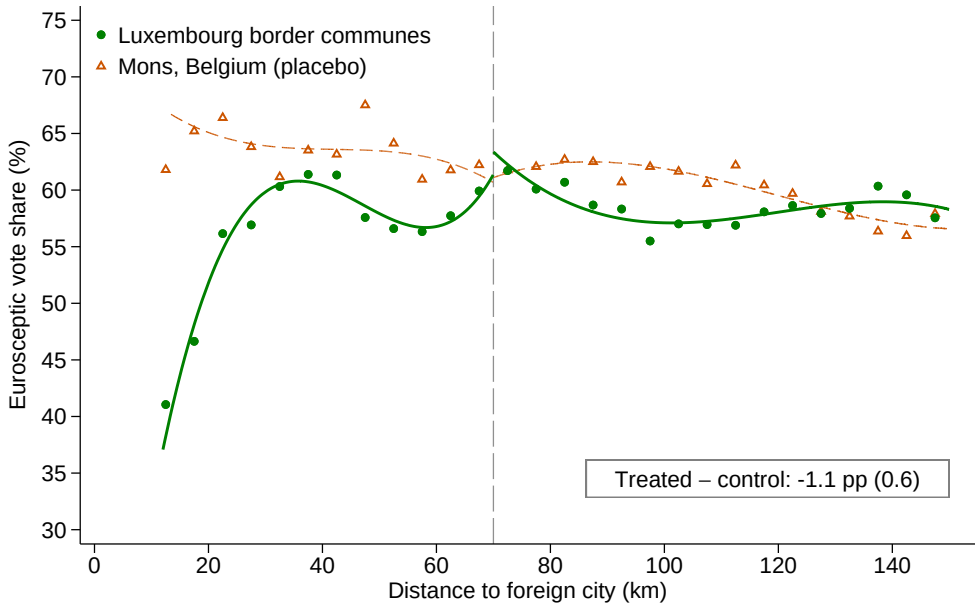



Notes: Each panel reports cross-sectional binned scatter plots for within-municipality dispersion of far-right vote shares across voting booths in presidential elections. The coefficient of variation (Panel A) and the standard deviation (Panel B) are computed at the municipality level.

## H.8 Eurosceptic Vote in the 2024 European Parliament Election

The main text reports the spatial gradient of the eurosceptic vote share in the 2019 European Parliament election (Figure 14, Panel B). Figure A.49 reproduces the exercise for the most recent election, in 2024. The pattern is the same: the share of votes cast for eurosceptic lists is markedly lower in municipalities closer to Luxembourg, with no comparable gradient around the Mons placebo.

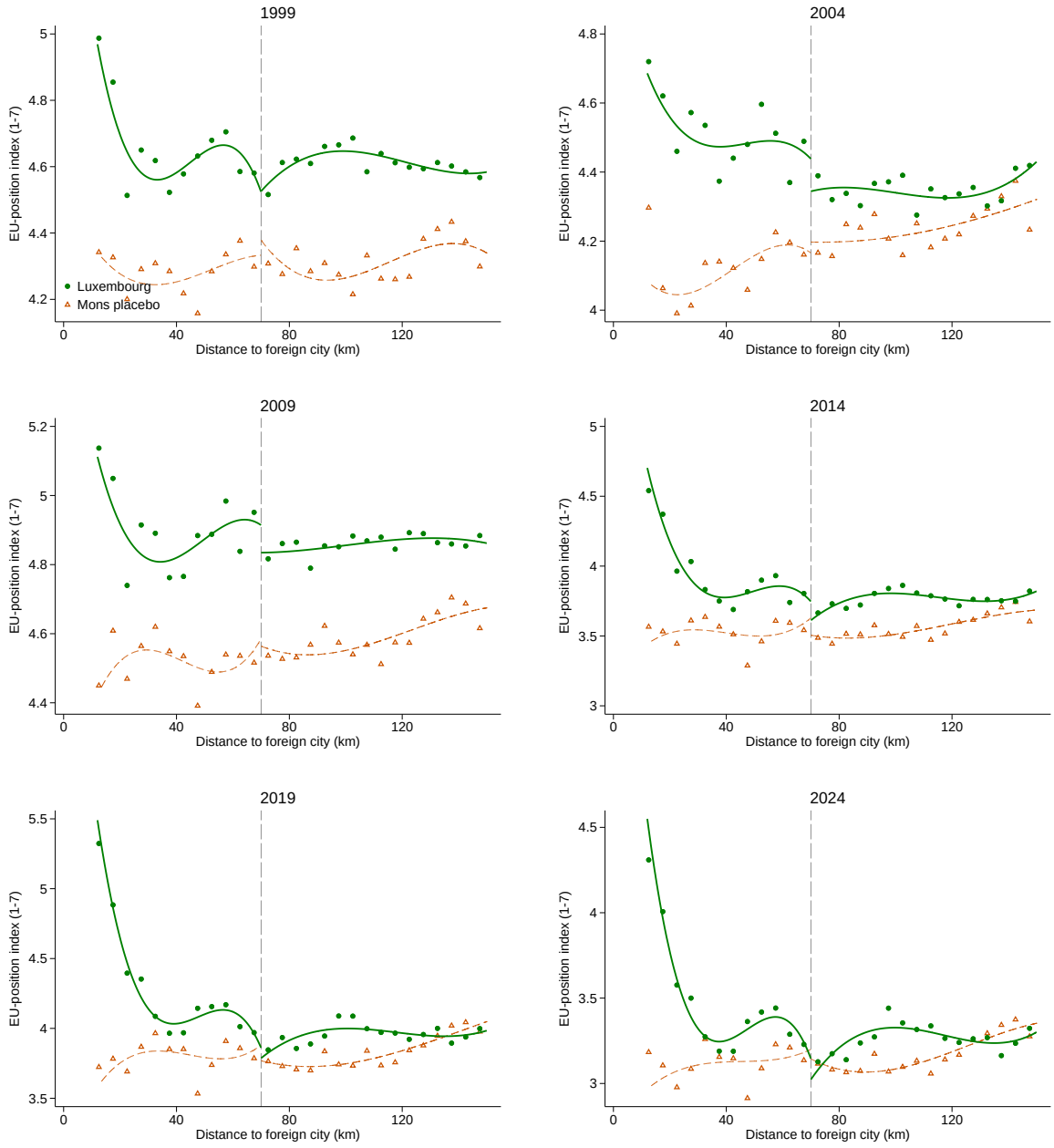
Figure A.49: **Eurosceptic Vote Share, 2024 European Parliament Election**




*Notes:* Spatial gradient of the eurosceptic vote share in the 2024 European Parliament election against distance to Luxembourg City (green, solid circles with cubic fit) and, as a placebo, against distance to Mons, Belgium (orange, open triangles with dashed fit). A list is classified as eurosceptic if its party is rated below the midpoint (a position below 4 on a 1–7 scale) on European integration in the Chapel Hill Expert Survey (Jolly et al., 2022). Dots are 5 km distance-bin means; the long-dashed vertical line marks the 70 km feasible-commuting threshold. The annotated estimate is the fitted treated–control gap (communes within 50 km of Luxembourg City minus control communes 70–150 km away) from a 500-replication municipality bootstrap. This is the 2024 counterpart to the 2019 gradient in the main text (Figure 14, Panel B).

## H.9 Spatial Gradient of the EU-Integration Index, by Election

Figure A.50: **Support for European Integration by Distance: CHES Index, 1999–2024**




*Notes:* Each panel plots, for one European Parliament election, the vote-weighted Chapel Hill Expert Survey position of a commune's electorate on European integration (1 = strongly opposed, 7 = strongly in favour; Jolly et al., 2022) against distance to Luxembourg City (green, solid circles with cubic fit) and, as a placebo, against distance to Mons, Belgium (orange, open triangles with dashed fit). Higher values indicate a more pro-European electorate. Dots are 5 km distance-bin means; the long-dashed vertical line marks the 70 km feasible-commuting threshold. The fitted treated–control gap for each election (within 50 km of Luxembourg minus 70–150 km) and its bootstrap confidence interval are plotted over time in Figure 14, Panel C.

### H.10 Political Supply in European Parliament Elections

In European Parliament elections, the ballot is through national (or, in 2004–2014, large interregional) lists. The same lists appear in every municipality of a constituency, so candidate supply does not vary with local conditions. Table A.35 documents this directly. In every election, a far-right list is present in 96–100% of the municipalities in our estimation window, and the mainstream right, left, radical left, and greens are similarly near-universal. Presence rates in treated and control municipalities are nearly identical (within about two percentage points for the far right), so the treated–control comparison isolates demand rather than differential entry. The only genuine gap is the centre bloc, which has no distinct list before the emergence of the MoDem in 2009 and of Emmanuel Macron's En Marche party in 2019; this is a national feature of the party system that applies equally to treated and control municipalities. This uniform supply of candidates distinguishes European Parliament elections from legislative or municipal elections where candidate entry is itself endogenous to local political and economic conditions.

Table A.35: **Political Supply in European Parliament Elections: Share of Municipalities Where Each Family Fielded a List**

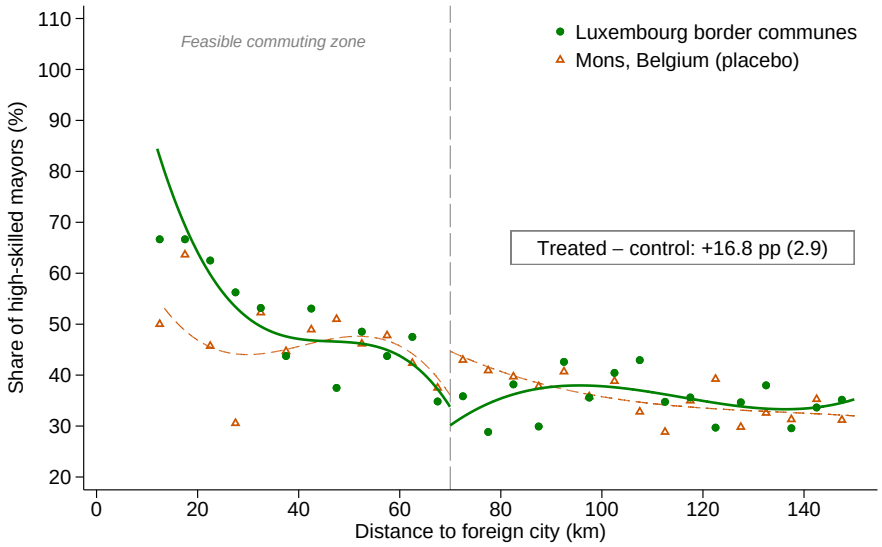
| Election | Far-right | Mainstream right | Centre | Left | Radical left | Green |
|---|---|---|---|---|---|---|
| 1999 | 98 | 100 | – | 98 | 94 | 96 |
| 2004 | 99 | 100 | – | 99 | 88 | 94 |
| 2009 | 96 | 100 | 97 | 97 | 99 | 97 |
| 2014 | 100 | 100 | 96 | 96 | 93 | 91 |
| 2019 | 100 | 98 | 100 | 93 | 94 | 98 |
| 2024 | 100 | 99 | 98 | 95 | 93 | 91 |

*Notes:* Entries are the share (%) of municipalities within 150 km of Luxembourg City in which a list of the given political family received at least one vote, by European Parliament election. Political families are classified as in the main text. "–" indicates that no distinct list of that family stood: there is no separate centre list before the MoDem (2009) and Renaissance/La République En Marche (from 2019).

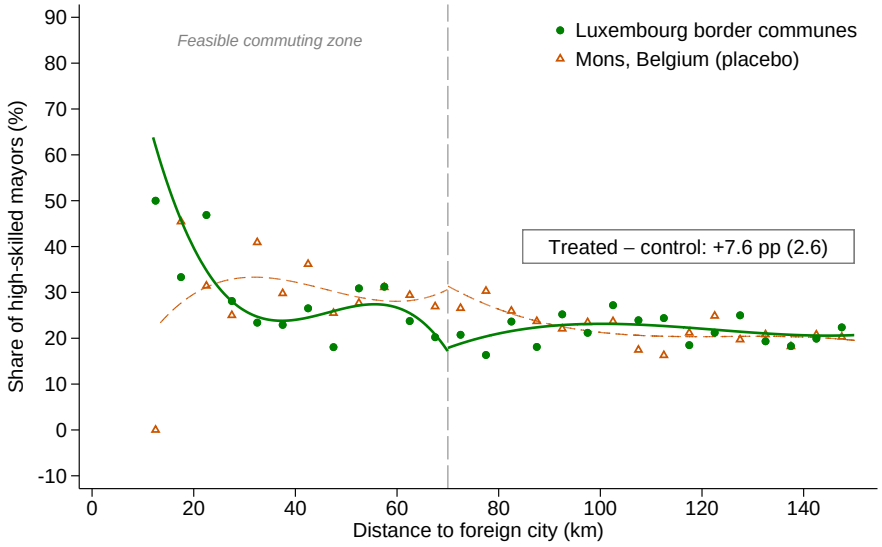
## H.11 Occupational Composition of Mayors

Figure A.51: **Share of High-Skilled Mayors by Distance to Luxembourg**

**A. Occupation of origin (including retired former cadres)**




**B. Current occupation (active mayors only)**




*Notes:* Share of sitting mayors in high-skilled occupations—PCS group 3 (cadres and higher intellectual professions, i.e. managers and professionals) plus business owners (chefs d'entreprise)—by distance to Luxembourg City (green, solid circles with cubic fit) and, as a placebo, to Mons, Belgium (orange, open triangles with dashed fit). Panel A uses occupation of origin, adding retired mayors whose former occupation was a cadre; Panel B counts only mayors currently in a high-skilled occupation. Each municipality contributes its single sitting mayor; mayor occupation is from the Répertoire National des Élus. Points are 5 km distance-bin means; the long-dashed vertical line marks the 70 km feasible-commuting threshold. The annotated estimate is the fitted treated–control gap (treated within 50 km, control 70–150 km) in percentage points, from a 500-replication municipality bootstrap.

# I Data and Measurement

This appendix documents the data sources, sample construction, and variable definitions underlying the analysis. It contains:

- The DADS worker panel: sample construction, filters, and worker counts by cohort and treatment assignment (Section I.1).
- Worker survival analysis and the assignment of treatment (commune of work, commune of residence, and exposure measures).
- The DADS salaries data and the commune-level regression sample (Section I.2).
- The commune crosswalk and harmonization of communes across time, and the sector classification (Section I.3 and I.4).
- The Census (Saphir) sample, with observation and commune counts by census wave (Section I.5).
- Construction of census variables, including manufacturing share, education, distance, employment concentration, occupation, age, income, housing, political, and public-goods measures.

### I.1 DADS - Worker Panel

**Availability: 1976 - 2010, excluding 1981, 1983, 1990**

**Unit:** Worker

The DADS panel is a worker-level panel version that follows a 4% (of population) random sample of workers from 1976-2010, excluding 1981, 1983, 1990 (census years). The full sample contains 7,266,269 workers.

For our worker-level estimation, we filter for:

- Workers continuously employed between 1976-1979, 1979-1982, and 1982-1985 ($\approx 8.5\%$ of panel)
- Worker's main job. We also drop workers whose main job is classified as income from distribution of social security funds during the continuous work period.

After applying these filters, some workers still have duplicates if they held multiple jobs in a given year. We keep their highest paid job and create separate variables aggregating their total salary, days worked, and hours worked across jobs. For remaining duplicates in terms of wage, we keep the observation with the most days/hours worked.

To further filter the sample, we keep those that are within 150km of Luxembourg City (treated if 0-50km away, control within 70-150km away) based on their municipality of work at the beginning of the cohort period or municipality of residence in 1993 (data on residence is only available starting in 1993). **Final sample is 30,773 workers.**

Table A.36: Number of Workers by Year Cohort

| Year Cohort | Full Data | Main Job Filter | Drop initial emp in SS | Within 150km of Lux. City |
|---|---|---|---|---|
| 1976–1979 | 392,772 | 386,563 | 379,847 | 20,968 |
| 1979–1982 | 423,566 | 416,938 | 410,372 | 21,878 |
| 1982–1985 | 396,516 | 389,416 | 382,882 | 20,572 |
| Total unique workers | 618,879 | 609,804 | 600,566 | 30,773 |

*Notes:* The table reports the number of workers in each worker cohort after applying each filter. The final row reflects the total number of unique workers. Columns do not sum to the final row because some workers overlap across cohorts for continuous work.

Table A.37: Number of Workers by Treatment Assignment

| Year Cohort | Commune of Work | | | Commune of Residence (1993) | | |
|---|---|---|---|---|---|---|
| | Total | Treat | Control | Total | Treat | Control |
| 1976–1979 | 17,930 | 4,553 | 13,377 | 8,911 | 2,094 | 6,817 |
| 1979–1982 | 18,076 | 4,091 | 13,985 | 10,690 | 2,365 | 8,325 |
| 1982–1985 | 16,699 | 3,839 | 12,860 | 11,540 | 2,485 | 9,055 |

*Notes:* The table reports the number of workers in each estimation sample by cohort.

Table A.38: Number of Workers by Treatment Assignment (25-54)

| Year Cohort | Commune of Work | | | Commune of Residence (1993) | | |
|---|---|---|---|---|---|---|
| | Total | Treat | Control | Total | Treat | Control |
| 1976–1979 | 13,860 | 3,583 | 10,277 | 7,372 | 1,805 | 5,567 |
| 1979–1982 | 14,102 | 3,365 | 10,737 | 8,803 | 2,047 | 6,756 |
| 1982–1985 | 13,774 | 3,245 | 10,529 | 10,281 | 2,211 | 8,070 |

*Notes:* The table reports the number of workers ages 25-54 in each estimation sample by cohort. Age is assigned based on the worker's age at the end of the cohort range (i.e. for the 1976-1979 workers, we use the age in 1979).

**Worker Survival Analysis:**

In the survival analysis, we fill the worker panel for entire period so each worker has an observation from 1976-2010 (excluding missing data years). We create a binary variable equal to 0 or 1 for working in France (`wk_in_fr`). We also create two alternate outcome variables marking a worker's first exit and final exit from French labor market. First exit is defined as 1 as soon as the person exits the sample (`first_exit`). For example, if a worker leaves the sample in 1987 but returns in later years, they would have 0s filled in the panel from 1987, the year they first exited. Final exit is 1 until the final year the worker is observed in France and 0 after (`final_exit`). Age cohorts are set based on the worker's age at the end of the worker cohort range (mainly 25-54, but also broken into 10 year increments). For workers "employed" under an activity code for "Distribution of Social Security Funds", we recode their working in France indicator to 0. We run the worker survival analysis by age cohort and 3 additional cuts: gender; above/below median wage (comparing the median wage over the cohort range to the worker's wage at the end of the range); sector (see section I.4)

**Assigning Treatment**

We assign treatment in 3 ways:

- **Commune of work**, based on work location at the beginning of the worker range (e.g. `treat_t_1982` or `control_t_1982` for workers continously employed from 1982–1985).
- **Commune of residence in 1993**. Commune of residence is only available from 1993 onward so this forces the worker to have an observation in the DADS in 1993, meaning they had to have worked *in France* that year.
- **Exposure measure**, using the intensity of workers *living* in treated municipalities. Using the full salaries data, we observe commune of residence from 1988 onward. Therefore, we can calculate the ratio of the total number of workers that are residents of a treated municipality to the total number of workers in a municipality. We calculate this exposure ratio from 1988-2000 and assign the average exposure over this period to each commune. We merge this with the worker's commune of work at the beginning of the cohort range.

**Social Security Funds**

1,090 workers are "employed" under the NAF activity code for "Distribution sociale de revenus" (after dropping those initially employed in this sector). Part of this is due to social programs concentrated in the early 1990s for older workers predominantly in the steel industry.

Table A.39: SS Recipients Summary Statistics

| Year Cohort | Num. Workers | Avg Age | Avg Wage (in €1000s) | Avg Days Worked | Avg Emp History | Avg Emp in SS | Years Concentrated [%] |
|---|---|---|---|---|---|---|---|
| 1976–1979 | 899 | 58 | 20.7 | 328 | 11 | 2 | 1991 [63.1]<br>1992 [38.2]<br>1993 [67.2] |
| 1979–1982 | 823 | 56 | 21.2 | 330 | 12 | 2 | 1991 [54.1]<br>1992 [44.5]<br>1993 [73.3] |
| 1982–1985 | 650 | 55 | 21.1 | 331 | 14 | 2 | 1991 [38.3]<br>1992 [52.8]<br>1993 [70.9] |

*Notes:* The table reports summary statistics for workers in each worker cohort that ever report working for a company under "Public Administration" related to the distribution of social funds. Number of workers reports the number of unique workers in this category. Average wage uses real gross wage. Average employment history is the number of years individual is employed, and average employment in social security is number of years observed with an activity code of $\{9102, 9103, 9104, 9105, 9106\}$ pre-1993, 753C in 1993-2007, or 8430C post-2007. Years concentrated reports the top three years where workers are "employed" by these social income firms, with the percent of unique workers in each year.

Table A.40: SS Recipients, by Initial Sector

| Year Cohort | % Manuf. | % Services | % Construction. | % Public | % Steel |
|---|---|---|---|---|---|
| 1976–1979 | 94.66 | 3 | 0.78 | 1.56 | 85.2 |
| 1979–1982 | 91.01 | 5.22 | 0.73 | 3.04 | 79.35 |
| 1982–1985 | 81.54 | 11.85 | 1.54 | 5.08 | 72.31 |

*Notes: Initial sector is based on the worker's sector at the beginning of the cohort. Workers receiving social security funds as income are highly concentrated in manufacturing, more specifically in the steel industry.*

### I.2 DADS - Salaries

**Availability:** 1967 - 2023, excluding 1981, 1983, 1990, 1993-1995. We use data starting from 1976.

**Unit:** Worker Contract (Worker-Company/Salary)

**Exhaustive:** Since 1996

The DADS salaries data contains contract-level data for each worker and company. The unique worker ID is `ident/ident_s`, depending on the year. This **is not constant/worker-specific** each year (i.e. a worker can have a different `ident` value across years). While it seems like `ident-siren-year` should be a unique identifier per contract, this is not the case for people who have multiple contracts in a given year with the same employer. Prior to 2002, there are many cases of duplicates where workers either have multiple contracts at the same company or multiple positions. To resolve duplicates, we aggregate contracts at the `ident-siren-year` level, and then follow the method outlined in the post-2002 DADS user guides, taking the non-ancillary position with the highest net salary as the employee's main job. If all positions are ancillary, we create a pseudo main job, aggregating the salary of all the ancillary positions. This creates a unique dataset at the worker-year level.

#### Commune Regression

For the commune-level regressions, we collapse the salary data to the commune level. We do separate regressions for workers and employed residents of communes in our estimation sample. We use the commune crosswalk to adjust old communes and map them to their new counterpart. Even with this adjustment, it is not a balanced panel since the data is not exhaustive until 1996. Also, some communes are balanced for resident characteristics, but not for workers (e.g. a small commune with 1 firm that closes so there are no more workers reported in that commune-year).

Table A.41: Communes in Estimation Sample

| Total | Treated | Control |
|---|---|---|
| 2,740 | 302 | 2,438 |

*Notes:* The table reports the number of communes in the estimation sample from the full collapsed salary data.

Table A.42: Communes in Estimation Sample (Exhaustive Data)

| | Workers | | | Residents | | |
|---|---|---|---|---|---|---|
| | Total | Treated | Control | Total | Treated | Control |
| N | 2,082 | 268 | 1,814 | 2,726 | 301 | 2,424 |
| Share | 2,083 | 269 | 1,814 | 2,726 | 302 | 2,424 |

*Notes:* The table reports the number of communes in the estimation sample from the collapsed salary data for the exhaustive years 1996-2023.

**Other Notes:**

- Up until 2017, the raw data files were broken up by region with each file containing employees that either work or live in the region. We restrict to those working and/or living in the Grand-Est or Hauts-de-France
- France adopted the Euro in 1999, so all monetary variables in raw files pre-2000 are denominated in francs. They are converted across $t \in [1976, 1999]$ using the fixed-rate exchange of 6.55957 French francs to 1 Euro.
- We drop interns and apprentices (`typ_emploi` $\in \{A, S\}$ or `cs_broad == 7`. The CS category uses the classification of socio-professional categories defined by INSEE.
- To be consistent with the worker panel, we also remove workers employed under an activity code for the "Distribution of Social Income".

### I.3 Commune Crosswalk

To obtain a list of communes with consistent geography over time, we iterate through commune mergers and splits and resolve the changes until there is one final commune, creating a crosswalk with the original commune code and the new, harmonized commune. Treatment or control status is assigned based on the commune's distance to Luxembourg City or Mons. A commune is treated if within 0-50 km of each respective city, and in control if 70-150km away.

### I.4 Sectors

Sectors are assigned based on the activity code at the place of work. We assign workers to 4 broad categories: manufacturing, services, construction/real estate, and public administration. The activity codes are based on the Nomenclature d'activités et de Produits (NAP) codes from 1973 to 1992, which was replaced by Nomenclature d'activités française (NAF) codes, provided by INSEE. NAF codes have been revised over the years, notably in 1993, 2008, and 2015. While NAF codes remain mostly stable over time, we make adjustments to ensure consistency over the years. Note that for international comparison, the NAF codes also correspond to the NACE codes. The sectors are defined as follows:

- Manufacturing (tradables): Manufacturing, mining/extractive industries, electricity, water, agriculture.
- Services (private, non-tradable and tradable): Retail/commerce, transport, communications, restaurants, hotels, art, specialized jobs, administrative services (not including *public* administration).
- Construction/Real Estate.
- Public/Health: Public administration, education, health/social action.

### I.5 Census - Saphir

**Years:** 1968, 1975, 1982, 1990, 1999, 2010, 2015, 2021
**Unit:** Individual

Table A.43: Number of Observations

| | Total | | Living in Northeast | | |
|---|---|---|---|---|---|
| Census Year | N | Communes (Unadj.) | N | Communes (Unadj.) | Communes (Adj.) |
| 1968 | 2,591,223 | 9,410 | 2,587,483 | 9,409 | 8,782 |
| 1975 | 2,160,833 | 8,837 | 2,155,235 | 8,936 | 8,781 |
| 1982 | 2,730,964 | 8,933 | 2,722,807 | 8,932 | 8,779 |
| 1990 | 2,779,882 | 9,006 | 2,769,328 | 9,006 | 8,785 |
| 1999 | 3,121,705 | 9,014 | 3,108,404 | 9,014 | 8,782 |
| 2010 | 3,473,615 | 9,025 | 3,455,714 | 9,025 | 8,784 |
| 2015 | 3,217,777 | 8,936 | 3,200,334 | 8,935 | 8,782 |
| 2021 | 2,816,206 | 8,898 | 2,799,177 | 8,898 | 8,780 |

*Notes:* The table reports the number of observations and communes in the Northeast in Saphir Census files. Total counts all communes reported for those living *and* working in the Northeast. The adjusted commune column reflects the number of harmonized communes with consistent geography over time. When including those who work in the region, there is an extra commune reported in 1968, 1975, 1982, and 2015 where a worker is reported but no residents. It corresponds to 55164 in 1967 and 1982, 02247 in 1975, and 55394 in 2015. 02247 becomes 02580 in 1976 and 55164 becomes 55537 in 2019. These communes are not in the estimation sample for Luxembourg City.

Table A.44: Number of Communes in Estimation Sample** UPDATE

| Census Year | Total | Treated | Control | % Matched, Treated | % Matched, Control |
|---|---|---|---|---|---|
| 1968 | 2,741 | 302 | 2,439 | 100 | 99.9 |
| 1975 | 2,706 | 296 | 2,410 | 98 | 98.8 |
| 1982 | 2,710 | 300 | 2,410 | 99.3 | 98.8 |
| 1990 | 2,734 | 302 | 2,432 | 100 | 99.7 |
| 1999 | 2,736 | 302 | 2,434 | 100 | 99.8 |
| 2010 | 2,738 | 302 | 2,436 | 100 | 99.8 |
| 2015 | 2,736 | 302 | 2,434 | 100 | 99.8 |
| 2021 | 2,737 | 302 | 2,435 | 100 | 99.8 |

*Notes:* The table reports the number of (adjusted) communes in the estimation sample (donut) using the Saphir Census files.

### Manufacturing Share

Manufacturing share is calculated for each commune using the sample of workers ages 25-54, calculating the total employed in manufacturing over the total employed.

### Bachelor Degree Share

INSEE definition of education levels listed here. To get bachelor share, we include BAC/diplome universitaire or higher over total population.

**Migration Flows**

Inflows and outflows are calculated using the full census file using information reported on previous commune of residence. We harmonize all commune variables using our commune crosswalk. Inflows are counted for the current commune of residence if it differs from the previous commune reported. Likewise, outflows are counted for the previous commune of residence. Pre-2010, previous commune of residence is recorded based on where the person lived during the previous *census*. Post-2010 it refers to where the person lived in the previous *year*. Inflows and outflows are annualized for the pre-2010 years. We further decompose inflows/outflows as moves abroad, moves within department, or moves across departments. Outflows are undercounted because we do not observe moves abroad. Migration flows are not available for 2010 because data on previous residence are not reported. To calculate migration distances, we compute the distance between the centroids of each commune.