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**Three essays on health systems and resilience to
pandemics in developing countries**

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Zahra Khalilzadeh Silabi

Trois essais sur les systèmes de santé et la résilience aux pandémies dans les pays en développement

Résumé:

Cette thèse traite le risque sanitaire comme une variable économique et pose une série de questions simples : *comment le risque sanitaire se transforme-t-il en perte économique, où la résilience tient-elle, et quelles capacités en amortissent les effets* ? Pour y répondre, j'utilise une grille unifiée de *vulnérabilité*, exposition, sensibilité et capacité d'amortissement, appliquée à deux marges où les comportements s'ajustent en temps réel : les *flux privés transfrontaliers* et la *vie au travail*.

Empiriquement, le travail combine (i) des éléments macro sur le comportement de l'investissement direct étranger (IDE) et des envois de fonds autour des épidémies, lus dans une perspective régionale (transfrontalière, pays voisins) ; (ii) une analyse multi-épidémies et multi-régions qui dissocie l'*impact* des chocs du *profil de reprise* de l'IDE et teste si la capacité sanitaire de première ligne amortit le choc initial ; et (iii) des éléments micro sur les risques psychosociaux, les ressources et la santé mentale à partir de données représentatives pour la France .

Trois résultats centraux émergent. **Premièrement**, les chocs sanitaires déstabilisent les flux privés, mais les marges diffèrent : l'IDE *marque une pause*, baisse marquée dans les pays directement touchés et, plus modestement, chez leurs voisins, tandis que les envois de fonds dans les pays affectés *se stabilisent ou augmentent souvent*, conformément au partage de risque intrafamilial. La lecture conjointe des deux flux révèle de la résilience sur une marge et un retrait sur l'autre. **Deuxièmement**, sur 20 grandes épidémies dans 98 pays (2000–2022), l'IDE recule à l'impact mais les profils de reprise sont hétérogènes et varient selon le mode de transmission, d'une manière cohérente avec les canaux touchant les entreprises et l'administration (disponibilité de la main-d'œuvre, fiabilité logistique, continuité administrative). Fait crucial, les pays à *plus forte densité d'infirmières et de sages-femmes* subissent des *contractions initiales plus faibles* de l'IDE, étayant l'idée qu'une capacité visible de première ligne joue un rôle d'*infrastructure de continuité économique* en réduisant la valeur optionnelle de l'attente. **Troisièmement**, la vulnérabilité se vit dans les lieux de travail : des combinaisons de fortes exigences avec une faible autonomie et un soutien insuffisant sont systématiquement associées à de moins bons résultats de santé mentale (symptômes dépressifs, fatigue, désengagement), tandis que les *ressources*, un *encadrement soutenant* et le *soutien des collègues* jouent un rôle d'amortisseur.

Mots-clés : IDE ; Transferts de fonds ; Chocs épidémiques ; Systèmes de santé ; Pays en développement ; Risques psychosociaux

Three essays on health systems and resilience to pandemics in developing countries

Abstract:

This thesis treats health risk as an economic variable and asks a simple set of questions: *how does health risk become economic loss, where does resilience hold, and which capacities buffer the damage?* To answer them, this thesis uses a unified lens of *vulnerability*, exposure, sensitivity, and buffering capacity, applied at two margins where behaviour adjusts in real time: cross-border private inflows and working life.

Empirically, the work combines (i) macro evidence on the behaviour of foreign direct investment (FDI) and remittances around epidemics, read through a regional (cross-border, neighbouring-country) perspective; (ii) a multi-epidemic, multi-region analysis that separates the *impact* of shocks from the *return path* of FDI and tests whether frontline health capacity buffers the initial hit; and (iii) micro evidence on psychosocial risks, resources, and mental health using nationally representative data for France.

Three core findings emerge. **First**, health shocks unsettle private inflows, but margins differ: FDI *pauses*, falling sharply in directly affected economies and, more modestly, in neighbours, while remittances in affected countries *often stabilise or rise*, consistent with household risk-sharing. Reading both flows together reveals resilience on one margin and retreat on another. **Second**, across 20 major epidemics in 98 countries (2000–2022), FDI falls on impact but recovery profiles are heterogeneous and vary with transmission mode in ways consistent with channels into firms and public administration (workforce availability, logistics reliability, administrative continuity). Crucially, countries with higher nurse/midwife density experience *smaller initial contractions* in FDI, supporting the view that visible frontline capacity functions as economic continuity infrastructure by reducing the option value of waiting. **Third**, vulnerability is lived in workplaces: combinations of high demands with low control and weak support are systematically associated with worse mental-health outcomes (depressive symptoms, fatigue, disengagement), while resources, supportive supervision, and friendly colleagues can act as a buffer.

Keywords: FDI; Remittances; Epidemic Shocks; Healthcare Systems; Developing Countries; Psychosocial Risks

To my mother and father and everyone who once loved me...

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General Introduction

General Introduction

0.1 Motivation

Health is not only a matter of medicine; it is a system of risks that shapes how economies function and how people live and work. When health risks materialise, whether as epidemics or as persistent pressures, they reallocate resources, strain institutions, and affect well-being. Looking back over the last two decades, it is clear that countries and societies are vulnerable to health shocks at both the macro and micro levels.

0.1.1 Why health matters for the economy

Health is a core component of economic capacity. In this thesis, the terms "health pressures" and "health risks" refer specifically to acute health shocks arising from infectious disease outbreaks, including epidemics and pandemics such as Ebola, SARS, MERS, H1N1, and COVID-19. These shocks generate sudden and widespread disruptions across economies. The analysis does not encompass chronic illnesses or gradual demographic health transitions, but rather concentrates on short- to medium-run disturbances associated with epidemic events. When such shocks occur, whether abruptly or through prolonged waves of contagion, they alter behaviour and expectations and reshape the timing of decisions across firms, households, and the state. The effects are systematic rather than incidental, operating through a set of identifiable channels that together influence the trajectory of output, income, and welfare.

First, health shapes *labour and human capital*. Illness, mortality, caregiving, and interruptions to education reduce labour supply, productivity, and skill accumulation, with consequences for growth today and the stock of skills tomorrow (Barro et al. (2020); UNICEF et al. (2021)). Second, it affects *production and supply networks*. Health risks and protective measures interrupt inputs, logistics, and contact-intensive services; projects slow and costs rise as firms reconfigure operations (Baldwin and Tomiura (2020)). Third, epidemic shocks and associated protective measures widen *uncertainty and expectations* regarding demand, costs, and regulation, which in turn encourages firms to defer irreversible investment and hiring (Lee and McKibbin (2004); Yu et al. (2023)). Fourth, it moves *public finances*; emergency

and routine health outlays increase while revenues soften, tightening fiscal space precisely when credible service delivery is most valuable (IMF (2020)). Fifth, it alters *external accounts and market access* as mobility and tourism adjust, commodity demand shifts, and cross-border capital reassesses operating conditions (UNCTAD (2020a)).

These mechanisms generate immediate *impacts* and can leave longer-run *scars*; weaker capital formation, slower technology adoption, and setbacks to human capital when training and schooling are disrupted (UNICEF et al. (2021)). Interdependence matters too; through transport links, supply chains, labour mobility, and shared expectations, economic effects can spill across borders even when underlying health conditions differ, so purely national views risk understating the footprint (Baldwin and Tomiura (2020)).

Treating health as an economic variable clarifies what to measure and where policy can act. The sections that follow build on this premise by examining how health-related risk enters economic decisions and how existing capacities shape the translation of risk into loss.

External financial flows matter most when domestic constraints bite. Because part of this thesis examines how epidemic shocks transmit through external finance, the focus is placed on two key private flows, foreign direct investment (FDI) and remittances, that are particularly relevant for developing economies. In many developing economies, the composition of external finance has shifted since the 1990s from public sources toward private flows, notably FDI and remittances, with the private sector becoming the main beneficiary of inflows. This shift has unfolded alongside limited domestic savings, shallow credit markets, and recurring external shocks, making these two flows both large and policy-relevant.

Their scale underlines the point. Across developing economies, FDI and remittances account for meaningful shares of national income; for example, in Sub-Saharan Africa (SSA), FDI roughly quadrupled since 1990, reaching about 3.8% of GDP in 2021, while remittances stood near 2.6% of GDP (World Bank (2023)). Where internal resources are scarce, these inflows supply capital and foreign exchange and help economies plug into global markets and technology. Yet inflows can reverse, so understanding what stabilises or destabilises them is essential.

The first part of this thesis studies how epidemic outbreaks affect the development pathways of developing and emerging economies, with a particular focus on external private financial flows. In light of their scale and responsiveness, this thesis focuses on FDI and remittances because, for many developing economies, these are large private flows whose timing is especially responsive to operational risk and household risk-sharing. By contrast, portfolio flows typically move with global liquidity and monetary cycles, and official flows with budget cycles, making them less aligned with the mechanisms studied here.

Two implications follow. First, they are now the salient private flows for many developing economies, large enough to matter for growth and stability, and sufficiently responsive to changing risk to reveal how

health shocks transmit through markets and households. Second, their complementarity, one capturing multinational investment decisions and spillovers, the other capturing household risk-sharing, allows a richer picture of vulnerability and buffering capacity than either flow alone. Here, vulnerability is used in the broad sense of how systems or organisations absorb shocks, a concept defined in detail in the section "Vulnerability: definition and operationalisation". Other official flows (e.g., ODA) remain important for development finance, but they follow different allocation logics and timelines. Taken together, then, FDI and remittances are large, consequential, and differently sensitive to adverse events. Studying them side-by-side helps identify the conditions under which private capital pauses and when family networks step up, and whether stronger public-health capacity can dampen investment contractions while preserving the remittance cushion.

Understanding behaviour under risk requires first outlining the determinants of these flows. For FDI, the literature identifies macroeconomic stability, institutional quality, and infrastructure as key determinants (Blonigen (2005); Globerman and Shapiro (2002)). Studies on remittances highlight their counter-cyclical responses, often rising to support households during downturns in migrant-sending countries (Rapoport and Docquier (2006a); Yang (2008)). When health shocks hit, these mechanisms imply distinct adjustments; firms delay initiation and reinvestment as disruption and uncertainty reduce expected returns, whereas migrants step up transfers that help smooth consumption and sustain foreign-currency earnings. Studying both together is informative; it reveals the conditions under which resilience holds and when it gives way.

At the micro level, vulnerability is experienced in workplaces. Again, referring to how exposure, sensitivity, and buffering capacity shape outcomes, as elaborated in Section "Vulnerability: definition and operationalisation". Day-to-day operations face staffing pressures, shifting roles, volatile schedules, and uneven demands between on-site and remote tasks. These conditions weigh on mental health and coordination and spill over into productivity, visible in absence, presenteeism, and turnover. Where organisations sustain clear roles, fair workloads, supportive supervision, and accessible help, disruptions are contained and recovery is faster; where such conditions are thin, harms are larger and more persistent.

0.2 Vulnerability: definition and operationalisation

To analyse the macro and micro patterns consistently, this thesis adopts a single organising lens: *vulnerability*. Vulnerability is not the shock itself; it is the set of conditions that transform a shock into loss and shape the profile of recovery. Three complementary dimensions structure the analysis, *exposure*, *sensitivity*, and *buffering capacity*, chosen because they map directly onto (i) where and when shocks hit, (ii) how strongly and how long key outcomes move, and (iii) which capabilities shorten disruptions.

Framing the work in these terms keeps the discussion measurable and comparable across levels.

Exposure captures where and when shocks strike and who stands in their path. *Sensitivity* refers to the magnitude and persistence of movements in outcomes once exposed (e.g., pauses or retreats in capital inflows, expansions in remittances, deterioration or improvement in working conditions, shifts in mental health). *Buffering capacity* denotes the features that absorb strain and shorten its effects health workforce and infrastructure, institutional readiness, and social supports.

Three considerations from the literature motivate this lens in the context of health shocks. **First**, health shocks are often *regional* in their economic footprint. Throughout, “regional” denotes *cross-border co-movement between adjacent countries*. Because neighbours are tied by transport, supply chains, labour mobility, tourism, and border policies, an outbreak in one place can trigger economic disruption next door even when local caseloads are low. In such settings, exposure rarely stops at a border, and sensitivity is jointly produced.

Second, while state capacity is a known attractor of investment, the specific role of *health-system capacity as an economic stabiliser* is underexplored. The immediate impact of a shock is only part of the story; the *duration* of the effect and the *recovery path* determine whether losses fade quickly or leave lasting marks. Responses differ by transmission mode because channels into firms and public administration, workforce availability, logistics reliability, and administrative continuity differ. To operationalise a tractable and policy-relevant proxy for frontline capability, the empirical work uses *nurse and midwife density (per 1000 people)* to test whether greater capacity is associated with a shallower initial contraction in FDI during epidemics. The proxy does not capture resilience in full; it identifies a lever governments can strengthen and that lends itself to comparison.

Third, at the micro level, there is rich evidence on psychosocial risks and job resources, but limited nationally representative analysis that organises workplace conditions within the *exposure–sensitivity–buffering* lens and quantifies their associations with mental-health outcomes. Extending the same organising idea from systems to organisations keeps the thesis coherent: vulnerability is shaped not only by public systems but also by work design and managerial practice.

These considerations lead to the following overarching research question: **How do health shocks expose economic and social vulnerability, and what factors determine the sensitivity and recovery of key outcomes?** This question is operationalised through three specific lines of inquiry:

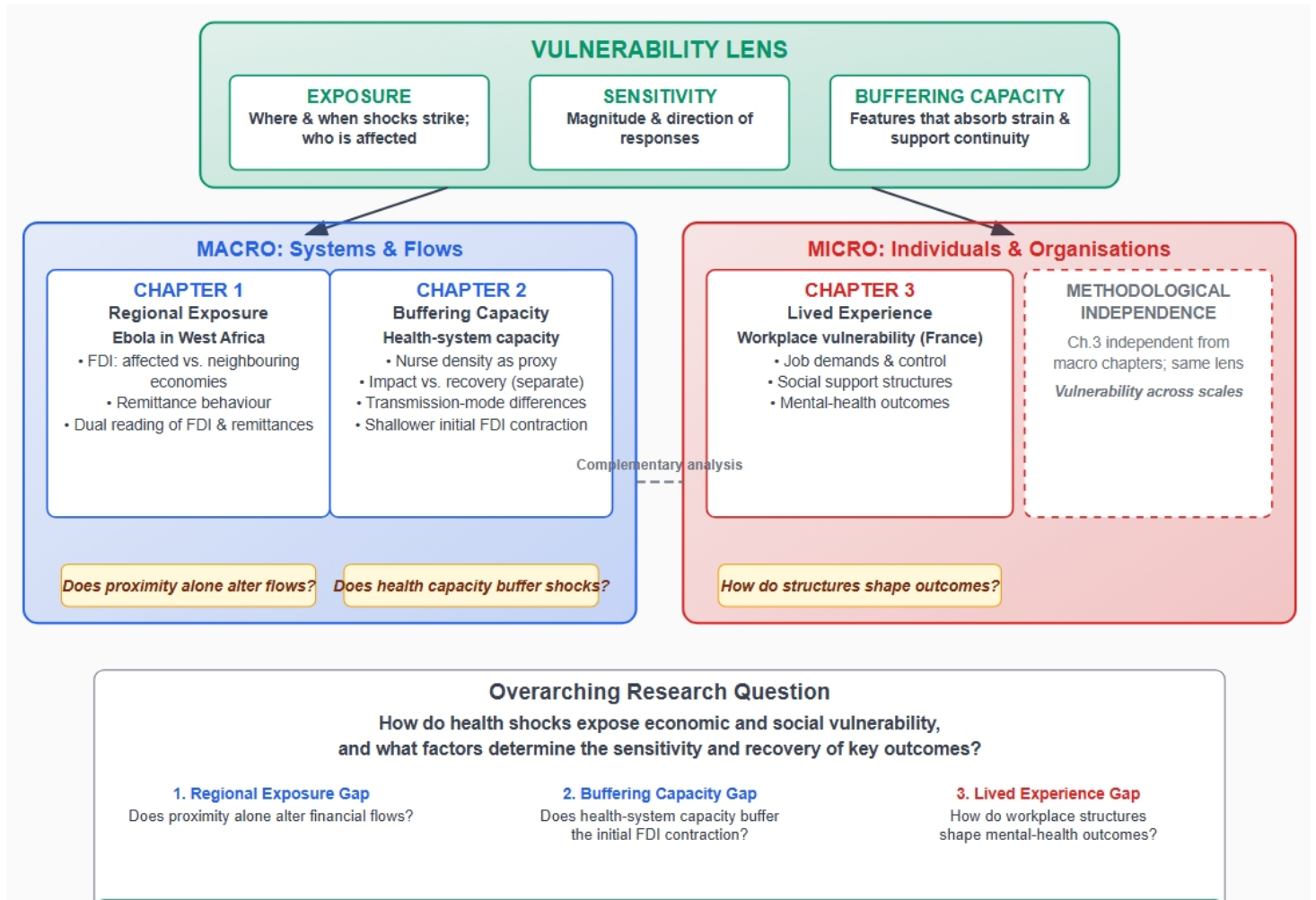
1. **Regional Exposure:** Does proximity to a health shock, distinct from direct outbreak intensity, alter the volume and behaviour of key financial flows (FDI and remittances)?
2. **Buffering Capacity:** Does stronger health-system capacity make the initial contraction in FDI shallower during health shocks?

3. **Lived Experience:** How are health-related pressures experienced at the individual level in France, and how do workplace structures shape mental-health outcomes and their sensitivity to adverse conditions?

As summarized in Figure 3.5, the vulnerability lens spans both macro- and micro-economy levels and anchors the empirical strategy.

Figure 3.5 illustrates the conceptual structure of the thesis through a multi-level vulnerability lens. It distinguishes between macro-level systems and flows (left) and micro-level lived experiences (right), both viewed through three common dimensions: exposure, sensitivity, and buffering capacity. Chapters 1 and 2 explore the macroeconomic effects of health shocks on FDI and remittances, with a focus on regional spillovers and health-system capacity. Chapter 3 turns to workplace vulnerability, using nationally representative data from France to assess how job conditions shape mental health. This visual structure highlights the coherence across chapters and underscores the shared analytical lens, while also clarifying the methodological independence of the micro-level analysis.

Figure 1: Multi-level analysis of vulnerability to health shocks



Note: The figure summarises the vulnerability lens (exposure, sensitivity, buffering capacity) and how the chapters map onto it. **Ch. 1:** regional exposure (Ebola, West Africa); FDI & remittances read together. **Ch. 2:** impact vs. recovery; test of whether nurse density buffers the initial FDI contraction; heterogeneity by transmission mode. **Ch. 3:** workplace structures and mental-health outcomes in France; methodological independence.

0.3 What we know?

0.3.1 Foreign Direct Investment: An Engine for Growth and Its Vulnerability to Health Shocks

Foreign Direct Investment (FDI) is a long-term investment that establishes a lasting interest and degree of control in a foreign enterprise, unlike portfolio holdings. The key differentiator from other international investments (like buying stocks) is the element of control. For developing nations, FDI is often sought after as a crucial catalyst for economic development. Its importance stems from the package of benefits it brings, which goes far beyond just capital.

FDI typically arrives as a bundle, technology, management practices, workforce training, and access to export markets, generating spillovers through supplier upgrading, knowledge transfer, and participation in global value chains (Javorcik (2004); Gereffi (2005); UNCTAD (2023)). This bundle helps modernise host economies, raise productivity, and diversify production structures; in that sense FDI functions as a “passport” into the global economy. Accordingly, governments, especially in developing economies, actively court FDI as a lever for structural transformation, export capacity, and foreign-exchange earnings (UNCTAD (2023); World Bank (2020)).

These advantages are not automatic. Because projects may have a degree of irreversibility and be planned on multi-year horizons, FDI is acutely sensitive to policy predictability and operating conditions. Investors continuously reassess political and macroeconomic risks; large health shocks amplify uncertainty and disrupt supply chains and workforce availability, raising the option value of waiting (Yu et al. (2023)).

The empirical literature has extensively investigated the multifaceted benefits of FDI, though it consistently highlights that these benefits are not automatic and are often contingent on the host country’s absorptive capacities. The seminal work of (Borensztein et al. (1998)) was among the first to rigorously demonstrate that FDI is a primary channel for technology transfer, which in turn is a key driver of economic growth. However, they crucially identified a threshold effect: the positive impact on growth is only realized if the host country possesses a sufficient stock of human capital to understand, implement, and adapt the imported technologies. This underscores that FDI’s benefits are a function of synergy between foreign investment and domestic preparedness

Health crises are a particularly potent external shock. The literature examining the link between health shocks and FDI has grown significantly, especially following pandemics like SARS and COVID-19. Studies consistently find that health crises induce severe economic uncertainty and disrupt the very factors that attract FDI. For instance, research on the 2003 SARS outbreak by Lee and McKibbin (2004) estimated significant short-term losses in economic activity and investment flows in affected economies due to reduced productivity, broken supply chains, and diminished investor confidence. They modeled how the shock reduced the present value of expected returns on investment, making host locations less attractive.

The COVID-19 pandemic served as a catalyst for a new wave of empirical studies that confirmed and expanded these findings. The *World Investment Report 2020* UNCTAD (2020a) meticulously documented the unprecedented 40% drop in global FDI flows, attributing it to operational disruptions, macroeconomic recession, and a pervasive “wait-and-see” attitude among investors. Furthermore, post-COVID research has begun to explore a paradigm shift in investor strategy. The *World Investment Report 2024* UNCTAD (2024) highlights that global FDI stagnated at about US\$1.3 trillion in 2023, with flows to developing countries falling by around 7%, mainly due to trade fragmentation, regulatory risk, and supply-chain

vulnerabilities. Robinson and Dolfsma (2025) further distinguishes between *proactive push FDI* aimed at resilience and *escape FDI*, emphasizing the role of institutional quality in shaping investor choices. Similarly, Zhao et al. (2024) shows that pandemic-induced declines in FDI are mediated by infrastructure capacity, reinforcing the importance of domestic resilience. At the same time, recent studies on the “China Plus One” strategy Lund et al. (2020) confirm that multinational corporations are increasingly diversifying supply chains across regions, with Southeast Asian economies such as Vietnam, India, and Thailand emerging as key alternatives. This evolving body of work confirms that a country’s ability to manage a health shock is a critical signal of its institutional quality and a key determinant of its future attractiveness to foreign investment.

0.3.2 Migrant Remittances: A Lifeline of Resilience and Its Vulnerability to Health Shocks

Unlike the large-scale, profit-driven nature of Foreign Direct Investment (FDI), migrant remittances represent a flow of capital that is profoundly human in scale and motive. Defined as the earnings that migrants send back to their families and communities in their countries of origin, remittances are a core component of many developing economies. These person-to-person transfers are typically driven by altruism, a sense of familial obligation, and a desire to support household consumption, education, and small-scale investments back home. Their sheer magnitude is staggering; remittance flows have consistently surpassed official development assistance (ODA) and, in many countries, rival or even exceed FDI as the largest source of external financing (World Bank (2023)).

The drivers of remittance flows are distinct from other capital flows. They are less influenced by macroeconomic rates of return and more by a combination of microeconomic factors. The volume and value of remittance flows are primarily driven by the size and economic success of a nation’s diaspora. A larger migrant population employed in high-income countries naturally generates a larger aggregate flow of capital back to their countries of origin, as noted by Ratha (2003). However, the decision to remit is motivated by more than just capacity; it is deeply rooted in altruism and a sense of familial insurance. Research by Yang and Choi (2007) highlights the counter-cyclical nature of these transfers, demonstrating that they often increase in direct response to economic hardship, natural disasters, or personal crises in the home country, effectively functioning as a critical private social safety net.

Beyond these core motivations, practical and macroeconomic factors significantly influence how and when money is sent. The efficiency and cost of transfer services are a major determinant, as high fees can deter formal transfers and push flows into informal, less secure channels (World Bank (2023)). Furthermore, the broader economic conditions in both the host and home country play a crucial role. For

instance, a weakening domestic currency can incentivize migrants to send more money, as the relative value of their remittance in the local economy increases, providing greater support to their families. The literature has extensively documented the multifaceted benefits of these flows at the household and national level. At the microeconomic level, remittances are a potent tool for poverty reduction and human capital development. Studies have shown they are directly associated with lower levels of poverty and child labor, and higher expenditures on health and education, particularly in recipient households (Adams and Page (2005)). This investment in human capital is a critical long-term benefit. At the macroeconomic level, remittances provide a stable source of foreign exchange, help finance current account deficits, and enhance national resilience to economic shocks by providing a disposable income cushion that supports local demand even during downturns (Ratha (2003)). However, the stability of remittance flows is not guaranteed. Their very nature, being tied to the employment and well-being of migrant workers—makes them highly vulnerable to economic and health shocks, albeit in a complex and sometimes paradoxical manner.

0.3.3 Psychosocial Risks in the Workplace: Understanding the Modern Occupational Environment

Psychosocial risks represent an increasingly significant dimension of occupational health and safety, encompassing aspects of work organization, social relations, and job design that may potentially impair psychological and physical well-being. According to the World Health Organization, these risks arise from deficiencies in work design, organization, and management, as well as from poor social context of work that may result in negative psychological, physical, or social outcomes (Leka and Jain (2010)). Unlike traditional physical hazards, psychosocial risks operate through psychological and social mechanisms, making them both complex to assess and challenging to address.

The evolution from industrial to knowledge-based economies has fundamentally transformed the nature of workplace hazards. While physical risks remain relevant, cognitive and emotional demands now constitute prominent sources of occupational stress. The digital transformation of work has further complicated this landscape through the erosion of traditional work-life boundaries and the emergence of constant connectivity as a new normative expectation. These developments necessitate a comprehensive approach to occupational safety that acknowledges the significance of psychological well-being alongside physical protection.

The theoretical understanding of these risks has been substantially advanced through several foundational frameworks. The *Job-Demand-Control model* by Karasek (1979) established the crucial interaction between psychological demands and decision latitude, identifying the high-strain job combination (high

demands with low control) as particularly detrimental to worker health. This model was subsequently expanded by the *Effort-Reward-Imbalance model* proposed by Siegrist (1996), which introduced the critical dimension of reciprocity, demonstrating that insufficient rewards for efforts expended constitute another significant pathway to work-related stress.

Manifestations and Consequences

The expression of psychosocial risks in occupational settings manifests through multiple interconnected dimensions. Common manifestations include excessive workload, conflicting role expectations, limited autonomy, inadequate social support, workplace violence, and organizational injustice. These factors frequently operate in combination, creating complex patterns of workplace stress that may evolve over time and across different organizational contexts.

The health implications of prolonged exposure to adverse psychosocial work conditions are well-established through epidemiological research. Comprehensive meta-analyses have demonstrated that chronic workplace stress associated with these risks increases the likelihood of coronary heart disease by approximately 40-50%, indicating that psychosocial factors have substantial physical health consequences beyond their psychological impacts (Kivimäki et al. (2012)). The mental health outcomes are equally significant, with robust evidence connecting poor psychosocial work conditions to elevated risks of depression, anxiety disorders, and burnout syndrome.

Economic Implications of Psychosocial Risks

The economic burden of psychosocial risks extends far beyond organizational boundaries, creating substantial costs at both macroeconomic and societal levels. Research indicates that work-related stress constitutes a significant drain on national economies through multiple channels, including reduced productivity, increased healthcare expenditures, and social welfare costs. A comprehensive systematic review by Hassard et al. (2018) found that work-related stress accounts for considerable economic losses across industrialized nations, with costs equivalent to approximately 3-4% of gross domestic product in many European countries. These costs manifest through both direct pathways, such as medical treatment and medication for stress-related illnesses, and indirect pathways, including presenteeism (reduced productivity while at work) and increased absenteeism. The economic impact is particularly pronounced in knowledge-intensive economies where cognitive performance and emotional resilience are critical drivers of productivity and innovation.

Beyond these measurable economic costs, psychosocial risks generate significant societal implications that affect long-term economic sustainability. Chronic exposure to adverse work conditions is a well-documented driver of early labor market exit through disability pensions and premature retirement,

which reduces overall workforce participation rates and creates additional strain on national social security systems (OECD (2021); Eurofound (2017)). Furthermore, research indicates that the consequences of work-related stress can transcend generations, impacting household economic stability and children’s educational outcomes, thereby potentially creating long-term human capital deficiencies (Marmot et al. (2020); Schaller and Stevens (2015)). The economic case for proactively addressing psychosocial risks is therefore compelling. Robust cost-benefit analyses indicate that organizational investments in preventive interventions, such as improving job design and managerial support, yield substantial returns through improved productivity, reduced employee turnover, and lower healthcare costs (Hamberg-van Reenen et al. (2012);McDaid et al. (2019)). This body of evidence suggests that the effective management of psychosocial risks represents not merely an ethical imperative but an economic necessity for sustainable economic development in advanced economies.

0.4 Structure of the Thesis

The thesis proceeds in three chapters, moving from *regional (cross-border, adjacent-country)* macro effects to a global multi-region panel and, finally, to micro-level outcomes within a common vulnerability lens.

Chapter 1: Ebola’s Shadow on African Economies, FDI and Remittances

The first chapter treats the West African Ebola crisis as a *regional (cross-border, adjacent-country)* economic event, not only a country-specific shock. It asks how two key external flows, foreign direct investment (FDI) and remittances, responded in directly affected countries and in their neighbours. In this chapter, a country-year panel is built for 28 African economies, combining macro data from the World Development Indicators with epidemiological information from the WHO and CDC. A custom exposure measure identifies the epicentre and codes proximate neighbours to reflect shared supply chains, transport, labour mobility, and tourism. Two complementary strategies are used. First, a local projection framework traces short- to medium-term responses of FDI and remittances around the outbreak, so both the initial dip and the path back toward baseline are visible. Second, a system GMM specification is used as a robustness check to address endogeneity concerns and to validate longer-run relationships. The results show, FDI declines sharply in directly affected economies and, to a smaller but clear extent, in neighbouring countries, consistent with regional co-movement when operating constraints are shared. Remittances behave differently; in affected countries, they increase or remain stable, reflecting household risk-sharing and the stabilising role of migrant support. About neighbours, the results do not report changes. Reading the two flows together sharpens interpretation; investment is delay-prone under uncer-

tainty, while remittances often act as a cushion. These patterns remain after checks that vary the timing of exposure, re-weight the sample, and exclude large recipients. The chapter establishes that “neighbour exposure” is measurable and policy-relevant, and that analysing FDI and remittances side by side reveals resilience on one margin and retreat on another.

Chapter 2: Public Health as a Buffer for FDI: The Role of Healthcare Services

The second chapter widens the lens to multiple epidemics and asks two linked questions: How large is the *impact* of an outbreak on FDI? And what does the *return path* look like? The sample spans 98 countries across Africa, Asia, Latin America and the Caribbean, the Middle East and North Africa; results are reported for the full sample with robustness by world-region groupings. The analysis covers 20 major outbreaks from 2000 to 2022. Outbreak timing and disease classifications come from Torres Munguía et al. (2022), which harmonises WHO Disease Outbreak News with the WHO Coronavirus Dashboard; macro controls are from the World Bank’s World Development Indicators (WDI). Dated epidemic information is linked to country–year FDI inflows and standard determinants (growth, openness, and political stability), and augmented with a tractable proxy for frontline health capacity: nurse and midwife density, observed on the same scale. A two-way fixed-effects design (country and year) estimates average changes in FDI during epidemic years, controlling for macroeconomic fundamentals to separate health-related effects from background conditions. Local projections then trace the evolution of FDI in the years that follow, allowing dynamic responses to differ by transmission mode (e.g., direct contact, zoonotic). To assess buffering, epidemic exposure is interacted with nurse/midwife density within the fixed-effects framework; the test is explicitly about the depth of the initial drop. Three results stand out. First, on average, FDI falls in impact when health risk increases, but the *recovery profile* varies by context; some cases return toward trend within a few years, others remain in a longer trough. Second, responses differ by transmission mode in ways that align with plausible channels into firms and public administration (workforce availability, logistics reliability, administrative continuity). Third, countries with higher nurse/midwife density experience *smaller impact effects* on FDI during epidemics, especially for higher-fatality or contact-intensive diseases. This supports a clear interpretation: credible frontline capacity functions as an economic *buffer* on the margin investors notice most, the size of the initial disruption.

Chapter 3: Psychosocial Risk Factors, Resources, and Workers’ Mental Health

The third chapter turns to the micro level and documents how vulnerability is lived at work. It examines how psychosocial conditions, demands, control, support, role clarity, and job insecurity are associated with mental-health outcomes among workers in France. The analysis uses France’s SUMER 2017 (Medical Monitoring of Employee Exposure to Occupational Risks), a nationally representative physician-

administered survey ($n = 20,605$; April 2016–September 2017) that covers employees in the general and agricultural regimes, hospital public services, state / local government, and large public enterprises (nearly 25 million workers). It integrates validated instruments (e.g., PHQ-9 and Karasek) to measure mental health and psychosocial exposures. Mental-health outcomes include depressive symptoms, fatigue, attentional difficulties, and loss of motivation. The analysis is not tied to a specific outbreak; it documents workplace risks and resources in their own right. Validated scales or composite indices are constructed to measure psychosocial risks and resources. Associations with mental-health outcomes are estimated using logistic regression models that adjust for demographics, sector, and contract type. Structural equation modelling complements these estimates by treating psychological well-being as a latent construct and by mapping indirect pathways through workplace conditions. Two patterns are strong and consistent. First, combinations of high demands with low control and weak support are linked to substantially worse mental-health outcomes. Second, resources, autonomy, role clarity, and supportive supervision are protective and appear to dampen the association between high demands and poor outcomes. Exposure is unequal; women and workers in healthcare, social work, and public service face higher psychosocial risks and show greater vulnerability to burnout, fatigue, and distress. The economic implications are clear; poorer mental health aligns with higher absence, presenteeism, and disengagement, costs borne by workers, employers, and the public purse.

0.5 The Added Value of This Thesis

This thesis offers a clear way to understand how health shocks affect economies and societies by using a single lens, *vulnerability*, and applying it consistently at both macro and micro levels. Its value is to turn a familiar idea into a practical framework that works across contexts, to assemble comparable evidence across countries and events, and to point to concrete levers that governments and organisations can use. In doing so, it shifts the debate from broad calls for “resilience” to specific, testable claims: who is exposed across borders, how large the disruption is, and how long it lasts, and which buffers shorten the return to normal.

Conceptually, the thesis clarifies what is meant by *vulnerability* in the economics of health. Vulnerability is not the shock itself; it is the conditions that turn a shock into loss. Following the disaster risk literature, risk can be understood as a function of three elements: the *hazard* (such as an epidemic outbreak), *exposure* (patterns of trade, transport, and work that place populations or capital in harm’s way), and *vulnerability* (the sensitivity of outcomes and the capacity to cope) (Wisner et al. (2004); World Health Organization (2007); IPCC (2014)). In this sense, vulnerability is operational and measurable: (i) who is exposed by integration into trade and labor markets; (ii) how strongly key outcomes

move when risk rises; and (iii) which capacities, in public systems and organisations, limit damage and speed recovery. Using the same lens at macro and micro levels closes a common gap in the literature, which often separates aggregate studies of capital flows from case studies of households and workplaces. The framework is not a new theory; its contribution is practical: a small set of quantities that can be estimated transparently, compared across countries, and linked to existing policy tools.

Within the international finance and development literatures, the first contribution is to put the regional, here, cross-border co-movement among neighbouring countries, front and centre. Much work on FDI under risk focuses only on the country hit by a health shock and treats neighbours as background, yet supply chains, labour markets, transport, and tourism tie nearby economies together. As a result, even with a few local cases, a shock next door can shift plans and slow activity. The approach here turns such “neighbour exposure” into something measurable; proximity itself, not only the presence of the pathogen, can be a source of economic risk, it also draws a clear line between epidemiological contagion and *economic co-occurrence*; countries can move together because they face the same constraints and expectations, even if the disease never crosses the border. A second, related contribution is to read two cross-border flows together because they are driven by different motives and adjust on different margins. FDI is profit-seeking and planned on multi-year calendars; remittances are household transfers shaped by risk-sharing and social ties. Studied alone, each tells only part of the resilience story; read side by side, they offer a clearer picture of when resilience holds and when it gives way.

A third contribution of the macro-level analysis is to examine not only the immediate impact of epidemic shocks but also the subsequent recovery. Yet whether losses fade or persist depends on duration and shape, how deep and how long the trough is, whether there is catch-up, and how quickly outcomes return toward trend. The analysis, therefore, puts recovery on the same footing as impact and asks not only “how large is the hit?” but also “what does the return path look like, and why does it differ across places?” In the same spirit, the thesis brings the health system into the investment-climate conversation. While the literature links investment to state capacity and predictable rules, the role of health-system capability is usually marginal. Here, frontline capacity is examined as an *economic buffer*; where essential services are credible, the initial disruption to investment is smaller and expectations are less unsettled during epidemics, treating part of health spending as continuity infrastructure.

Finally, the added value is microeconomy as well as macroeconomy. Research in occupational health and labour economics consistently shows that psychosocial risks, high demands with low control, weak support, and job insecurity are linked to poorer mental health, while resources such as autonomy, role clarity, and supportive supervision help to buffer strain. Using the same organising lens across levels and nationally representative data, the analysis identifies which features of work are most often associated with worse outcomes and which appear to cushion them. Conceptually, this provides the micro-foundations

for a common puzzle: aggregate indicators may “recover” while people at work do not if the organisation of work remains fragile.

Chapter 1

Chapter 1

Ebola's Shadow on African Economies: FDI and Remittances ¹

Co-written with Isabelle Rabaud

1.1 Introduction

In March 2014, "*Médecins Sans Frontières (MSF) sounded an alarm: They were struggling to contain an outbreak of Ebola in Guinea*" (The Economist 2018). Between December 2013 and January 2016, the Ebola epidemic spread across several sub-Saharan African (SSA) countries, with a particularly high concentration of cases in West Africa. Guinea, Liberia, Sierra Leone, and, to a lesser extent, Nigeria, were particularly affected. Individual health expenditures are particularly low in SSA. This has an impact on macroeconomic fundamental aggregates such as employment, growth, or inflation. (The Economist 2014).

As for the macroeconomic outlook, Foreign Direct Investment (FDI) and remittances are two critical sources of capital that support growth, development, and resilience. The outbreak of a major epidemic can disrupt investor confidence, distort labor mobility, and weaken economic fundamentals, leading to sharp declines in FDI inflows. At the same time, these crises can trigger increased remittance flows as diaspora communities seek to support affected households, acting as a form of informal insurance.

From a theoretical perspective, the expected decline in foreign direct investment during a deadly epidemic can be understood through the lens of mortality risk and investment incentives. A seminal contribution by Acemoglu et al. (2001) shows that high mortality environments shape economic behavior by discouraging long-term investment and altering institutional and capital allocation decisions. In a

¹This chapter was first presented at the Journées doctorales du développement (JDD), BETA at the Strasbourg university (Jan 28-29, 2025) and subsequently at Journées doctorales du LEO at the University of Orléans (May 30-31, 2024). An extended version has been submitted for publication in the journal International Economics.

similar spirit, epidemic outbreaks such as Ebola can be viewed as sudden and severe mortality shocks that increase uncertainty, raise the perceived risk of operating in affected regions, and reduce the expected returns to irreversible investments. Even in the absence of institutional collapse, heightened health-related risks may lead multinational firms to delay, scale down, or divert investment projects toward safer locations. This framework provides a theoretical rationale for examining how epidemic-induced mortality risk translates into reduced FDI inflows, while allowing for heterogeneous responses across countries depending on exposure and proximity to the outbreak.

Recent literature has increasingly examined the economic consequences of health shocks, with a focus on how infectious diseases affect both macroeconomic indicators and external financial flows. Compared to non-communicable diseases, epidemics of infectious diseases generate more immediate and severe economic disruptions, often through heightened uncertainty and behavioral responses such as panic or reduced mobility (Bish and Michie (2010); Bloom et al. (1998); Bloom et al. (2014); Bloom et al. (2019); Hassan et al. (2023)). From a broader theoretical perspective, the negative response of foreign investment to epidemic outbreaks is consistent with earlier work emphasizing the role of mortality risk in shaping economic decisions. Acemoglu, Johnson, and Robinson (2001) show that high European mortality rates significantly influenced colonization strategies by discouraging settlement and long-term investment in high-risk environments. In a similar spirit, epidemic outbreaks such as Ebola may increase perceived health and operational risks faced by foreign investors, thereby reducing mortality-adjusted returns and leading to a contraction in FDI inflows during outbreak periods. FDI, in particular, is sensitive to such risks. Ghosh and Renna (2015) found that communicable diseases substantially reduce FDI inflows across 114 countries, while Furceri et al. (2021) examined past pandemics such as SARS, H1N1, and Ebola, showing that they led to significant declines in investment, employment, and GDP in affected countries. Similarly, Jordà et al. (2022) analyzed major pandemics over the past century and found that these shocks are typically followed by sustained periods of depressed economic activity and lower real interest rates, partly due to reduced investor confidence. Cavallo et al. (2013) investigated the economic effects of epidemics and natural disasters, concluding that epidemics tend to produce more persistent effects on capital flows than many natural shocks.

In contrast, remittances tend to behave counter-cyclically. They often increase during periods of crisis, as migrants send more money home to help families cope with adverse conditions. Several studies confirm this trend. Mohapatra et al. (2012) found that international remittances tend to rise after natural disasters, helping to bolster household resilience. Beuermann and McKelvey (2016) highlighted the capacity of remittances to offset the negative economic effects of health shocks, particularly when households lack access to private insurance. Ponce et al. (2011) documented the positive impact of remittances on health behaviors in Ecuador, including increased vaccination and health-related expenditures. Even

during health crises, such as the COVID-19 pandemic, remittances have remained resilient or increased in some regions, reflecting their importance as a social safety net (Shastri and Garg (2022); Chami et al. (2005)).

Despite the growing body of research examining the economic impacts of epidemic shocks, such as Ebola, SARS, and COVID-19—most existing studies have focused primarily on the direct effects within countries that experienced major outbreaks. While these works have provided valuable insights into how health crises affect FDI, remittances, and broader macroeconomic outcomes, they tend to adopt a country-specific lens, often overlooking the broader regional dynamics that such shocks can trigger. In particular, there remains limited empirical evidence on whether neighboring countries, which may not experience widespread infection but are geographically and economically interconnected with affected nations, also face disruptions in foreign investment or shifts in remittance patterns.

This oversight is critical. Epidemics like Ebola do not respect national borders when it comes to economic perception and behavioral responses. Even countries without confirmed cases may suffer reputational spillovers, border closures, trade disruptions, or reductions in capital flows simply due to proximity and perceived contagion risk. Migration ties can also extend the economic consequences of an epidemic to neighboring states, as diasporas respond to crises in nearby home countries.

The impact of epidemics on financial inflows to hurt countries and their neighbors remain uncovered. This study aims to fill this gap by investigating the impact of the Ebola epidemic on FDI and remittance flows towards 28 African countries, including both Ebola-affected nations and their immediate neighbors. By extending the analysis beyond the directly affected countries, we explore whether proximity to the outbreak influenced economic behavior in surrounding areas. Our central hypothesis is that while Ebola negatively affects FDI by increasing perceived risk and disrupting economic activity, it may also lead to an increase in remittances, as migrants step in to support households during times of health and financial distress, in particular in nearby countries connected through borders, migration networks, or economic ties.

To examine the impact of the Ebola epidemic on FDI and remittance flows, this study employs the Local Projection Method (LPM) as its main empirical approach. This flexible framework allows us to estimate the dynamic effects of epidemic shocks over time, without imposing restrictive assumptions on the underlying data structure. Through this method, we capture both the immediate and delayed responses of financial flows to health crises.

Yet, the relationship between epidemics and external financial flows may not be strictly one-directional. Concerns about endogeneity arise, particularly due to the possibility of reverse causality. Countries with higher levels of FDI, for example, may have stronger institutions, more robust healthcare systems, or greater crisis-management capacity, factors that could influence the severity or spread of an epidemic.

The latter happens to be idiosyncratic. Similarly, remittances may enhance household resilience and health-seeking behavior, potentially shaping outbreak outcomes themselves. To address these concerns and reinforce the credibility of our findings, we complement the LPM results with estimates from the System Generalized Method of Moments (GMM). This dynamic panel technique helps mitigate bias from endogenous regressors and accounts for unobserved heterogeneity across countries.

To carry out this analysis, we construct a novel panel dataset covering the period 2000 to 2019, drawing from the World Development Indicators (WDI), the Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO). Our empirical strategy proceeds in three stages: (i) We first assess the short-term effects of the 2014–2016 Ebola outbreak across all 28 countries in our sample; (ii) We then examine longer-term effects in the 11 most affected countries over the full 2000–2019 period, encompassing multiple outbreak episodes; and (iii) We analyze the response of neighboring countries during the 2014–2016 crisis, exploring how geographic proximity may shape exposure to economic disruptions. By combining two empirical methods across different samples and time horizons, this study offers a clear view of how epidemic shocks influence external financial flows, both in the immediate aftermath and over the longer term.

In doing so, Our work bridges the gap between two strands of the literature. The first pertains to the determinants of financial inflows (FDI and remittances). The second strand of the literature relates to the impact of epidemics that were examined on different domestic outcomes such as growth, employment, but seldom on foreign capital inflows.

Our results confirm our expectations: Ebola shocks are associated with a significant decline in FDI inflows and a concurrent rise in remittance receipts. This divergence reflects the dual nature of financial flows during epidemics—where investor confidence deteriorates, but migrant networks respond with increased financial support, highlighting their contrasting roles in economic resilience.

The rest of the paper is structured as follows: Section 2 presents the data and methodology. Section 3 discusses the empirical results. Section 4 highlights the main findings, and the final section concludes with policy implications for managing external financial flows in the context of epidemic shocks.

1.2 Data and Methodology

1.2.1 Data

This study employs annual data from 2000 to 2019 for a panel of 28 countries. The analysis focuses on two key dependent variables: foreign direct investment (FDI) inflows and remittance inflows, both expressed as a percentage of GDP. To control for country-specific characteristics that may influence these flows, we include several covariates, grouped into five categories: macroeconomic indicators, market conditions,

demographic factors, institutional quality, and structural characteristics. Each control variable is selected based on its relevance in the literature and its theoretical link to FDI or remittance behavior.

- **Macroeconomic Indicators:** GDP per capita (constant 2010 US dollars) reflects the level of economic development. Higher GDP per capita is typically associated with greater market size and stronger institutional capacity, attracting more FDI (Poelhekke and Van Der Ploeg (2013); Azzimonti (2019)). In contrast, remittances often respond counter-cyclically, decreasing as economic conditions improve in the home country (Chan and Zheng (2017)). In addition, GDP growth (annual %) is included to capture short-term economic performance. Rapid growth may attract FDI by signaling dynamic market potential and profitability (Julio and Yook (2016)), whereas for remittances, higher growth may reduce the financial need for support from abroad.
- **Market Conditions:** Inflation, measured as the annual percentage change in the consumer price index, captures macroeconomic stability. High inflation tends to deter FDI due to higher uncertainty and reduced investment returns (Julio and Yook (2016)), and may also reduce remittance inflows by eroding the real value of transfers.
- **Demographic Factors:** The age dependency ratio is included to account for demographic pressure. A higher ratio typically leads to greater remittance inflows, as migrants send money to support dependent family members (Chan and Zheng (2017)). Its impact on FDI is expected to be limited or indirect. Additionally, the share of services in GDP is included only in the remittance model, since a higher share of services often reflects an urban and service-oriented economy where migrants are more likely to originate and remit funds.
- **Institutional Quality:** Political stability is an important factor for both FDI and remittances. Countries with stable political environments are more likely to attract long-term foreign investment (Azzimonti (2019)) and give migrants greater confidence in the safety of their transfers. We also include the Gini coefficient to measure income inequality. Higher inequality may discourage FDI by increasing social and political risks and may increase remittances if migrants aim to reduce inequality within their families (Chan and Zheng (2017)).
- **Structural Characteristics:** Total tax rate (as a percentage of commercial profits) is included in the FDI model, as higher taxes can deter foreign investors by lowering net returns (Julio and Yook (2016)). Trade openness, measured as the sum of exports and imports as a percentage of GDP, is also included for FDI, since open economies often present more attractive opportunities for investment (Poelhekke and Van Der Ploeg (2013)).

The panel dataset includes 28 African countries, comprising both Ebola-affected and unaffected countries, allowing for cross-country variation in exposure to the epidemic. Data are sourced from the World Development Indicators (WDI), the Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO).

To provide a comprehensive understanding of the dataset, we present three key tables.

Table 1.1: **Descriptive statistics of all variables of interest**

Variables	Definition	Source	Mean	Std.Dev.	Min	Max	Obs
Remit(%gdp)	Personal remittances, received(% GDP)	WDI	3.068	3.581	0	14.063	555
FDI(%gdp)	Foreign direct investment, net inflows (% of GDP)	WDI	4.24	5.55	- 3.04	28.216	588
logGDP(per capita)	GDP per capita (%current US)	WDI	6.713	0.845	5.034	8.886	616
Inflation	Inflation, consumer prices (annual)	WDI	6.848	6.460	- 0.606	23.563	578
GDP(growth)	GDP growth (annual %)	WDI	4.440	3.386	- 2.680	10. 548	615
Population	Population density (people per sq. km of land area)	WDI	85.721	101.188	2.614	532.888	588
logDependency	Age dependency ratio (of working-age population)	WDI	4.474	0.123	3.878	4.717	616
logServices	Services, value added (constant 2015 US\$)	WDI	22.286	1.490	19.227	26.361	591
Gini	Gini	WDI	- 0.481	0.680	-1	0.571	559
Political	Political Stability and Absence of Violence/Terrorism	WDI	- 0.752	0.827	- 2.665	1.219	560
Totaltax	Total tax and contribution rate	WDI	61.082	59.473	15	288.2	411
Trade	Trade (%GDP)	WDI	60.947	26.396	21.641	133.108	589
Lifeex	Life expectancy at birth, total (years)	WDI	57.725	5.967	39.441	73.166	588
Ebola	number of Ebola-related deaths or a dummy	CDC - WHO	20.560	186.902	0	2617	616

Note: This table provides definitions, sources and summary statistics for the variables used in the analysis. The sample extends from 2000 to 2022 of the variables.

Source: WDI, CDC, and WHO indicators.

Table 1.1 summarizes the main characteristics of the variables used in the analysis. It includes measures of central tendency (mean), variability (standard deviation), and the range (minimum and maximum values) for each variable. This table helps in understanding the basic distribution and variability of the data.

On average, countries in the sample received remittances equivalent to 3.07% of their GDP, while foreign direct investment inflows averaged 4.24% of GDP. The mean GDP per capita (in logarithmic form) is approximately 6.71, which corresponds to a moderate income level across the countries studied. Several variables, including GDP per capita, services value added, and age dependency ratio, are log-transformed to reduce skewness and improve interpretability. Inflation rates vary widely, with a mean of 6.85%, suggesting diverse macroeconomic environments. The average GDP growth rate is 4.44%, indicating relatively strong economic performance over the period.

Demographic and structural indicators, such as the age dependency ratio (log value of 4.47) and services sector value added (mean log value of 22.29), highlight the development patterns of the sample countries. Political stability has a negative average score of -0.75, indicating overall political risk. The Gini coefficient has been normalized or centered for the analysis, which may result in negative values. Tax burdens are highly variable, with an average total tax rate of 61.08%. Trade openness averages around 61% of GDP, and life expectancy stands at 57.73 years on average, reflecting relatively low levels

of health outcomes in the region.

Regarding the epidemic variable, the mean value of the Ebola indicator is 20.56, with a maximum of 2617, indicating the presence of severe health shocks in some countries during the study period. For the regression analysis, a dummy variable was created to capture whether a country experienced an Ebola outbreak in a given year.

Table 1.4.1 and 1.4.2 presented in Appendix 1.4, provide a comprehensive view of how FDI and remittances are related to various economic, demographic, and policy factors. The first matrix illustrates the pairwise correlations between FDI and variables such as economic conditions, demographic factors, and policy measures, helping to identify potential determinants of FDI flows. The second matrix focuses on Remittance, showing how it correlates with similar variables, thereby elucidating the linear relationships that might influence remittance inflows.

Ebola Shock Variable Construction

To identify the timing and exposure of countries to the Ebola epidemic, we construct three distinct Ebola shock variables to capture different dimensions of the outbreak's impact: direct exposure, regional spillovers, and general epidemic periods.

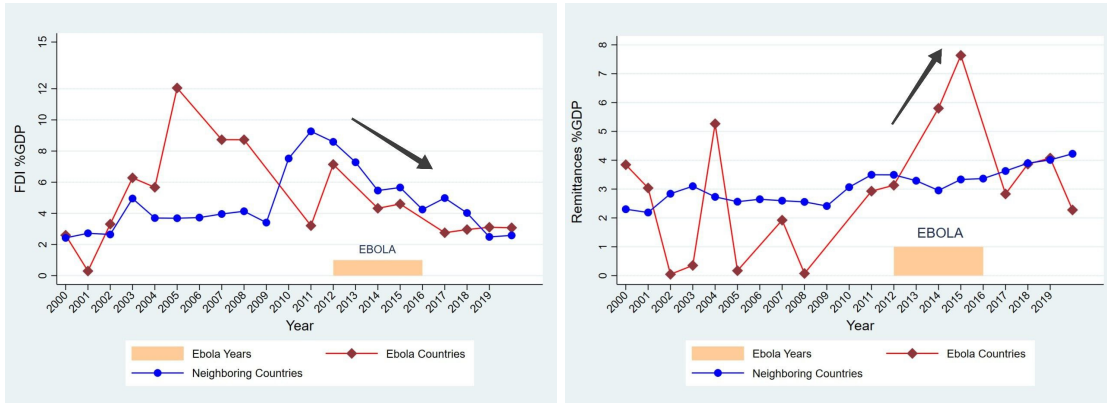
- **Ebola_all countries:** A binary variable equal to 1 for all countries in the sample during the core epidemic years (2014–2016), and 0 otherwise. This captures the general regional shock associated with heightened uncertainty and contagion fears, even in countries without confirmed cases.
- **Ebola_Affected:** A country-year dummy equal to 1 only for countries that experienced at least one confirmed Ebola outbreak between 2000 and 2019 and only in the specific years when cases were reported. This variable isolates the effect of direct health shocks.
- **Ebola_Neighbors:** A binary variable equal to 1 for countries geographically neighboring the directly affected ones, but only during 2014–2016. This variable accounts for regional spillover effects, such as reduced investor confidence or border closures that may influence economic outcomes despite the absence of domestic cases.

Using these three alternative definitions allows us to explore how the impact of Ebola varies depending on whether a country was directly hit, exposed through proximity, or affected by broader regional dynamics. This distinction is particularly important in the context of foreign direct investment and remittances, which may respond differently to localized health risks versus widespread epidemic uncertainty.

To provide an initial overview of the behavior of financial flows during health crises, this section examines trends in foreign direct investment (FDI) and remittances over the period 2000–2019, with

particular focus on the years of the Ebola outbreak (2014–2016). We analyze both the distribution and the dynamic evolution of these two variables across Ebola-affected and neighboring countries.

Figure 1.1: Changes in FDI and Remittances during the period 2000–2019



Note: The evolution of Foreign Direct Investment (FDI) and remittance as a percentage of GDP for both Ebola-affected and neighboring countries.

Source: Authors' calculations based on data from the WDI, CDC, and WHO.

Figure 1.1 illustrates the evolution of Foreign Direct Investment (FDI) and remittance as a percentage of GDP for both Ebola-affected and neighboring countries. The FDI exhibit a sharp decline during the Ebola crisis. Starting in 2012 for affected countries and 2014 for neighboring countries, FDI inflows fell significantly and reached their lowest point in 2014 and 2016, likely due to heightened investor uncertainty and disruptions caused by the epidemic. Although there was some recovery in subsequent years, the overall trend suggests that the Ebola crisis had a more lasting negative impact on FDI inflows, as investor confidence was slow to return.

In contrast, in Ebola-affected countries, remittance inflows rose sharply between 2012 and 2015, peaking in 2015 during the height of the epidemic. This surge likely reflects an increase in financial support from diaspora communities responding to heightened health and economic needs during the crisis. In contrast, neighboring countries exhibited a relatively stable remittance trend over the same period, with only modest increases. However, in 2016, remittance inflows dropped significantly in affected countries and declined slightly in neighboring countries as well. This post-peak downturn may suggest a normalization of flows after the crisis period, or temporary disruptions in the channels used to send remittances. Overall, the figure underscores the critical, though time-sensitive, role that remittances can play in reducing the economic effects of health shocks, particularly for the most directly impacted populations.

1.2.2 Methodology

This study investigates the impact of the Ebola epidemic on foreign direct investment (FDI) and remittance inflows across 28 African countries over the period 2000–2019. Given the need to capture both the dynamic short-run effects of epidemic shocks and address potential endogeneity in the data, we adopt a two-step estimation strategy.

First, we estimate impulse response functions using the local projection method (LPM), as introduced by Jordà (2005). The LPM framework is particularly suitable for our context because it allows us to trace the dynamic response of financial flows in the years following an Ebola outbreak, without requiring full specification of the underlying data-generating process. This temporal analysis is particularly important in the case of the Ebola epidemic. Epidemic shocks are indeed often unanticipated and generate sudden, widespread uncertainty. While investors may in reality respond with caution based on early warning signs, our focus is on the dynamic adjustment following the outbreak. The local projection method (LPM) allows us to trace how FDI inflows evolve in the aftermath, highlighting both immediate disruptions and more persistent effects driven by lingering risk perceptions. This helps us understand the duration and asymmetry of the shock’s impact on investor confidence and capital mobility. The LPM also accommodates nonlinear and heterogeneous responses over time, making it particularly well-suited to studying the cross-country dynamics of epidemic shocks. This forms the basis of our baseline estimation strategy.

Second, as a robustness check, we employ the System Generalized Method of Moments (System GMM) to estimate the long-run structural relationships between Ebola shocks and financial inflows, while addressing potential endogeneity concerns. In the context of our analysis, endogeneity may arise from several sources. First, there is a risk of reverse causality: countries with lower FDI or remittance inflows may have weaker health surveillance and reporting systems, which could affect the measurement and international response to epidemic outbreaks. Second, unobserved country-specific factors, such as institutional quality, governance, or diaspora engagement, may simultaneously influence both exposure to epidemics and financial flows. Finally, both FDI and remittances are persistent over time, meaning that past values influence current outcomes, further complicating causal interpretation. System GMM is particularly well-suited to address these challenges in dynamic panel data settings. It allows us to control for country-specific fixed effects, account for the persistence of financial flows, and use internal instruments (lagged variables) to correct for potential biases arising from omitted variables or simultaneity. This is especially relevant in the context of highly localized and irregular shocks such as epidemics, where traditional fixed-effects estimators may fall short.

Together, these two complementary approaches allow us to uncover both the short-run dynamics and

longer-run relationships between epidemic shocks and external financial flows in African countries.

1.2.3 Baseline Empirical Specification

The general empirical model used throughout the paper is specified as follows:

$$y_{it} = \alpha + \gamma \text{EbolaShock}_{it} + \mathbf{X}'_{it}\boldsymbol{\beta} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1.1)$$

Where:

- y_{it} is the dependent variable: either foreign direct investment or remittances (both as % of GDP);
- EbolaShock_{it} captures the intensity of the epidemic (e.g., number of Ebola-related deaths or a dummy);
- $\mathbf{X}_{it}$ is a vector of control variables;
- μ_i and λ_t are country and year fixed effects;
- ε_{it} is the error term.

The control variables in $\mathbf{X}_{it}$ include GDP per capita (log), inflation, GDP growth, population, trade openness, tax rate, life expectancy, Gini coefficient, political stability index, dependency ratio, and value added in the services sector.

GDP per capita, often used as a proxy for market potential and economic stability, is expected to have a positive influence on FDI inflows (Asiedu (2002), Chakrabarti (2001)), while its association with remittances may be negative, as higher income levels tend to reduce the reliance on transfers from abroad (Giuliano and Ruiz-Arranz (2009)). Inflation enters the model to capture macroeconomic uncertainty; higher inflation is generally seen as a deterrent for investors due to rising costs and increased volatility as rising price harm savings (Bengoa and Sanchez-Robles (2003)), although its effect on remittances remains less conclusive (Faini (2006)). In a similar vein, GDP growth is commonly viewed as a signal of economic dynamism and potential profitability, thus likely attracting greater FDI (Moosa (2002)).

The role of demographic and geographic characteristics is also considered. While higher population density can signal a larger domestic market and labor availability (Wheeler and Mody (1992)), it may also reflect pressures on infrastructure and resources. Trade openness, reflecting a country's level of integration into global markets, is generally found to support both FDI and remittance inflows by enhancing economic connectivity and reducing transaction barriers (Borensztein et al. (1998), Giuliano and Ruiz-Arranz (2009)). Conversely, higher tax rates may reduce the net returns for investors, thereby discouraging foreign capital (Hines (1993)).

Life expectancy, as a proxy for human capital and health system strength, can positively influence both FDI and remittances by signaling higher productivity and quality of life (Alsan et al. (2006), Beine et al. (2011)). Income inequality, measured by the Gini index, may play a dual role: excessive inequality can create social and political instability, undermining investor confidence, yet it may also reflect untapped markets and potential opportunities (Teo and Wong (2021)). In line with this, political stability is a critical determinant, with more stable environments generally attracting both foreign investors and migrant remittances (Globerman and Shapiro (2003), Daude and Stein (2007)).

Finally, demographic burdens are captured through the age dependency ratio, which is often positively associated with remittance flows, as migrants send funds to support children and elderly family members left behind (Adams and Cuecuecha (2010)). A larger services sector, meanwhile, can signal greater economic diversification and development, making a country more attractive for long-term investment (Alfaro et al. (2004)).

1.2.4 Local Projection Method (LPM)

To trace the dynamic effects of Ebola shocks over time, we estimate impulse response functions using the local projection method of Jordà (2005). This method allows for flexible estimation of responses at different horizons without imposing restrictive assumptions on the underlying process. The local projection equation is:

$$y_{i,t+h} = \alpha_h + \gamma_h \text{EbolaShock}_{it} + \mathbf{X}'_{it}\boldsymbol{\beta}_h + \mu_i + \lambda_t + \varepsilon_{i,t+h} \quad (1.2)$$

We estimate this specification for several horizons $h = 0, 1, 2, 3$ to assess both pre-trends and the short- to medium-term impact of the shock. We conduct three sets of local projection estimations:

1. For all 28 countries during the 2014-2016 Ebola crisis;
2. For the 11 most affected countries over the full period (2000-2019);
3. For neighboring countries during 2014-2016, to analyze regional spillovers.

1.2.5 System GMM Estimation

A key challenge in estimating the effects of epidemic shocks on foreign direct investment (FDI) and remittances is the issue of endogeneity. First, the relationship between epidemics and FDI may be bidirectional: epidemics can reduce investor confidence and increase the perceived risk of doing business, while low levels of FDI may reflect deeper structural weaknesses, such as poor healthcare systems or weak

institutions, that make a country more vulnerable to outbreaks. This two-way relationship creates the risk of reverse causality.

Second, several control variables commonly used in the analysis of capital flows may also be endogenous. Variables such as GDP growth, trade openness, inflation, and epidemic-related deaths may be jointly determined with FDI or remittances, or may suffer from measurement error. If these issues are not addressed, they can lead to biased and inconsistent estimates.

To deal with these concerns, we use the System Generalized Method of Moments (System GMM) estimator developed by Blundell and Bond (2023). This approach is well-suited for dynamic panel data models with a short time dimension and helps control for endogeneity, unobserved heterogeneity, and reverse causality. In both the FDI and remittances models, we include a lagged dependent variable to account for persistence over time. We also treat potentially endogenous control variables, such as GDP growth, trade, inflation, and epidemic-related deaths—using their lagged values to help isolate their causal effects.

System GMM combines equations in first differences and in levels, and uses internal instruments based on past values of the variables. The general form of the dynamic model is:

$$y_{it} = \alpha + \rho, y_{it-1} + \gamma, \text{EbolaShock} * it + \mathbf{X} * it' \boldsymbol{\beta} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1.3)$$

To eliminate unobserved country-specific effects (μ_i), we first-difference the equation:

$$\Delta y_{it} = \rho, \Delta y_{it-1} + \gamma, \Delta \text{EbolaShock} * it + \Delta \mathbf{X} * it' \boldsymbol{\beta} + \Delta \varepsilon_{it} \quad (1.4)$$

However, many macroeconomic variables are highly persistent, and using lagged levels as instruments in the differenced equation alone may result in weak instruments. System GMM addresses this issue by also using lagged differences as instruments in the levels equation, which improves the efficiency and consistency of the estimates.

We implement the two-step System GMM estimator and apply the following diagnostic checks to assess the validity of our estimation:

1. **Hansen J test for instrument validity:** This test evaluates the overall validity of the instruments used in the model. Specifically, it tests the null hypothesis that the instruments are exogenous, that is, uncorrelated with the error term. A high p -value suggests that the instruments are valid, while a very low p -value may indicate overidentification or instrument proliferation, which can bias the results. Since GMM estimation often involves a large number of instruments, this test is critical to ensure credible inference.
2. **Arellano-Bond test for autocorrelation:** This test helps check whether the model suffers from serial

correlation in the error terms. After differencing the equation, some autocorrelation is expected at the first order. However, second-order autocorrelation would indicate a problem with the model and that the instruments used might not be valid. If the test does not find significant second-order autocorrelation, we can be more confident that the model is well specified and the instruments are appropriate.

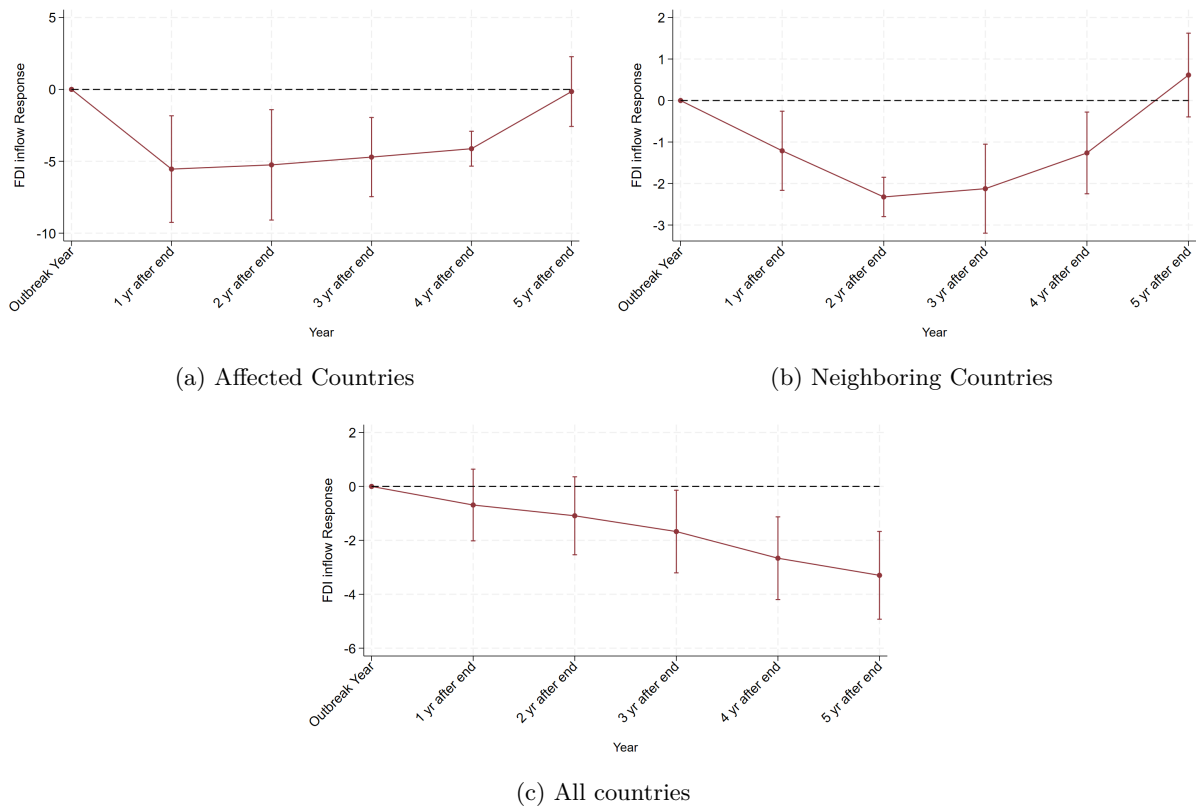
1.3 Results

This section presents the main findings from the Local Projection Method (LPM), our primary empirical approach, which allows us to trace the dynamic effects of epidemic shocks on foreign direct investment (FDI) and remittances over time. We then assess the robustness of our results using two complementary estimation strategies: a standard fixed-effects panel model and a dynamic System GMM estimator to address potential endogeneity.

1.3.1 Dynamic Effects of Ebola on FDI and Remittances: Local Projection Results

To examine how the impact of Ebola on foreign direct investment (FDI) evolves over time and varies by exposure, we estimate impulse response functions (IRFs) using the local projection method for three distinct samples: (i) all 28 African countries during the core outbreak years (2014–2016), (ii) Ebola-affected countries over the full 2000–2019 period, and (iii) neighboring countries during the same outbreak window. The results are illustrated in Figures 1.2a, 1.2b, and 1.2c respectively.

Figure 1.2: Impulse Response of FDI to Ebola Outbreak Shock



Note: Each panel shows the impulse response of FDI inflows to an Ebola outbreak shock using the local projection method. The solid line represents the point estimate, and the vertical bars indicate 90% confidence intervals. Panel (a) shows results for directly affected countries, (b) for neighboring countries, and (c) for all countries in the sample.

Source: Authors' calculations based on data from the WDI, CDC, and WHO.

The analysis reveals Ebola's negative impact on FDI across all country groups, though the effects differ in timing and intensity. In the full sample of 28 African countries (Figure 1.2c), FDI shows a steady decline, reaching about -3.5 percentage points by year five. This pattern aligns with studies showing that health crises trigger regional investor caution, as risks spread beyond directly affected areas (Ghosh and Renna, 2015).

The eleven most affected countries (Figure 1.2a) experience a sharp initial drop of nearly 6 percentage points, echoing findings that epidemics cause immediate capital flight from high-risk zones (Karlsson et al., 2013). The slow recovery over five years supports research on lasting investor skepticism after repeated outbreaks (Yu et al., 2021).

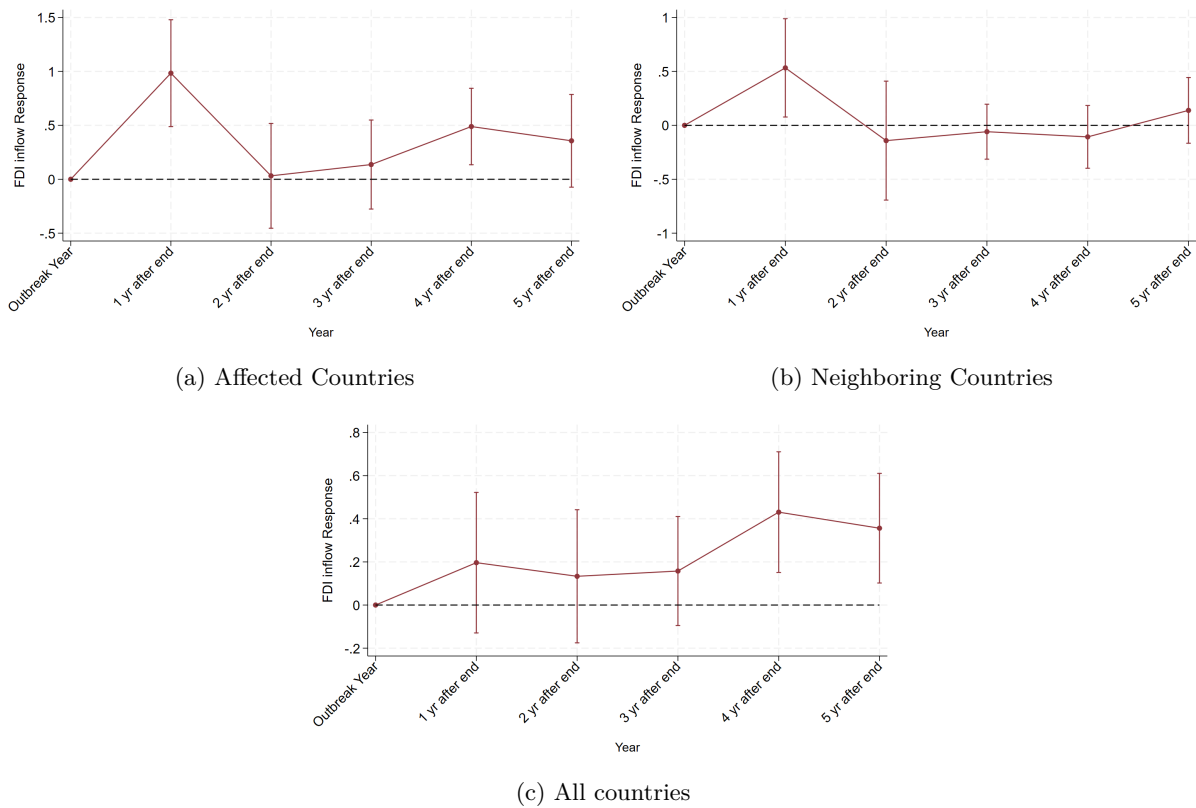
Neighboring countries (Figure 1.2b) show a different pattern: a rapid two-year decline followed by

recovery. This matches studies suggesting geographic proximity alone causes temporary investment hesitancy (Bloom et al., 1998), unless paired with direct exposure (Bloom et al., 2014).

Our findings reveal that while the Ebola outbreak led to a sharp but short-lived drop in FDI for directly affected countries, regional neighbors experienced a slower but more prolonged decline. In contrast, a broad-based investor retreat persisted across the region, suggesting that fear and uncertainty were not confined to the epicenter but spilled over both spatially and temporally. Three key insights emerge. First, epidemic severity appears to shape FDI recovery timelines, as evidenced by the stark contrast between directly affected and neighboring nations. Second, regional risk perceptions matter, even countries without active outbreaks may suffer investment slowdowns due to heightened uncertainty (Azemar and Desbordes, 2009). Third, the persistent FDI decline in affected countries underscores how health crises can erode institutional credibility and investor trust (Hassan et al., 2023). These findings highlight the need for coordinated cross-border health-investment strategies. As Bloom et al. (2019) emphasize, mitigating epidemic-driven capital flight requires not only swift health interventions but also long-term measures to reassure and attract investors.

Figure 1.3a, 1.3b, and 1.3c present the dynamic responses of remittance inflows (as a share of GDP) to Ebola outbreak shocks, estimated using the local projection method across three different samples: (i) all 28 African countries, (ii) Ebola-affected countries, and (iii) neighboring countries. These estimates allow us to assess not only the immediate effect of the crisis but also the persistence and evolution of remittance responses over time.

Figure 1.3: Impulse Response of Remittances to Ebola Outbreak Shock



Note: Each panel shows the impulse response of Remittances inflow to an Ebola outbreak shock using the local projection method. The solid line represents the point estimate, and the vertical bars indicate 90% confidence intervals. Panel (a) shows results for directly affected countries, (b) for neighboring countries, and (c) for all countries in the sample.

Source: Authors' calculations based on data from the WDI, CDC, and WHO.

The analysis shows different patterns in remittance flows across country groups. In the full sample (Figure 1.3c), remittances gradually increase by about 0.4 percentage points of GDP. This steady rise aligns with studies showing that migrants maintain stable support during systemic shocks (Lueth and Ruiz-Arranz, 2008). It may reflect regional solidarity and learning from past health crises, consistent with findings that diasporas adapt their transfer strategies over time (Mohapatra et al., 2012).

In countries directly affected by Ebola (Figure 1.3a), remittances initially surge in response to the crisis, similar to patterns seen in natural disasters (Shastri and Garg, 2022). After a brief decline, remittances strongly increase again, exceeding 1 percentage point of GDP. This dual response supports the idea that remittances act as a form of insurance during crises (Ratha, 2007), helping households cope with immediate shocks and supporting longer-term recovery (Yang, 2008). The delayed resurgence echoes

findings that remittances aid in rebuilding livelihoods when public services are disrupted (Beuermann and McKelvey, 2016).

Neighboring countries show a modest response (Figure 1.3b), supporting the notion that remittances are targeted at specific households rather than broader regional risks (Giuliano and Ruiz-Arranz, 2009). While some studies suggest that general risk awareness influences remittance behavior (Ponce et al., 2011), our results indicate that migrants prioritize direct family needs over geographic proximity alone (Amuedo-Dorantes and Pozo, 2007).

These findings collectively enhance our understanding of remittances as stabilizers during health crises. The pattern in directly affected countries confirms that remittances serve as both investments and insurance payments (Chami et al., 2005), while the persistence across the full sample supports the idea that institutional factors play a role (Álvarez Tinajero, 2015). This synthesis shows how crisis characteristics shape the magnitude and timing of migrant-led risk mitigation.

1.3.2 Robustness Check:

Estimation of fixed effects

To assess the consistency of our main results, we begin with a standard fixed-effects model as a baseline. This approach captures average relationships between Ebola shocks, remittances, and FDI across countries and time, controlling for unobserved heterogeneity through country and year fixed effects. While this static model does not account for dynamic adjustments or delayed responses, it provides a useful point of comparison.

Table 1.2: Country and Time Fixed Effects Estimation: The Impact of Ebola on Remittances and FDI

Variables	Remittances (FE)	FDI (FE)
Ln.GDPpc	-2.743** (0.776)	-2.378* (1.364)
Inflation	-0.027* (0.015)	-0.097 (0.083)
GDP growth	0.034 (0.029)	0.061 (0.065)
Ln.Services	3.145 (2.032)	—
Political Stability	0.055 (0.299)	-0.008 (0.449)
Gini	0.099 (0.180)	-0.458 (0.704)
Population	0.006 (0.008)	-0.006 (0.015)
Ln.Dependency	3.257** (1.560)	—
Total Tax Rate	—	-0.000 (0.007)
Trade Openness	—	0.079* (0.045)
Life Expectancy	—	0.334 (0.332)
Ebola	0.001** (0.000)	-0.002*** (0.000)
Observations	482	398
R^2	0.114	0.250

Note: This table reports two-way fixed effects estimations with country and year fixed effects. The variable *Ebola* is a dummy equal to 1 during outbreak years. Standard errors are clustered at the country level. All regressions include country and time fixed effects. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: Author's calculations based on WDI, CDC, and WHO.

Table 1.2 reports two-way fixed-effects estimation results examining the relationship between Ebola outbreaks, remittances, and FDI as percentages of GDP. By including country and year fixed effects, the model accounts for time-invariant heterogeneity and macroeconomic shocks common to all countries.

The findings indicate that Ebola shocks have a statistically significant and positive association with remittances, suggesting that remittance inflows increased during Ebola outbreaks. This is consistent with the literature highlighting the counter-cyclical nature of remittances, as diaspora communities increase transfers to support affected households in times of crisis. In contrast, the effect of Ebola on FDI is negative and highly significant, reflecting the vulnerability of investment flows to health-related uncertainty. Epidemic shocks likely erode investor confidence, disrupt supply chains, and raise perceived country risk, all of which discourage foreign capital inflows.

Control variables behave largely as expected. GDP per capita is negatively associated with both remittances and FDI, possibly reflecting saturation effects or changing relative needs. Trade openness shows a positive and significant effect on FDI, highlighting the role of global integration in attracting investment.

While the two-way fixed-effects estimates offer valuable insights into the average relationship between Ebola outbreaks, remittances, and FDI, they do not account for how these effects evolve over time. To explore the temporal dynamics of these relationships, the analysis now turns to the local projection method, which enables the estimation of impulse response functions and the identification of short- and medium-term patterns in the behavior of external financial flows surrounding epidemic shocks.

Addressing Endogeneity with System GMM

While the local projection estimates offer valuable insights into the dynamic responses of FDI and remittances to Ebola shocks, concerns around endogeneity remain critical for causal interpretation. In particular, variables such as GDP per capita, political stability, and population may be jointly determined with external financial flows, raising issues of simultaneity and reverse causality. For instance, while higher political stability may attract FDI, FDI inflows themselves may contribute to improved institutional quality and economic governance. Similarly, remittance flows may influence and be influenced by economic development or demographic structure.

To address these concerns, we implement the System Generalized Method of Moments (System GMM), which provides a consistent and efficient estimation strategy for dynamic panel models with potential endogeneity. By using internal instruments based on lagged levels and first differences of the regressors, System GMM controls for unobserved heterogeneity, measurement error, and feedback effects between the dependent and independent variables. This method is particularly well-suited to our context, where many explanatory variables exhibit persistence over time and traditional fixed effects or OLS estimators may be biased or inconsistent.

The GMM estimates serve as a robustness check for the local projection results, allowing us to assess the stability of our main findings under an alternative identification strategy that addresses endogeneity explicitly.

Table 1.3: System GMM Estimations of the Relationship between Ebola, Remittances, and FDI

Variable	Remittances	FDI
L.Remit(%GDP)	0.883*** (0.111)	—
L.FDI(%GDP)	—	0.456* (0.233)
Ln.GDPpc	0.263 (0.187)	−1.294* (0.721)
Inflation	0.141*** (0.035)	−0.007 (0.053)
GDP growth	0.126** (0.054)	−0.064 (0.211)
Ln.Services	−0.309** (0.118)	—
Politic	0.197 (0.223)	0.727 (0.473)
Gini	0.376*** (0.096)	−0.324 (0.414)
Population	0.000 (0.001)	−0.007 (0.005)
Ln.Dependency	−0.120 (1.421)	—
Total tax	—	−0.002 (0.004)
Trade	—	0.023 (0.066)
Life expectancy	—	0.065 (0.087)
Ebola	0.001** (0.000)	−0.003** (0.001)
Obs	453	398
Number of groups	28	28
AR(1)	0.015	0.005
AR(2)	0.776	0.773
Hansen test	0.424	0.586
Number of Instruments	20	21

Note: This table reports System GMM estimations. The variable *Ebola* is a dummy equal to 1 during outbreak years. Standard errors are clustered at the country level. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: Author's calculations based on WDI, CDC, and WHO.

The results obtained from our estimation using the System GMM method, as presented in Table 1.3 (Columns 1 and 2), align with our expectations and support the findings from Table 1.2. In the first column, we find that the Ebola variable has a positive and significant effect on remittances. This outcome reinforces the notion that individuals tend to behave altruistically in critical situations, such as epidemic outbreaks in their countries of origin. They increase their remittance contributions to support their families and help mitigate the damages caused by the crisis. It could also be a sign of a strategic motive from the migrant or of insurance or investment behavior from the family ((Rapoport and Docquier, 2006b)). These findings are consistent with previous studies ((Stark and Bloom, 1985; Lucas and Stark, 1985; Johnson and Whitelaw, 1974; Chami et al., 2005; Benmamoun and Lehnert, 2013; Singh et al., 2011)) that have explored the relationship between health crises and remittance patterns.

Turning to the effect of the Ebola outbreak on foreign direct investment (FDI), the results in the second column of Table 1.3 are consistent with our expectations. We find that a 1 percent increase in Ebola prevalence is associated with a 0.45 percent decline in FDI inflows. This negative relationship suggests that epidemic shocks influence investor confidence and decision-making, likely through increased uncertainty, heightened risk perception, and potential disruptions to economic activity. These findings are consistent with previous research documenting the adverse effects of health crises on investment behavior (Ajide et al. (2022); Chiappini et al. (2022); Immurana (2021); Alsan et al. (2006)).

Firstly, the outbreak creates a high level of uncertainty among investors, which directly contributes to the decline in FDI inflows. The severe health crisis raises concerns about the stability of the affected countries' economies and the safety of investments. Investors become more cautious and hesitant to allocate capital to regions grappling with a severe epidemic, resulting in reduced FDI. Secondly, the Ebola outbreak severely disrupted economic activities in affected countries, particularly in key sectors such as agriculture, mining, and services. While these economies are not deeply integrated into global supply chains, the crisis led to labor shortages, mobility restrictions, and business closures, which significantly hindered production and trade. For example, mining operations were scaled back due to health risks and a reduced workforce, and quarantine measures and market closures disrupted agricultural activities. These conditions created an uncertain and challenging environment for doing business, discouraging foreign investors from entering or expanding in the region (Corps, 2015; Bank, 2014).

The impacts of other explanatory variables are equally notable. The first model suggests that GDP growth, inflation, and the Gini coefficient have a positive and significant impact on remittances, while services and value-added have a negative and significant relationship with remittances. Additionally, remittances play a shock-absorbing role when adverse economic shocks decrease incomes in their home country. In the second model, a negative and significant relationship exists between GDP per capita and FDI, indicating a growing economy, stable investment climate, and improved infrastructure. Although

there exists both a negative and positive relationship between total tax, trade, and foreign investment, which is entirely consistent with theoretical perspectives and analysis, we were unable to obtain significant results.

1.3.3 Additional Robustness Checks: Controlling for Confounding Events and Outliers

Beyond econometric concerns, we also account for other potential confounding factors that could distort the observed relationship between the Ebola outbreak and external financial flows. Specifically, we conduct a set of robustness tests by introducing additional controls and sample exclusions:

- **Conflict and Malaria:** We include variables capturing the incidence of armed conflict and malaria prevalence, both of which are known to influence FDI and remittance flows. Armed conflict deters investment but may boost remittances as diaspora networks respond to crises. Malaria, as an endemic health burden, affects labor productivity and government spending. Including these variables ensures that the effects attributed to Ebola are not conflated with broader health or security shocks.
- **Exclusion of the 2008 Global Financial Crisis:** To rule out contamination from global financial trends, we exclude the period corresponding to the 2008 financial crisis, which saw a sharp contraction in global FDI and remittance flows.
- **Exclusion of Nigeria:** Given its outsized role in the region's FDI and remittance flows, we exclude Nigeria from the sample to test whether the main findings are driven by this influential outlier.

Across all specifications, the Ebola shock variable remains statistically significant and shows consistent effects. We find that Ebola outbreaks are linked to a drop in FDI inflows and a rise in remittance receipts. This supports the idea that while epidemics tend to scare off investors, they also lead to increased financial support from migrants. These results add confidence to our findings and suggest that the impact of Ebola on external financial flows is not simply the result of other shocks or the influence of large economies in the sample (see in Appendix 1.4, Table 1.4.3, Table 1.4.4, Table 1.4.5, Table 1.4.6 respectively for full results).

1.4 Conclusion and Policy Implications

This study examines the impact of the Ebola epidemic on foreign direct investment (FDI) and remittances across 28 African countries over the period 2000–2019. By combining fixed effects estimations, local projection methods (LPM), and system GMM models, we provide an in-depth analysis of how epidemic

shocks influence external financial flows, both in countries directly affected by the outbreak and in their neighboring economies.

Our findings show that Ebola outbreaks have a substantial and persistent negative effect on FDI inflows. This pattern is most pronounced in countries that experienced repeated or severe outbreaks, where investor confidence was likely undermined by heightened health risks, disruptions to business activity, and deteriorating macroeconomic conditions. Even neighboring countries not directly affected by the virus experienced significant spillover effects, with FDI declining, albeit more gradually and temporarily, suggesting that epidemic risk perceptions extend beyond borders.

In contrast, remittance inflows tend to increase following Ebola outbreaks, especially in the most affected countries. This response reflects the countercyclical nature of remittances and the important role of diaspora networks in providing financial support during health emergencies. While neighboring countries exhibit weaker remittance responses, the overall evidence confirms that remittances act as a stabilizing force in times of crisis, offsetting part of the income and welfare losses incurred domestically.

These dynamics remain robust across multiple empirical strategies, including controls for endogeneity through system GMM, and sensitivity tests accounting for armed conflict, malaria prevalence, the 2008 global recession, and outlier effects from dominant economies like Nigeria. Together, the results emphasize the asymmetric nature of external financial flows during health shocks: FDI contracts in the face of uncertainty, while remittances expand as a form of social insurance.

From a policy perspective, while international organizations often emphasize the economic costs of health shocks within affected countries, more attention should be paid to the way these shocks influence the behavior of economic agents in surrounding regions. For policymakers, this represents a missed opportunity to develop regional preparedness plans, cross-border cooperation mechanisms, and financial buffers that account not only for direct health impacts but also for broader contagion through markets, migration, and perceptions.

Our outcomes underscore the need to strengthen public health systems in order to reduce the economic cost of disease outbreaks by preserving investor confidence and maintaining productive capacity. At the same time, governments and development partners should recognize the critical role of remittances in crisis response. Policies that reduce transaction costs, improve access to financial services, and foster diaspora engagement can enhance the resilience of remittance flows during emergencies.

Finally, the regional nature of the effects documented in this study calls for coordinated cross-border responses. Health crises do not respect national boundaries, and neither do their economic consequences. Regional integration, surveillance, and joint policy action can help mitigate both the health and economic spillovers of future epidemics, preserving financial stability and development prospects across the continent.

Appendix

Table 1.4.1: **Correlation matrix**

	FDI(%gdp)	logGDPpc	Inflation	Totaltax	Trade	GDPg	Population	Lifeex	Gini	Politic	Ebola
FDI(%gdp)	1.00										
logGDPpc	0.04	1.00									
Inflation	0.02	-0.13	1.00								
Totaltax	-0.02	-0.27	0.07	1.00							
Trade	0.48	0.36	- 0.09	-0.07	1.00						
GDPg	0.01	- 0.10	0.00	- 0.06	0.02	1.00					
Population	-0.17	-0.22	0.00	0.09	- .31	0.04	1.00				
Lifeex	0.09	0.48	- 0.18	-0.22	0.17	-0.12	0.14	1.00			
Gini	0.03	0.11	- 0.17	-0.18	0.10	-0.14	- 0.09	0.32	1.00		
Politic	0.15	0.26	- 0.31	-0.10	0.30	0.04	-0.03	0.22	-0.11	1.00	
Ebola	0.03	- 0.02	0.00	-0.02	0.06	-0.09	-0.02	0.00	0.02	-0.00	1.00

Note: This table displays the correlation matrix of FDI and control variables.

Source: Authors' calculations are based on data from the World Development Indicators (WDI), the Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO).

Table 1.4.2: **Correlation matrix**

	Remit(%gdp)	logGDPpc	Inflation	GDPg	Population	logDependency	logServices	Gini	Politic	Ebola
Remit(%gdp)	1.00									
logGDPpc	0.026	1.00								
Inflation	- 0.19	- 0.14	1.00							
GDPg	- 0.08	- 0.12	0.02	1.00						
Population	0.15	- 0.23	0.00	0.05	1.00					
logDependency	- 0.25	- 0.55	0.15	0.16	- 0.07	1.00				
logServices	- 0.32	0.36	0.29	0.11	- 0.06	0.09	1.00			
Gini	0.12	0.11	- 0.17	- 0.15	- 0.11	- 0.18	- 0.02	1.00		
Politic	0.23	0.26	- 0.31	0.02	- 0.06	- 0.29	- 0.40	- 0.11	1.00	
Ebola	0.08	- 0.02	0.00	- 0.06	0.01	- 0.00	- 0.03	0.02	- 0.00	1.00

Note: This table displays the correlation matrix of Remittances and control variables.

Source: Authors' calculations are based on data from the World Development Indicators (WDI), the Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO).

Table 1.4.3: Robustness Test of System GMM Estimations Including War

Variable	System GMM	
	Remittances	FDI
L.Remit(%GDP)	0.884*** (0.108)	-
L.FDI(%GDP)	-	0.452* (0.233)
Ln.GDPpc	0.213 (0.209)	-1.300* (0.709)
Inflation	0.143*** (0.034)	-0.011 (0.058)
GDP growth	0.117** (0.056)	-0.061 (0.210)
Ln.Services	-0.294** (0.119)	-
Politic	0.133 (0.224)	0.755* (0.420)
Gini	0.365*** (0.099)	-0.322 (0.417)
Population	0.000 (0.001)	-0.006 (0.005)
Ln.Dependency	-0.509 (1.414)	-
Total tax	-	-0.003 (0.005)
Trade	-	0.024 (0.065)
Life expectancy	-	0.061 (0.091)
Ebola	0.001** (0.000)	-0.003** (0.001)
War	-0.736 (0.554)	0.437 (1.072)
Obs	453	398
Number of groups	28	28
AR(1)	0.016	0.005
AR(2)	0.775	0.772
Hansen test	0.416	0.617
Number of Instruments	21	22

Note: This table reports Robustness Test of System GMM Estimations Including War. The variable *Ebola* is a dummy equal to 1 during outbreak years. Standard errors are clustered at the country level. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: Author's calculations based on WDI, CDC, and WHO.

Table 1.4.4: Robustness Test of System GMM Estimations Including Malaria's Outbreak

Variable	System GMM	
	Remittances	FDI
L.Remit(%GDP)	0.808*** (0.098)	-
L.FDI(%GDP)	-	0.528* (0.209)
Ln.GDPpc	0.454* (0.221)	-1.323** (0.643)
Inflation	0.126*** (0.033)	-0.024 (0.065)
GDP growth	0.125** (0.061)	-0.090 (0.199)
Ln.Services	-0.394** (0.142)	-
Politic	0.157 (0.228)	0.781 (0.475)
Gini	0.406*** (0.122)	-0.261 (0.419)
Population	0.257 (0.158)	-0.007 (0.005)
Ln.Dependency	0.357 (1.705)	-
Total tax	-	-0.002 (0.004)
Trade	-	0.008 (0.065)
Life expectancy	-	-0.013 (0.106)
Ebola	0.001** (0.000)	-0.004** (0.002)
Malaria	-0.000 (0.001)	-0.004 (0.007)
Obs	453	398
Number of groups	28	28
AR(1)	0.020	0.004
AR(2)	0.828	0.812
Hansen test	0.451	0.725
Number of Instruments	21	23

Note: This table reports the Robustness Test of System GMM Estimations Including Malaria's Outbreak. The variable *Ebola* is a dummy equal to 1 during outbreak years. Standard errors are clustered at the country level. *p < 0.1, **p < 0.05, ***p < 0.01. *Source:* Author's calculations based on WDI, CDC, and WHO.

Table 1.4.5: Robustness Test of System GMM Estimations excluding Global Recession of 2008

Variable	System GMM	
	Remittances	FDI
L.Remit(%GDP)	1.043*** (0.108)	-
L.FDI(%GDP)	-	0.429* (0.141)
Ln.GDPpc	0.134 (0.167)	-1.326* (0.765)
Inflation	0.175*** (0.037)	-0.015 (0.072)
GDP growth	0.021 (0.065)	0.055 (0.184)
Ln.Services	-0.197 (0.130)	-
Politic	0.308 (0.256)	0.923* (0.479)
Gini	0.231*** (0.081)	-0.429 (0.565)
Population	0.000 (0.000)	-0.009** (0.004)
Ln.Dependency	0.594 (1.267)	-
Total tax	-	0.000 (0.005)
Trade	-	0.003 (0.044)
Life expectancy	-	0.0722 (0.085)
Ebola	0.001* (0.000)	-0.004** (0.001)
Obs	397	391
Number of groups	28	27
AR(1)	0.003	0.00
AR(2)	0.868	0.646
Hansen test	0.214	0.640
Number of Instruments	24	21

Note: This table reports Robustness Test of System GMM Estimations excluding Global Recession of 2008. The variable *Ebola* is a dummy equal to 1 during outbreak years. Standard errors are clustered at the country level.

*p < 0.1, **p < 0.05, ***p < 0.01.

Source: Author's calculations based on WDI, CDC, and WHO.

Table 1.4.6: Robustness Test of System GMM Estimations excluding Nigeria

Variable	System GMM	
	Remittances	FDI
L.Remit(%GDP)	0.889*** (0.124)	-
L.FDI(%GDP)	-	0.719*** (0.000)
Ln.GDPpc	0.249 (0.187)	-0.941 (0.958)
Inflation	0.151*** (0.039)	-0.039 (0.065)
GDP growth	0.153*** (0.054)	0.288 (0.395)
Ln.Services	-0.391*** (0.139)	-
Politic	0.250 (0.240)	1.111* (0.574)
Gini	0.461*** (0.111)	-0.703 (0.855)
Population	-0.000 (0.001)	-0.012 (0.010)
Ln.Dependency	-0.143 (1.398)	-
Total tax	-	-0.001 (0.005)
Trade	-	0.024 (0.087)
Life expectancy	-	0.070 (0.179)
Ebola	0.001* (0.000)	-0.016* (0.008)
Obs	435	391
Number of groups	27	27
AR(1)	0.021	0.075
AR(2)	0.714	0.719
Hansen test	0.387	0.635
Number of Instruments	20	21

Note: The table reports Robustness Test of System GMM Estimations Excluding Nigeria. The variable *Ebola* is a dummy equal to 1 during outbreak years. Standard errors are clustered at the country level. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: Author's calculations based on WDI, CDC, and WHO.

Table 1.4.7: **List of the countries that we used in this study**

Countries			
Angola	Cabo Verde	Liberia*	Sudan*
Burundi	Ethiopia	Mali*	Senegal*
Burkina Faso	Gabon*	Mozambique	Sierra Leone*
Cote d'Ivoire	Guinea*	Mauritania	Togo
Cameroon	Gambia, The	Niger	Tanzania
Congo, Dem. Rep.*	Guinea-Bissau	Nigeria*	Uganda*
Congo, Rep.*	Kenya	Rwanda	Zambia

* = Affected Countries

Chapter 2

Chapter 2

Public Health as a Buffer for FDI: The Role of Healthcare Services in Economic Stability ¹

2.1 Introduction

Infectious disease outbreaks no longer belong only to the realm of public health; they have become powerful global economic shocks. From localized epidemics to pandemics, these events increasingly disrupt trade, production, mobility, and investment flows. In the 21st century alone, dozens of outbreaks have tested the ability of countries not only to save lives but also to maintain their economies.

One of the most affected channels is foreign direct investment (FDI), a critical engine of economic growth, technology diffusion, and global integration (UNCTAD (2021); International Monetary Fund (2020)). Given its sensitivity to perceived risk, institutional strength, and uncertainty, FDI is especially vulnerable to health-related shocks (Lee and McKibbin (2004); Bloom et al. (2014)). Historical evidence bears this out: across multiple health crises since 2000, including SARS, Ebola, and COVID-19, global FDI has contracted sharply. In 2020, inflows fell by 42% following the COVID-19 outbreak, dropping below levels seen during the 2008–2009 financial crisis (UNCTAD (2020b)). The impact has been highly uneven: Latin America and the Caribbean saw a 37% fall, Africa’s inflows declined by 18%, while developing Asia experienced only a mild 4% drop, with East Asia even showing modest resilience (Sheng et al. (2023)). Similar declines were observed during the 2014–2016 Ebola outbreak in West Africa, particularly in countries with limited healthcare capacity and weak institutions. These are not just

¹This chapter was written independently, without external collaboration.

numbers; they reflect how quickly an epidemic can bring economic activity to a halt. Empirical research supports this trend, showing that disease outbreaks tend to reduce FDI inflows in the short term (Fu et al. (2021); Oh et al. (2020); Yu et al. (2023)).

Health shocks, whether sudden like fast-moving epidemics or slower moving local outbreaks affect much more than public health systems. They send shock waves through entire economies, disrupting how people work, move, consume, and invest. As Smith et al. (2019) remind us, good health is the foundation of any functioning society. When fear and illness spread, they do not just burden hospitals; they weaken consumer confidence, interrupt supply chains, and destabilize institutions. These disruptions extend beyond immediate output losses, influencing longer-term economic decisions, especially in FDI, which tends to retreat under heightened uncertainty. While traditional determinants of FDI, such as market size, institutional quality, and trade openness, remain central (Aisbett et al. (2018); Frenkel and Walter (2019); Li and Vashchilko (2010); Li et al. (2018)), epidemic outbreaks introduce new layers of risk that can alter investment behavior.

According to the World Health Organization report, in 2019, the WHO African Region spent only 5.3% of its GDP on health the second lowest among WHO regions. Although per capita health spending rose between 2002 and 2011, it began to decline around the time of the 2014–2016 Ebola outbreak. Most African countries dedicate less than 10% of their total government budget to the health sector, with many falling below 5%. This reflects persistent underinvestment in epidemic preparedness (WHO (2022)). In addition to financial constraints, basic healthcare infrastructure remains limited in many parts of the region. With an average of just 10 beds per 10,000 population, well below the global average of 27, many countries are ill-equipped to handle sudden surges in demand during health crises (WHO (2022)). Such limitations have been shown to undermine investor confidence and to amplify the economic impact of health shocks (OECD (2023); Fu et al. (2021)). Weak health systems and limited infrastructure create a lot of uncertainty for investors. When countries are not equipped to handle outbreaks properly, investors see greater risks, not just in reality but also in perception. By “reality,” we mean concrete operational risks, service disruptions, overwhelmed hospitals, and abrupt policy shifts, whereas “perception” reflects uncertainty amplified by limited or noisy information and media signals; this perceived risk often spikes ahead of fundamentals, prompting a wait-and-see stance ((Ahir et al., 2022)). During COVID-19, this perception-driven caution coincided with a marked pullback in global FDI ((UNCTAD, 2020b)). This uncertainty makes them more likely to pull back their investments or hold off on new ones, which only makes the economic damage from health crises worse.

Past crises have shown that economies with weaker health systems and lower institutional capacity suffer sharper and more prolonged declines in FDI. Limited epidemic preparedness heightens both perceived and actual risks, making investors more likely to withdraw or avoid high-risk markets altogether. The

dominant explanation for these declines centers on the uncertainty mechanism, whereby health shocks amplify perceived risks, disrupt investor confidence, and destabilize host economies (OECD (2023); Yu et al. (2023)). Some research has begun to explore heterogeneity in FDI responses by industry, showing that sectors with lower redeployability and countries with weaker institutions suffer more pronounced investment losses during outbreaks (Moosa and Merza (2022); Nawo and Njangang (2022)). There is also evidence that the negative effects of epidemics on FDI can persist beyond the immediate crisis, but recovery patterns vary and remain poorly understood. This study documents the FDI losses associated with outbreaks and examines whether stronger health infrastructure, proxied by nurse and midwife density, can buffer these effects by stabilizing investor expectations.

Despite valuable contributions from previous studies, the literature on the relationship between FDI and health shocks remains surprisingly limited in scope. Most studies treat epidemics as uniform events, documenting that FDI tends to fall during outbreaks but overlooking important differences between epidemics. This statistical simplification ignores how epidemics vary widely in severity, duration, geographic reach, transmission modes, and affected sectors. Treating all outbreaks as the same risks masks the true heterogeneity in their economic impact and can lead to misleading conclusions about FDI responses.

This leaves critical questions unanswered: Why do some epidemic outbreaks trigger stronger declines in FDI inflows than others? To what extent do these health shocks have persistent effects on FDI over time, and how long does it take for FDI to recover? What features of a country’s healthcare system and institutional capacity help limit the economic damage from epidemics?

To address these gaps, this paper contributes to the literature in three key ways. First, while previous studies have shown that epidemics reduce FDI, I go further by examining a wider range of disease outbreaks across 98 countries over two decades. This comprehensive approach allows me to capture variations in outbreak characteristics, such as severity, duration, and transmission modes, and how these differences affect FDI differently across regions and time. By broadening the scope beyond a single epidemic or region, I can identify patterns and heterogeneity in the economic impact that earlier studies may have missed. Second, I use dynamic methods to capture persistent effects, moving beyond contemporaneous associations. This study systematically quantifies the moderating role of health infrastructure in the FDI response to epidemics and adds new evidence to the literature.

First, I study the short-term effect of epidemics on FDI. Then, recognizing that investment is key for long-term growth, I examine the dynamic response over time. Finally, I consider the mitigating effect of healthcare policy on a country’s attractiveness for FDI. Building on the literature and theoretical expectations, I test three central hypotheses. First (H1), epidemic outbreaks are associated with a significant decline in FDI inflows. While this paper does not directly test the uncertainty channel, previous research identifies increased investment uncertainty and perceived risks as primary reasons investors delay

or withdraw capital during health crises. Additionally, other economic channels such as disruptions to supply chains, declines in consumer demand, and rising operational costs may also explain the drop in FDI inflows. Second (H2), the effects of health shocks are dynamic, with FDI declining even after the immediate outbreak. This reflects both lingering uncertainty and institutional disruption. Third (H3), countries with stronger healthcare systems (proxied by nurse and midwife density) experience smaller declines in FDI during and after epidemics, due to better outbreak control and investor confidence in public infrastructure.

Using a balanced panel of 98 countries from 2000 to 2022, this study provides new evidence on how epidemic shocks affect FDI. The results reveal three key insights. First, epidemic outbreaks are associated with short-term declines in FDI inflows, particularly for high-fatality diseases such as Ebola, MERS, Lassa Fever, and Marburg. These diseases appear to trigger stronger investor reactions due to their severity, uncertainty, and visibility. Second, the effects are not confined to the outbreak period. A dynamic analysis using local projection methods shows that FDI often continues to decline for one to two years after a shock, though recovery patterns vary by transmission type and perceived severity. Third, and perhaps most importantly, countries with stronger healthcare systems, proxied by nurse and midwife density, experience significantly smaller investment losses during health crises. Nurse and midwife density is not just a health statistic; it signals a country's ability to contain outbreaks quickly, stabilize local conditions, and maintain business continuity. This buffering effect is especially pronounced for outbreaks transmitted through direct contact or vector-borne flea. Together, these findings underscore the importance of epidemic preparedness not only for public health, but also for safeguarding economic stability.

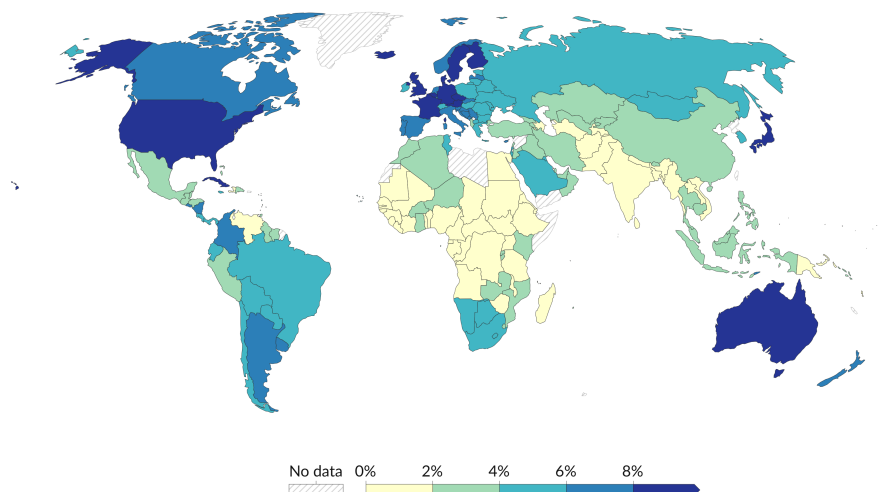
These findings answer an important question: why are some countries able to withstand the economic fallout of epidemics more effectively than others? The answer appears to lie not only in the nature of the disease itself, but in the strength of a country's healthcare system and its institutional ability to respond. Exploring these sources of resilience is key to understanding how health shocks affect investor behavior and how governments can limit the economic damage. At its core, this paper makes a simple but often overlooked point: epidemics are not just public health emergencies; they are economic shocks that test a country's institutional and structural resilience. While FDI is known to respond quickly to perceived risk (Alsan et al. (2006)), what matters in the longer run is a country's capacity to manage that risk.

The remainder of the paper is structured as follows. Section 2 stylised facts and describes the data and key variables. Section 3 presents the methodology. Section 4 discusses the main findings, including heterogeneity by disease characteristics and healthcare capacity. Section 5 concludes with policy implications and directions for future research.

2.2 Stylised Facts

Understanding cross-country differences in public health capacity is essential to contextualize how epidemic shocks may affect foreign direct investment.

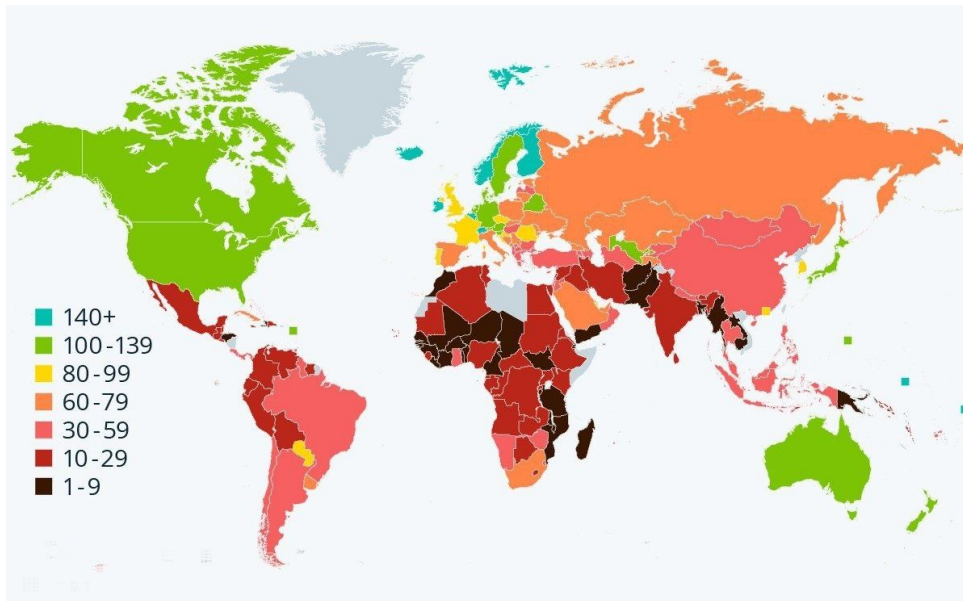
Figure 2.1: Public healthcare spending as a share of GDP, 2022



Note: Values report general government health expenditure (% of GDP). *Source:* WHO Global Health Expenditure Database, via World Bank WDI (2025)

Figure 2.1 shows a wide variation in public healthcare spending across countries. In much of Sub-Saharan Africa, South Asia, and parts of Latin America, government health expenditure is below 4% of GDP, with some countries spending less than 2%. In contrast, higher-income countries in Western Europe, North America, and Oceania exceed 6%, with a few surpassing 8%. These disparities point to large differences in fiscal capacity and public health readiness, which may shape how economies absorb epidemic shocks.

Figure 2.2: Number of nursing and midwifery personnel (per 10,000 people)

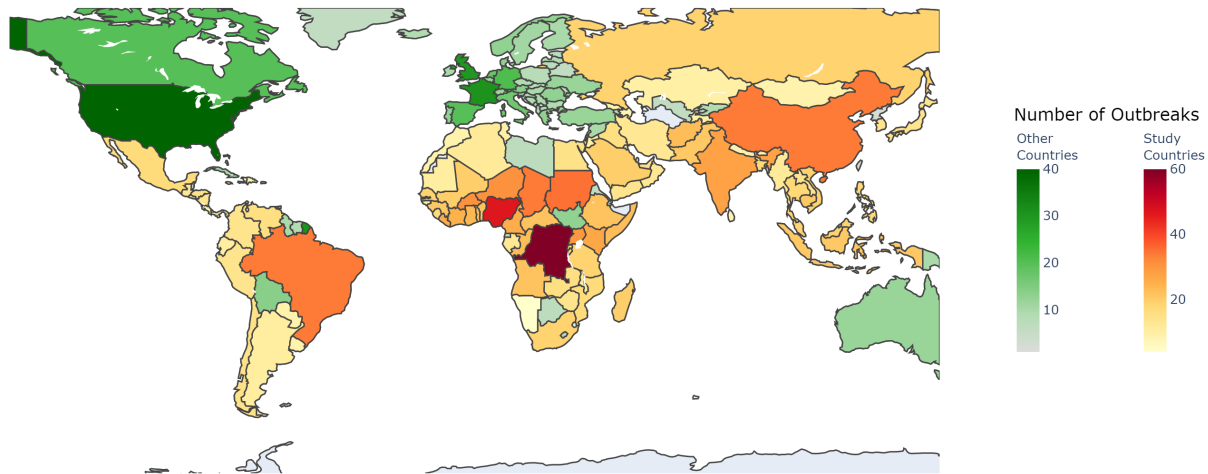


Note: Values report the distribution of nurses and midwives per 10,000 people. Source: World Health Organization (2023)

Figure 2.2 shows the distribution of nurses and midwives per 10,000 people. In 31 countries and territories, there are under 10 nurses and midwifery personnel for every 10,000 people. As this chart shows, these inequalities are regional, with figures lowest in countries in sub-Saharan Africa. Sub-regional differences are clear too. These structural weaknesses may amplify the disruptive effects of epidemics and deter foreign investors in affected regions.

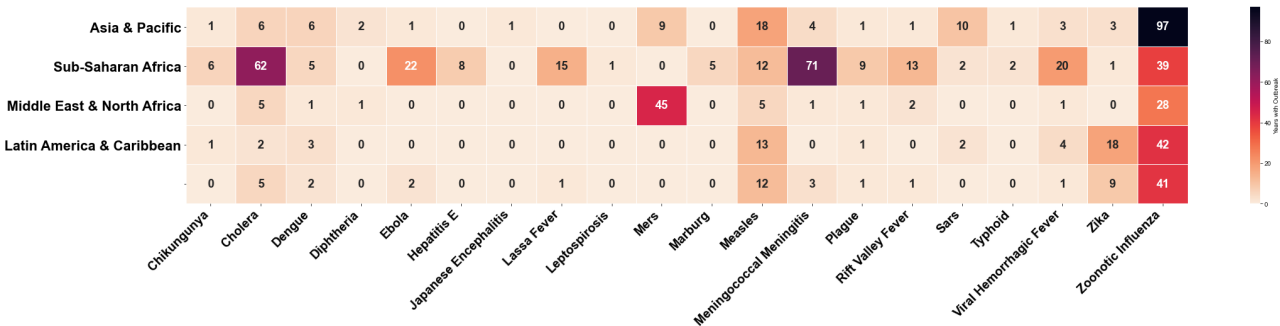
Figures 2.3 and 2.4 provide a descriptive overview of the global distribution and intensity of epidemic outbreaks during the period 1996–2022.

Figure 2.3: Number of Epidemic Outbreaks affecting each Countries



Note: This figure shows the geographic distribution of global infectious disease outbreaks (2001–2021). *Source:* Authors’ calculations based on data from the global dataset compiled by Torres Munguía et al. (2022)

Figure 2.4: Total Number of Years for each Outbreak by Region



Note: This Figure shows how many times each region was affected by each disease in each region during the study period. *Source:* Authors’ calculations based on data from the global dataset compiled by Torres Munguía et al. (2022)

Figure 2.3 displays a world map indicating the number of recorded outbreaks in each country, based on the global dataset compiled by Torres Munguía et al. (2022). The map uses two distinct color scales: countries included in this study sample are shaded from yellow to red, while all other countries appear in green tones. Although all countries represented have experienced at least one epidemic outbreak, the yellow-to-red gradient highlights the frequency of outbreaks specifically among the 98 countries included in the empirical analysis. As illustrated, a higher number of outbreaks is concentrated in parts of Sub-Saharan Africa and South Asia, particularly in countries such as the Democratic Republic of Congo and Nigeria.

Figure 2.4 complements this spatial representation by showing the total number of years each region

has been affected by specific diseases. The results indicate that Sub-Saharan Africa has experienced repeated exposure to high-mortality diseases such as Ebola, Lassa fever, and Marburg virus over extended periods. The heatmap also reveals that certain diseases, such as cholera, measles, and zoonotic influenza are more widespread across regions, while others, including MERS and Marburg, are more geographically concentrated. These patterns provide important context for understanding the regional variation in epidemic risks, which may influence foreign direct investment (FDI) dynamics in the subsequent analysis.

Together, these four figures paint a clear picture; the regions hit hardest by epidemic outbreaks often have the weakest healthcare systems. Low government spending on health (Figure 2.1) and serious shortages of nurses and midwives (Figure 2.2) leave these countries vulnerable and less able to respond quickly when crises strike. This gap between high epidemic risk and limited health capacity matters a lot for foreign investment, since investors look closely at a country's ability to handle shocks and maintain stability. Strengthening health systems in these regions is not just a public health issue; it is essential for building economic resilience and attracting investment.

2.3 Data Description and Variable Construction

This study combines data about FDI inflow percentage of GDP, epidemic outbreaks, and unilateral country characteristics. After cleaning and merging the data sets from different sources, I come up with a panel ranging from 2000 to 2022 with 1,944 observations for 98 countries. Following the World Bank classification, the sampled countries are grouped into four regions (Sub-Saharan Africa, Asia and Pacific, Middle East and North Africa, Latin America and Caribbean), (see Table 2.7.19 in Appendix 2.7). The definition and sources of the variables are listed in Appendix 2.7, Table 2.7.1, which includes both the economic and epidemic-related indicators used in the analysis. This table shows that the epidemic variables are constructed as binary indicators, while macroeconomic controls come from standard sources like the World Bank.

Table 2.1 presents the summary statistics. The average FDI inflow across the sample is 3.85% of GDP, but the range is wide, with some countries experiencing negative FDI and others exceeding 100% in a given year. Political stability, GDP growth, and natural resource rents also exhibit substantial variation. Trade openness averages 73% of GDP, with a maximum value exceeding 400%, highlighting large differences in global integration. Government expenditure accounts for about 13.7% of GDP on average.

2.3.1 Epidemic Outbreaks Data

Data on epidemic-prone disease outbreaks were obtained from the global dataset compiled by Torres Munguía et al. (2022), which integrates information from the World Health Organization’s Disease Outbreak News (DONs) and the WHO Coronavirus Dashboard. The dataset provides standardized records of 2,227 outbreaks of 70 infectious diseases across 233 countries and territories from January 1996 to March 2022. The DONs are based on official epidemiological, clinical, and laboratory investigations conducted by WHO member states and partners. The authors processed and harmonized these data using ISO country codes and ICD disease classifications, ensuring consistency and comparability across countries and years. This comprehensive dataset enables researchers to examine the spatial and temporal distribution of disease outbreaks globally and has been made openly accessible.

While several global databases track epidemic events such as EM-DAT (The Emergency Events Database) and WHO’s original Disease Outbreak News (DONs) this study uses the refined dataset compiled by Torres Munguía et al. (2022), which offers significant methodological and practical advantages. EM-DAT, though widely used, tends to focus primarily on large-scale natural disasters and often lacks granular, standardized information about disease-specific epidemic events, particularly when they are localized or not classified as disasters under EM-DAT criteria. In addition, reported damages in EM-DAT may be overestimated, as countries sometimes have incentives to exaggerate losses in order to secure greater international aid or insurance-based compensation (Cavallo and Noy (2011)). On the other hand, the raw DONs produced by WHO are not originally designed for statistical analysis; they are unstructured, event-driven bulletins that vary in format and detail, making them difficult to harmonize across countries and years without extensive manual processing.

The data set constructed by Torres et al. (2022) addresses these shortcomings by systematically collecting, cleaning, and harmonizing WHO’s DONs and Coronavirus Dashboard data using ISO-3166 country codes and ICD-10 disease classifications. The authors tackle several data quality issues, including duplicates, multicountry reporting, and disease mutation grouping, and apply consistent criteria for defining outbreaks. This approach not only improves statistical reliability but also aligns with FAIR data principles (Findability, Accessibility, Interoperability, and Reusability), making it highly suitable for empirical research. As a result, this dataset enables more accurate identification of meaningful, transnational epidemic events with epidemiological and economic significance, particularly in the context of studying global FDI inflows.

To keep the scope of the analysis clear, it is important to define what I mean by outbreaks. According to the WHO, infectious diseases are caused by harmful microorganisms such as bacteria, viruses, parasites, or fungi and can spread either directly or indirectly between people. The Centers for Disease Control

and Prevention (CDC) defines an epidemic as a sudden rise in the number of cases of a disease, going beyond what would normally be expected in a particular place and time. Based on these definitions, this study treats epidemic outbreaks as clear spikes in reported infectious disease cases that go beyond typical baseline levels.

Focusing on the period between 2000 and 2022, I refined the dataset by excluding outbreaks that affected only a single country, unless those outbreaks were classified by the WHO or CDC as particularly significant due to their severity, scale, or public health implications. This decision was made to ensure that the analysis captures epidemic events with broader relevance or greater epidemiological importance, rather than isolated or minor outbreaks. Additionally, I filtered the dataset based on the case fatality rate (CFR) to focus on diseases with meaningful mortality risk. CFR is defined as the number of deaths divided by the number of confirmed cases for each outbreak, expressed as a percentage. Outbreaks with a CFR below 0.01% were excluded.

Table 2.1: Descriptive Statistics

Variable	Mean	SD	Min	Median	Max
FDI Inflow	3.8546	6.2998	-37.1727	2.4242	103.3374
Political Stability	-0.5335	0.9132	-3.3130	-0.4609	1.5991
GDP Growth	4.1183	4.9676	-36.6568	4.3368	53.3856
Resource rent	10.0340	11.6884	0	5.5363	65.3185
lnGDP per Capital	7.879576	1.256237	5.451178	7.797576	11.30969
Trade Openness	73.3533	43.9049	2.6988	64.5191	437.3267
Government expenditure to GDP ratio	13.7164	4.7080	2.0471	13.5556	31.3443
Hepatitis_E	0.0033	0.0575	0	0	1
Chikungunya	0.0033	0.0575	0	0	1
Cholera	0.0331	0.1790	0	0	1
Dengue	0.0066	0.0811	0	0	1
Diphtheria	0.0012	0.0352	0	0	1
Ebola	0.0104	0.1012	0	0	1
Zoonotic_Influenza	0.0903	0.2866	0	0	1
Japanese_Encephalitis	0.0004	0.0203	0	0	1
Lassa_Fever	0.0066	0.0811	0	0	1
Leptospirosis	0.0004	0.0203	0	0	1
Marburg	0.0021	0.0455	0	0	1
Measles	0.0219	0.1465	0	0	1
Meningococcal_Meningitis	0.0327	0.1779	0	0	1
MERS	0.0224	0.1479	0	0	1
Plague	0.0050	0.0703	0	0	1
Rift_Valley_Fever	0.0070	0.0836	0	0	1
SARS	0.0058	0.0759	0	0	1
Typhoid	0.0012	0.0352	0	0	1
Zika	0.0099	0.0992	0	0	1
Viral_Hemorrhagic_Fever	0.0116	0.1071	0	0	1

Note: Summary statistics for the main variables used in the analysis. The sample extends from 2000 to 2022.

Source: WDI, CDC, and WHO.

Given the above selection criteria, I include 20 epidemic outbreaks from 2000 to 2022 across 98 countries in my sample.

2.3.2 Other Control Variables

To account for other key determinants of foreign direct investment (FDI) inflows, I include a set of standard control variables based on the existing literature on FDI drivers (Yu et al. (2023), Azzimonti (2019)). These variables reflect fundamental characteristics of the host economy that are widely recognized to influence investment decisions. Specifically, I control for GDP per capita (as a proxy for market size and development level), GDP growth (to capture the dynamism and growth prospects of the economy), and total natural resource rents (to account for resource-seeking FDI motivations). Political stability is included to reflect institutional quality and the perceived risk environment for investors. In addition, I incorporate trade openness—measured as the sum of exports and imports relative to GDP to capture the degree of integration into the global economy. Finally, government expenditure as a share of GDP is used to reflect the state’s fiscal capacity and its potential to influence economic stability and public investment. All control variables were collected from the World Bank’s World Development Indicators (WDI) database.

To classify countries based on healthcare system strength, I use nurse and midwife density (per 1,000 people) as a proxy for public health capacity. Countries with values above the median of the distribution in a given year are considered to have a relatively strong healthcare system, while those below are classified as weak. This binary classification is used to construct an interaction term with epidemic outbreak variables in order to test whether stronger healthcare systems buffer the adverse impact of health shocks on FDI.

2.4 Methodology

This study investigates how epidemic outbreaks affect foreign direct investment (FDI) inflows and whether the strength of a country’s healthcare system moderates this relationship. Using a panel dataset of 98 countries over the period 2000–2021, the empirical analysis proceeds in three steps, corresponding to the following hypotheses:

- **Hypothesis 1:** Epidemic disease outbreaks negatively affect FDI inflows in the short run.
- **Hypothesis 2:** The impact of epidemics on FDI is dynamic, involving short-term declines and potential recovery over time.
- **Hypothesis 3:** Countries with stronger healthcare systems are more resilient to epidemic-induced

FDI shocks.

These hypotheses build on established theory and empirical findings discussed in the introduction. Hypothesis 1 reflects evidence that epidemic outbreaks generate immediate uncertainty and risk, leading to short-term declines in investment. Hypothesis 2 acknowledges that the impact of epidemics often extends beyond the initial outbreak period, as lingering uncertainty and institutional disruptions continue to affect FDI. Hypothesis 3 is based on the premise that stronger healthcare systems improve epidemic preparedness and response, thereby reducing economic disruptions and preserving investor confidence.

To test these hypotheses, I employ two-way fixed effects regression models and the local projection method developed by Jordà (2005), using robust standard errors clustered at the country level. These methods are well-suited for analyzing the short-run and dynamic effects of shocks in panel data while accounting for unobserved country heterogeneity and time-specific global influences.

2.4.1 Baseline Estimation: Short-Run Effects of Epidemics on FDI (Hypothesis 1)

To test Hypothesis 1, I estimate a two-way fixed effects model separately for each epidemic disease. For each regression, the dependent variable is FDI inflows as a percentage of GDP, and the main explanatory variable is a dummy indicating the presence of a specific outbreak in a given country-year (e.g., Ebola, SARS, Zika). This setup allows me to capture the short-run effect of each outbreak individually, rather than averaging across all epidemics. The model includes country fixed effects to control for time-invariant characteristics like geography or long-term institutions, and year fixed effects to account for global shocks. All control variables, such as political stability, economic growth, and trade openness are included with a one-year lag to help reduce potential reverse causality. Standard errors are clustered at the country level.

The estimated equation is as follows:

$$FDI_{it} = \alpha + \beta \cdot \text{Epidemic}_{it} + \gamma \cdot \mathbf{X}_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (2.1)$$

where FDI_{it} denotes foreign direct investment inflows as a percentage of GDP in country i and year t , Epidemic_{it} is a dummy equal to 1 if a specific outbreak occurred in year t in country i , and $\mathbf{X}_{it}$ is a vector of time-varying economic and institutional controls. Country fixed effects (μ_i) capture unobserved heterogeneity across countries, while year fixed effects (λ_t) control for common global shocks.

2.4.2 Dynamic Response of FDI to Epidemic Shocks (Hypothesis 2)

Hypothesis 2 explores whether the effects of epidemic outbreaks on FDI are short lived or persist over time. In particular, I investigate how FDI behaves in the years following an outbreak does it gradually

recover, remain depressed, or continue to decline?

To analyze this, I employ the local projection method developed by Jordà (2005), which provides a flexible way to estimate the dynamic path of FDI after a shock. Rather than relying on a single regression with lagged dependent variables, this approach estimates a separate equation for each time horizon $h = 0, 1, 2, \dots, H$, where h represents the number of years after the epidemic year

The estimated equation is as follows:

$$\text{FDI}_{i,t+h} = \alpha_h + \beta_h \cdot \text{Epidemic}_{it} + \gamma_h \cdot \mathbf{X}_{it} + \mu_i + \lambda_t + \epsilon_{i,t+h} \quad (2.2)$$

The coefficients β_h trace the effect of an epidemic in year t on FDI inflows in subsequent years. By plotting these estimates over time, I can assess whether FDI drops temporarily and recovers, or whether the shock has more lasting effects. As in the baseline model, I include country and year fixed effects to control for unobserved heterogeneity and global shocks. Standard errors are clustered at the country level.

This approach is particularly useful in this context, as it allows the data to speak freely about the duration and shape of the FDI response, without assuming in advance whether the effect is short-term, persistent, or reversible.

2.4.3 Moderation Analysis: Health System Capacity as a Buffer (Hypothesis 3)

The third hypothesis examines whether the strength of a country's healthcare system can cushion the negative effects of epidemic outbreaks on foreign investment. The idea is that stronger public health infrastructure may improve outbreak control, reduce uncertainty, and boost investor confidence during crises. To test this, I estimate an interaction model between epidemic shocks and a proxy for healthcare system strength. The regression specification is as follows:

$$\text{FDI}_{it} = \alpha + \beta_1 \cdot \text{Epidemic}_{it} + \beta_2 \cdot \text{GoodHealth}_{it} + \beta_3 \cdot (\text{Epidemic}_{it} \times \text{GoodHealth}_{it}) + \gamma \cdot \mathbf{X}_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (2.3)$$

The variable GoodHealth_{it} is a binary indicator based on the distribution of nurses and midwives per 1,000 people. The threshold is defined as the median (50th percentile) within each year, so that countries above the median in a given year are considered to have relatively stronger healthcare systems. This year-specific threshold captures the idea that resilience depends on relative healthcare strength at the time of the outbreak, allowing countries to shift categories as their health capacity evolves.

The coefficient β_3 captures the moderating effect: a positive and statistically significant β_3 would indicate that countries with better healthcare systems experience smaller declines in FDI during epidemics, suggesting a buffering role.

2.4.4 Control Variables and Data Sources

To ensure that the estimated effects of epidemics on FDI are not confounded by other relevant factors, I include a standard set of control variables drawn from the literature on FDI determinants. These variables capture key economic and institutional characteristics of the host country that are widely recognized to influence investment decisions:

- **GDPpc:** GDP per capita (constant 2015 USD), which serves as a proxy for market size and development level. A positive relationship is expected, as higher income levels are generally associated with greater market potential and tend to attract market-seeking FDI (Asiedu (2006); Nunnenkamp (2002)).
- **GDPg:** GDP growth rate (annual %), which reflects the economy's growth prospects. A positive relationship is expected, as faster-growing economies tend to signal greater future profitability and thus attract more FDI (Chakrabarti (2001); Alfaro et al. (2004)).
- **Natres:** Total natural resource rents (as % of GDP), measuring the relative weight of extractive industries in the economy. While natural wealth can attract foreign investment, especially in mining and energy sectors, it may also deter investors due to exposure to price volatility, political risk, or weak institutions. Therefore, the expected sign is theoretically ambiguous (Poelhekke and van der Ploeg (2010); Kolstad and Wiig (2009)).
- **Trade:** Trade openness, defined as the ratio of total trade (exports plus imports) to GDP, reflects a country's level of integration with the global economy. Greater openness is generally associated with a positive effect on FDI, as it reduces entry barriers, enhances market access, and signals a liberal economic environment (Edwards (1998)).
- **GovEx:** Government expenditure as a percentage of GDP, serving as an indicator of fiscal capacity and the scope of public sector involvement. Its expected effect on FDI is ambiguous, as public spending may promote investment when directed toward infrastructure or human capital, but may deter it if associated with inefficient allocation, excessive bureaucracy, or crowding out of private sector activity (Barro (1991)).
- **Politic:** Political Stability and Absence of Violence/Terrorism index, sourced from the Worldwide Governance Indicators, which captures perceptions of the likelihood of political instability or polit-

ically motivated violence. A positive relationship is expected, as political risk increases uncertainty and discourages long-term commitments such as FDI (Busse and Hefeker (2007)).

All economic indicators are sourced from the World Bank World Development Indicators (WDI).

2.5 Results and Discussions

I present my main findings of this study in three parts, each addressing a distinct component of the research question. First, I estimate the short-run effects of epidemic outbreaks on foreign direct investment (FDI) inflows using country and time fixed effects models (Hypothesis 1). This allows me to identify whether the immediate presence of specific infectious disease outbreaks leads to significant disruptions in FDI activity. Second, I use a local projection model to examine the dynamic response of FDI to epidemic shocks over time, identifying the persistence and potential recovery trajectories following an outbreak (Hypothesis 2). Finally, I investigate whether healthcare system capacity can mitigate the negative impact of epidemics on FDI, testing the hypothesis that stronger public health infrastructure acts as a buffer during health crises (Hypothesis 3)

2.5.1 Short-Run Effects of Epidemic Outbreaks on FDI inflows (Hypothesis 1)

Main Results (Hypothesis 1)

Epidemics are not all alike in the way they affect economies. The route through which a disease spreads can shape both its public health impact and the way investors perceive risk. Some, like airborne diseases, can travel quickly and widely, while others, such as direct-contact or certain vector-borne diseases, are often linked to higher fatality rates or more severe symptoms. These differences may influence how strongly foreign investors react, particularly in the short run.

To examine these effects, I estimate the two-way fixed effects model described in Equation (1), where the dependent variable is FDI inflows as a share of GDP and the main explanatory variable is an indicator for epidemic outbreaks by transmission type. All regressions include country and year fixed effects, and standard errors are clustered at the country level to account for serial correlation and heteroskedasticity within countries over time.

Outbreaks are grouped into five transmission categories, following CDC and WHO classifications: airborne, water/food borne, vector-borne (mosquito), vector-borne (flea), and direct contact. The complete list of diseases by transmission type is provided in Appendix 2.7, Table 2.7.5.

Table 2.2: Country and Time Fixed Effect results for Transmission Type: Only Control Variables

Variable	Impact of Disease Outbreaks by Transmission Type on FDI				
	Airborne Outbreak	Water-Food Outbreak	Vector-borne Mosquito Outbreak	Vector-borne- Flea Outbreak	Direct Contact Outbreak
	(1)	(2)	(3)	(4)	(5)
Political Stability ^a	0.184 (0.327)	0.179 (0.326)	0.177 (0.327)	0.171 (0.328)	0.146 (0.336)
GDP Growth ^a	0.067** (0.0328)	0.069** (0.0327)	0.067** (0.0329)	0.068** (0.0330)	0.069** (0.0327)
Natural Resources ^a	-0.0132 (0.074)	-0.0133 (0.074)	-0.0129 (0.074)	-0.0126 (0.074)	-0.0146 (0.074)
Trade Openness ^a	0.043 ** (0.019)	0.043 ** (0.019)	0.043 ** (0.019)	0.043 ** (0.019)	0.044 ** (0.019)
GDP per Capita ^{a,b}	-2.102 (2.799)	-2.060 (2.772)	-2.045 (2.769)	-2.071 (2.771)	-1.979 (2.786)
General Expenditure ^a	0.151 ** (0.067)	0.153 ** (0.067)	0.151 ** (0.067)	0.150 ** (0.067)	0.151 ** (0.067)
Observations	1,944	1,944	1,944	1,944	1,944
R^2	0.071	0.071	0.071	0.071	0.074
Countries	98	98	98	98	98

Notes: Results for control variables used in this study from two-way fixed effects regressions with robust standard errors. All regressions include country and time fixed effects.

Source: Authors' calculations based on WDI, CDC, and WHO.

^a Lagged one period.

^b Natural log transformation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.2 first presents the estimates for the control variables under different transmission-type specifications. The results confirm the expected positive association of GDP growth, trade openness, and government expenditure with FDI inflows (Chakrabarti (2001); Aldashev and Verdier (2010); Asiedu (2002)), while political stability, natural resource rents, and GDP per capita do not show consistent short-run effects. These controls are included to account for macroeconomic and institutional factors that typically influence investment decisions, ensuring that the estimated outbreak effects are not driven by broader economic trends

Table 2.3: Country and Time Fixed Effect results for Transmission Type

Variable	Impact of Disease Outbreaks by Transmission Type on FDI				
	Airborne Outbreak	Water-Food Outbreak	Vector-borne Mosquito Outbreak	Vector-borne- Flea Outbreak	Direct Contact Outbreak
	(1)	(2)	(3)	(4)	(5)
FDI/GDP	-0.169 (0.233)	0.525 (0.644)	0.337 (0.315)	-1.344* (0.721)	-1.718** (0.750)
Observations	1,944	1,944	1,944	1,944	1,944
R-squared	0.071	0.071	0.071	0.071	0.071
Number of Countries	98	98	98	98	98

Notes: Results from two-way fixed effects regressions with robust standard errors, examining the differential impact of outbreaks by disease transmission route. All regressions include country and time fixed effects.

Source: Authors' calculations based on WDI, CDC, and WHO.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.3 reports the estimated short-run effects of outbreaks, broken down by transmission type, on FDI inflows. Turning to the outbreak coefficients, the results indicate that the magnitude and statistical significance of the impact vary across transmission routes, with the most pronounced declines occurring for direct-contact diseases and vector-borne (flea) diseases. Direct-contact outbreaks such as Ebola, Lassa Fever, and Marburg virus are associated with an average reduction of about 1.7 percentage points in FDI relative to GDP. Vector-borne (flea) diseases, which are often unpredictable and harder to contain, are linked to a decline of roughly 1.3 percentage points. These outbreaks share characteristics such as high fatality rates, severe symptoms, and containment challenges, which tend to heighten public fear and investor caution. Moreover, many of these outbreaks are highly regional in scope (see Table 2.4). While this can limit their immediate global spread, it may also result in lower international visibility and weaker global mobilization of treatment and containment resources. As a result, affected countries may face prolonged disruptions with limited external support, further amplifying investor concerns. Consistent with previous studies, such disease profiles tend to magnify perceived operational and economic risks (McKibbin and Sidorenko (2006); Goel et al. (2022); Alam et al. (2021)).

Other Results (Hypothesis 1)

To complement the transmission-type analysis, I also estimated the short-term impact of each individual epidemic outbreak on FDI inflows. The results are summarized in Table 2.4.

Table 2.4: Significant Disease Outbreak Effects on FDI Inflows

Disease	Coefficient	Std. Error
Leptospirosis	−1.613***	(0.608)
Lassa Fever	−1.907**	(0.795)
Ebola	−1.508**	(0.702)
MERS	−1.202**	(0.533)
Plague	−1.344*	(0.721)

Notes: Results from two-way fixed effects regressions with robust standard errors. All regressions include country and year fixed effects.

Source: Authors' calculations based on WDI, CDC, and WHO.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.4 shows a summary of diseases that are associated with statistically significant declines in FDI, ranging from approximately 1.2 to 1.9 percentage points of GDP. While the majority of the outbreaks in our sample also show negative estimated effects on FDI, these are not statistically significant at conventional levels.

These diseases are characterized by high case fatality rates, severe symptoms, and limited treatment options (WHO (2016), CDC (2020)), all of which heighten investor perceptions of risk (UNCTAD (2020a); Adeleye et al. (2022); Initiative (2014); Yu et al. (2023)). Many of these outbreaks have been regionally concentrated, which, while restricting their immediate global spread, often results in lower international visibility and a reduced mobilization of treatment and containment resources. This limited global attention can prolong local disruptions and intensify the perceived vulnerability of affected economies, further discouraging investment.

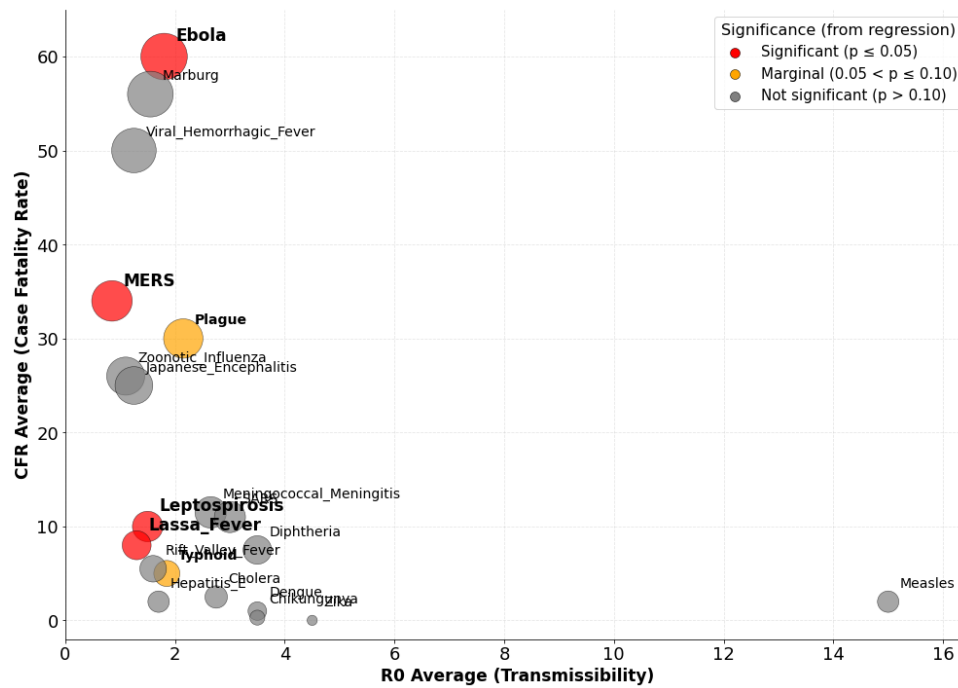
In contrast, more frequent or less lethal diseases such as Cholera, Measles, Zika, and Typhoid do not significantly deter investment. Their relatively predictable epidemiological patterns, wider geographic familiarity, and more established treatment responses may lead investors to perceive them as manageable risks. This selective reaction underscores that investor responses are shaped not only by disease severity but also by its geographic profile, media coverage, and the extent of international engagement in the outbreak response (Smith et al. (2019); Baker et al. (2020)). Full estimates for all diseases are provided in Appendix 2.7, Table 2.7.2.

To further examine how disease characteristics influence investor reactions, I classify epidemic outbreaks according to two key epidemiological indicators: the case fatality rate (CFR) and the basic reproduction number (R_0). CFR measures the proportion of deaths among confirmed cases and reflects the lethality of a disease. Following the WHO risk severity scale, I group diseases into five CFR categories: Very Low ($<1\%$), Low (1–4.99%), Moderate (5–19.99%), High (20–49.99%), and Very High ($\geq 50\%$) (see

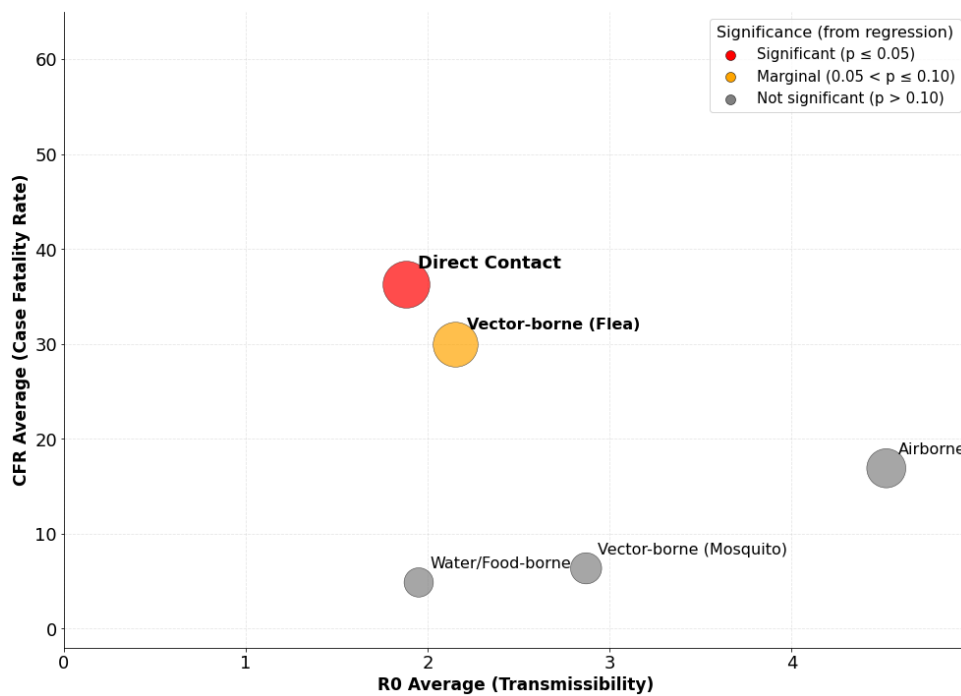
Appendix 2.7, Table 2.7.6).

The basic reproduction number (R_0) measures how many secondary cases one infected individual is expected to cause in a fully susceptible population, serving as an indicator of transmissibility. Based on ranges used in epidemiological modeling and emergency planning ((Delamater et al., 2019; Guerra et al., 2017; Lipsitch et al., 2003; Althaus, 2014; Van Kerkhove et al., 2019; Liu et al., 2020; Mukandavire et al., 2011; Nishiura et al., 2006)), I classify outbreaks into four categories: Low (<2), Moderate (2–3.49), High (3.5–5.49), and Very High (≥ 5.5) (see Appendix 2.7, Table 2.7.7).

Figure 2.5: Impact of Epidemic Outbreaks on FDI, by CFR and Reproduction Number



(a) All Outbreaks



(b) Outbreaks by Transmission type

Note: Each bubble is positioned by its average CFR (vertical axis) and average R_0 (horizontal axis). Bubble color indicates statistical significance from the regression: red = significant ($p \leq 0.05$), orange = marginal significance ($0.05 < p \leq 0.10$), grey = not significant ($p > 0.10$).

Source: Author's calculations based on WDI, CDC, and WHO

The scatterplots show a clear pattern: diseases with very high fatality rates, such as Ebola, Marburg, and MERS, tend to spread less easily, with relatively low R_0 values. This is a common trade-off in epidemiology: diseases that kill quickly often have fewer opportunities to spread widely, both for biological reasons and because control measures are introduced earlier. On the other hand, the most contagious diseases in the sample, like Measles and Zika, generally have much lower fatality rates.

From an investment point of view, the outbreaks in the high-CFR, low- R_0 group are the ones most clearly linked to the large drops in FDI. In Figure 2.5 (a), Ebola, Lassa Fever, MERS, Leptospirosis, and Plague, are severe in their health impact and often limited to specific regions, which can mean less international attention and slower support. For the countries affected, this combination of serious health impact and weaker outside help makes investors more cautious, even if the disease is unlikely to spread globally.

The transmission-type view in Figure 2.5 (b) reinforces this finding. Direct-contact and vector-borne (flea) diseases, which sit in the high-fatality but moderate-transmissibility range, show the largest and most consistent negative effects on FDI. By contrast, categories dominated by low-fatality, more contagious diseases, like airborne or mosquito-borne outbreaks, tend to show smaller and less significant effects. This suggests that investors react more to how deadly and hard to control a disease is, rather than to its contagiousness alone (Breban et al. (2007); World Bank (2020); Hong et al. (2020); Lesmanawati et al. (2020)).

2.5.2 Dynamic Response of FDI to Epidemic Shocks Over Time (Hypothesis 2)

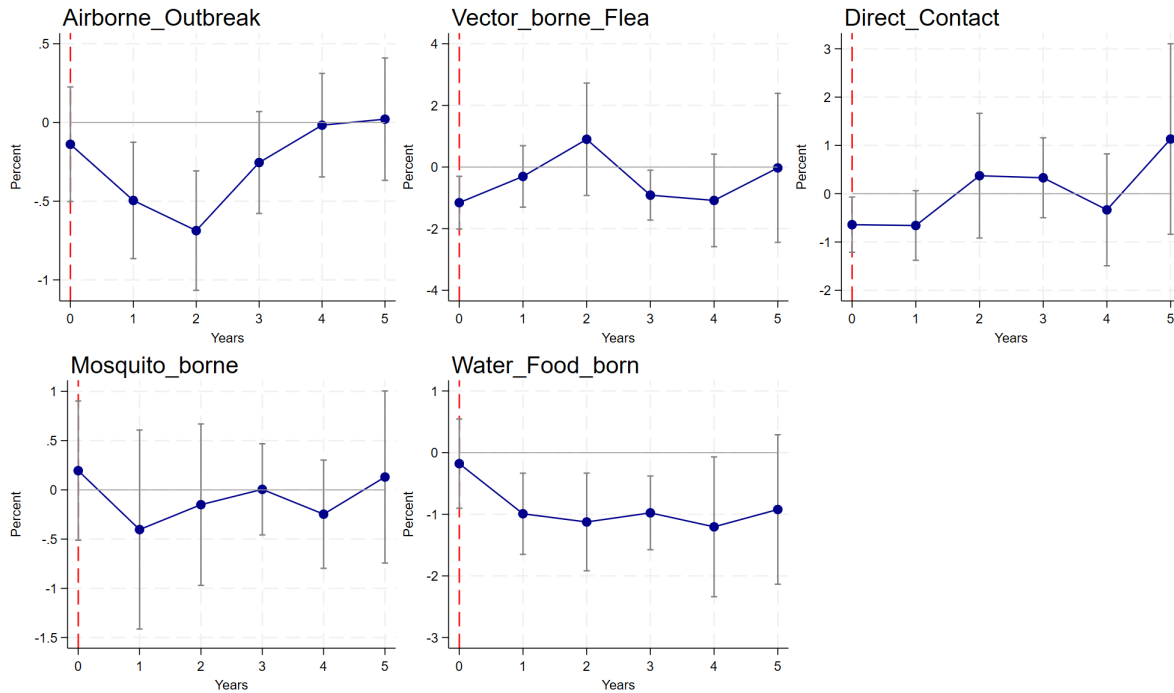
Main Results (Hypothesis 2)

This section tests Hypothesis 2, which suggests that epidemic shocks can have dynamic and potentially lasting impacts on foreign direct investment (FDI). To examine this, I use the Local Projection Method (LPM) in Equation (2) introduced by Jordà (2005), which estimates impulse response functions (IRFs) without relying on strict assumptions about the data structure. The analysis focuses on the years following an outbreak, tracking the path of FDI for up to five years to determine whether investment levels recover quickly, remain depressed, or adjust only gradually.

Importantly, the immediate effects of epidemics are already captured in the two-way fixed effects models discussed earlier (Hypothesis 1). The purpose of this dynamic analysis is to examine the medium-term recovery path of FDI and understand whether health shocks trigger temporary disruptions or lead to more enduring consequences. All models control for relevant macroeconomic variables and include country and year fixed effects to account for unobserved heterogeneity across time and space.

Figure 2.6 illustrates the evolution of foreign direct investment (FDI) inflows in the five years following the end of epidemic outbreaks, disaggregated by the mode of disease transmission. The estimates are derived using a local projection model and reflect dynamic post-crisis responses.

Figure 2.6: Impulse Response of FDI to Infectious Diseases outbreaks by Transmission Type



Note: Each panel shows the impulse response of FDI inflows to different types of infectious disease outbreaks, classified by transmission mode. The solid line indicates the estimated response, and vertical bars represent 90% confidence intervals.

Source: Author's calculations based on WDI, CDC, and WHO

The results show that all transmission types lead to a decline in FDI inflows in the aftermath of an outbreak, typically ranging from 0.5 to 1.1 percentage points of GDP. However, the depth and duration of these declines as well as the pace of recovery vary considerably depending on how the disease spreads (see Appendix 2.7 Table 2.7.5).

Direct contact outbreaks, such as those involving Ebola or Marburg, are associated with a sharp decline in FDI immediately following the epidemic. Importantly, FDI begins to recover as early as one year after the end of the outbreak, and by years two and three, investment flows not only stabilize but turn positive. This recovery suggests that although these outbreaks generate severe investor uncertainty in the short term, they may also trigger a rebound once the crisis subsides and confidence is gradually restored.

Vector-borne (Flea) outbreaks show a quicker recovery. After a short drop in FDI, inflows start to bounce back by the second year and even rise above pre-outbreak levels in some cases. Although these positive

effects are not always statistically strong, this pattern may suggest that investors adjust more easily in situations where such outbreaks are familiar or expected. The ups and downs seen in years four and five could be due to other outbreaks or unrelated shocks happening around the same time.

Airborne outbreaks such as SARS or MERS cause a longer-lasting negative effect. FDI inflows continue to fall during the first two years after the epidemic, showing that investors remain hesitant for a longer time. Signs of recovery appear only after the second year, suggesting that airborne diseases, because of their fast spread and wider disruptions, create deeper and longer economic uncertainty. This is consistent with the idea that investment decisions are often delayed when risks are systemic and hard to control.

Vector-borne (Mosquito) outbreaks cause moderate and short-lived drops in FDI. Investment inflows start to recover after the first year following the outbreak. Although the initial decline can be sharp, the recovery pattern suggests that investors see these epidemics as manageable or familiar risks, particularly in regions where such diseases are common.

Water/Food-born outbreaks show a sharp initial decline in FDI around 1% of GDP that remains persistent, with only partial recovery after the fourth year. This slower rebound may reflect deeper structural vulnerabilities, such as inadequate water and sanitation infrastructure, or recurring outbreaks that reinforce investor concerns. It may also indicate lasting reputational effects, as these diseases signal broader health and institutional challenges that take time to address.

These findings align well with the broader literature on FDI fluctuations following epidemics; Yu et al. (2023) reports a 21.5% FDI decline during outbreaks followed by compensatory increases in the three years after, while preparedness measures (e.g., Global Health Security Index) have been shown to buffer investment losses (Ait Soussane and Ibourk (2024)). Global trends also support a U-shaped recovery, UNCTAD observed FDI plunging in 2020 before a partial rebound in 2021–22 (UNCTAD (2020c)). The heterogeneity by transmission type underscores that investor responses are influenced not only by outbreak presence but also by the perceived control and spatial scope of spread. These insights can inform how public health strategies tailored by transmission mode may help accelerate investment restoration.

Other Results (Hypothesis 2)

To complement the transmission analyses, I also estimate the dynamic response of FDI to each of the 20 epidemic outbreaks individually. This allows for a closer look at how investment flows evolve over time following specific health crises, highlighting differences that might be obscured in grouped analyses. The estimations are based on the local projection model described in Equation(2), with country and year fixed effects, and standard errors clustered at the country level.

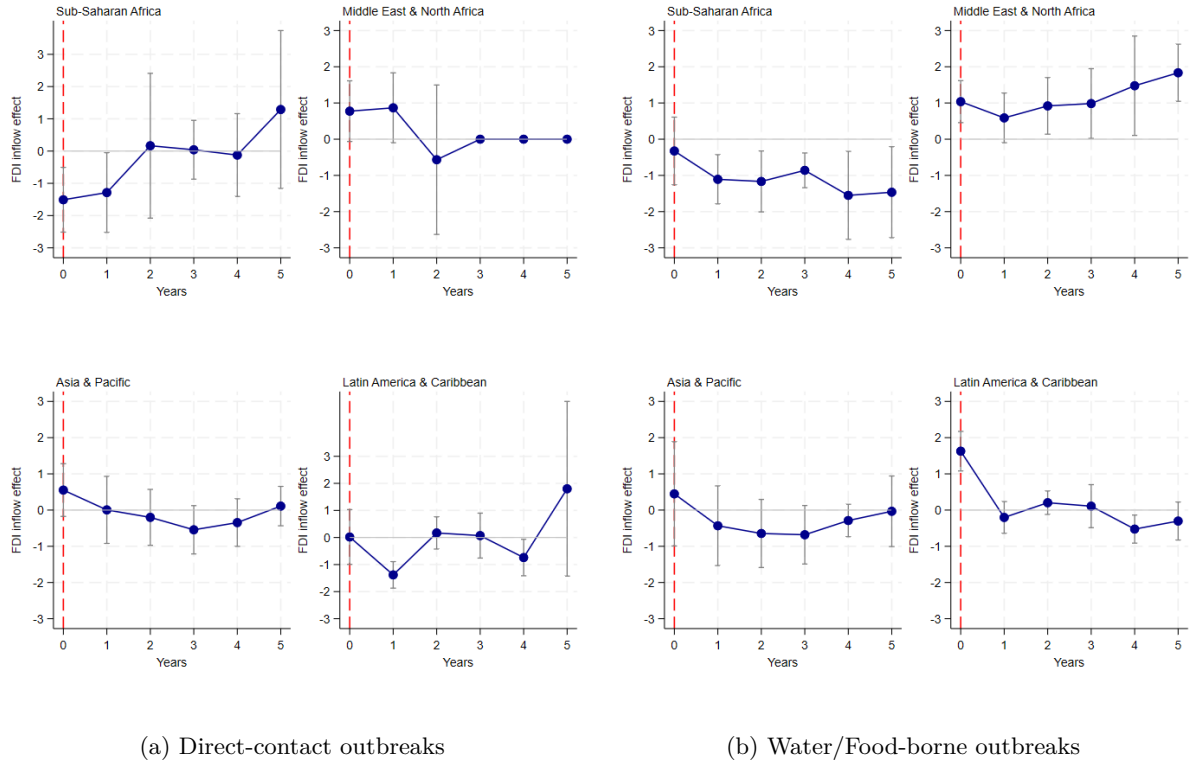
Given the large number of epidemics, the results are presented in Appendix 2.7 (Figures 2.7.1-2.7.2-2.7.3) rather than in the main text. Each figure shows the estimated impulse response of FDI

inflows to a subset of outbreaks. These figures provide a comprehensive overview of medium-term FDI adjustments across a wide range of epidemic contexts.

Overall, most outbreaks are associated with an initial decline in FDI inflows, typically within the first one to two years after the event. While the magnitude and duration of these declines vary, the general pattern shows partial to full recovery by years three or four for the majority of epidemics. A few high-fatality outbreaks, such as Ebola and MERS, exhibit more persistent negative effects, consistent with the results reported in the first hypothesis's section (see Table 2.4). These findings are in line with the broader literature, which emphasizes that health shocks tend to disrupt capital flows in the short term but that recovery is often faster when economies have stronger fundamentals and effective policy responses (Ma et al. (2020); ElFayoumi and Hengge (2021); MIT Research Group (2020); Beirne and et al. (2021); Eurasian Research Institute (2021)).

To illustrate these dynamics more clearly, Figure 2.7 focuses on the regional dimension of two transmission types: direct-contact outbreaks and water/food-borne outbreaks. These are chosen as representative examples, while results for other transmission channels (airborne, mosquito-borne, flea-borne) are consistent with the same general message; the economic shock of an epidemic depends heavily on where it strikes, with regions facing structural public health challenges bearing the greatest burden (see Appendix 2.7, Figure 2.7.4).

Figure 2.7: Impact of Epidemic Outbreaks on FDI by Transmission Type and Region



Note: Results are based on local projection estimates of the response of FDI inflows to epidemic shocks. Each line represents the average impulse response up to five years after the outbreak, with 95% confidence intervals.

Source: Author's calculations based on WDI, CDC, and WHO.

The regional patterns in Figure 2.7 show that epidemics do not hit all parts of the world equally. For direct-contact diseases, the sharpest and most lasting declines in FDI are found in Sub-Saharan Africa, where outbreaks such as Ebola and Marburg have been most severe. Here, limited containment capacity, scarce treatment resources, and the fear surrounding person-to-person transmission translate quickly into investor retreat.

For water- and food-borne diseases, the strongest disruptions also appear in regions where access to clean water and sanitation remains fragile, especially in parts of Africa and South Asia. Outbreaks like cholera can therefore carry not only health consequences but also serious economic costs, as weak infrastructure magnifies their impact.

2.5.3 Moderating Role of Healthcare System Capacity (Hypothesis 3)

Main Results (Hypothesis 3)

Building on the baseline specification in Equation (3), I extend the model by interacting epidemic outbreak dummies (classified by transmission type) with an indicator for healthcare workforce strength. The latter equals 1 if a country's nurse and midwife density per 1,000 people is above the annual median, capturing whether stronger frontline capacity moderates the effect of epidemics on FDI inflows.

Table 2.5 first presents the estimates for the control variables under different transmission-type specifications.

Table 2.5: Healthcare Workforce Capacity and FDI: Nurse and Midwife density as Buffers by Transmission Route, Only Control Variables

Variable	Impact of Disease Outbreaks by Transmission Type on FDI				
	Airborne Outbreak	Water-Food Outbreak	Vector-borne Mosquito Outbreak	Vector-borne- Flea Outbreak	Direct Contact Outbreak
	(1)	(2)	(3)	(4)	(5)
Political Stability ^a	0.186 (0.391)	0.196 (0.398)	0.188 (0.389)	0.188 (0.390)	0.163 (0.390)
GDP Growth ^a	0.062* (0.035)	0.065* (0.034)	0.062* (0.034)	0.063* (0.035)	0.065* (0.035)
Natural Resources ^a	-0.0163 (0.079)	-0.0163 (0.079)	-0.0195 (0.079)	-0.0161 (0.080)	-0.0162 (0.079)
Trade Openness ^a	0.049 ** (0.019)	0.049 ** (0.019)	0.049 ** (0.019)	0.048 ** (0.019)	0.059 ** (0.019)
GDP per Capita ^{a,b}	-2.669 (3.611)	-2.668 (3.571)	-2.624 (3.557)	-2.678 (3.557)	-2.575 (3.573)
General Expenditure ^a	0.177 ** (0.080)	0.178 ** (0.079)	0.178 ** (0.079)	0.175 ** (0.079)	0.174 ** (0.080)
Observations	1,670	1,670	1,670	1,670	1,670
R^2	0.076	0.076	0.076	0.076	0.078
Countries	97	97	97	97	97

Notes: Table reports coefficients on the control variables from the two-way fixed-effects specification that includes epidemic-outbreak by transmission route indicators and their interaction with a “good healthcare system” dummy (based on the annual median (50th percentile) in a given year). All regressions include country and time fixed effects. All regressions include country and time fixed effects.

Source: Authors' calculations based on WDI, CDC, and WHO.

^a Lagged one period.

^b Natural log transformation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The Table shows the results from the specification, including only control variables, before introducing the interaction between epidemics and nurse density. The coefficients behave broadly as expected. GDP growth, trade openness, and government expenditure are positively and significantly associated with FDI inflows, consistent with the idea that stronger macroeconomic performance and openness create favorable conditions for foreign investors. Political stability and natural resource rents show no systematic effects, while GDP per capita enters negatively but remains insignificant. These results provide a consistent baseline against which the moderating role of healthcare capacity can be assessed in the subsequent

models.

Table 2.6: Healthcare Workforce Capacity and FDI: Nurse and Midwife as Buffers by Transmission Route

Variables	Airborne Outbreak	Water/Food-Borne Outbreak	Mosquito-Borne Outbreak	Vector-borne Flea Outbreak	Direct Contact Outbreak
FDI/GDP	−0.0618 (0.376)	0.610 (0.850)	0.616 (0.397)	−2.208*** (0.583)	−1.745** (0.804)
Good Healthcare system	−0.139 (0.388)	−710 (1.277)	−0.710 (0.617)	3.295*** (0.894)	2.251** (0.994)
Observations	1,670	1,670	1,670	1,670	1,670
R-squared	0.076	0.076	0.078	0.076	0.076
Number of Countries	97	97	97	97	97

Notes: This table reports two-way fixed-effects regression estimates of the moderating role of healthcare capacity, proxied by nurse and midwife density, on transmission route. The indicator for “Good Healthcare System” equals 1 if a country’s nurse density is above the annual median (50th percentile) in a given year. Interaction terms capture how epidemic outbreaks (by transmission type) affect FDI inflows in countries with relatively stronger healthcare systems. All regressions include country and time fixed effects.

Source: Authors’ calculations based on WDI, CDC, and WHO.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The results in Table 2.6 reveal important heterogeneity in how nursing system capacity moderates the FDI response to different Transmission types (see Table 2.7.5 in Appendix 2.7). Specifically, frontline health workforce strength appears particularly critical in mitigating investor retreat during severe health shocks transmitted via direct contact or animal vectors.

The most pronounced effects are observed for direct contact and Vector-borne Flea outbreaks, where FDI declines sharply in countries with weaker health systems (−1.745 and −2.208 percentage points, respectively). In contrast, countries with stronger nursing coverage see these effects significantly softened (+2.251 and +3.295 percentage points). These results align with evidence that timely, community-based care and trust-building roles often led by nurses are central to controlling outbreaks with person-to-person transmission (Bloom et al. (2015); Kruk et al. (2017)). Strong nursing capacity also reduces transmission duration, hospital overload, and panic, key drivers of economic disruption during hemorrhagic epidemics (Evans et al. (2015); Moon et al. (2015)).

For mosquito-borne diseases (e.g., Dengue, Zika), the baseline effect on FDI is weakly negative, with no statistically significant moderating role for nurse density. These outbreaks tend to be seasonal and spatially concentrated, and health system preparedness relies more on vector control than on facility-based interventions (Fitzpatrick et al. (2017); Faria et al. (2016)). Thus, the limited buffering effect may reflect the relatively peripheral role of clinical care in influencing investor perceptions.

For fecal-oral and airborne transmission diseases, results are less conclusive. While FDI responses are statistically insignificant in both baseline and interaction terms, the direction of the coefficients suggests potential economic vulnerability that may not be adequately addressed by nursing capacity alone. Outbreaks such as cholera or airborne influenza may require infrastructure-based solutions like water sanitation or large-scale mobility restrictions domains where nurse density is a less decisive factor (Marcos-Marcos et al. (2018); World Health Organization. Regional Office for Europe (2020); Townson et al.

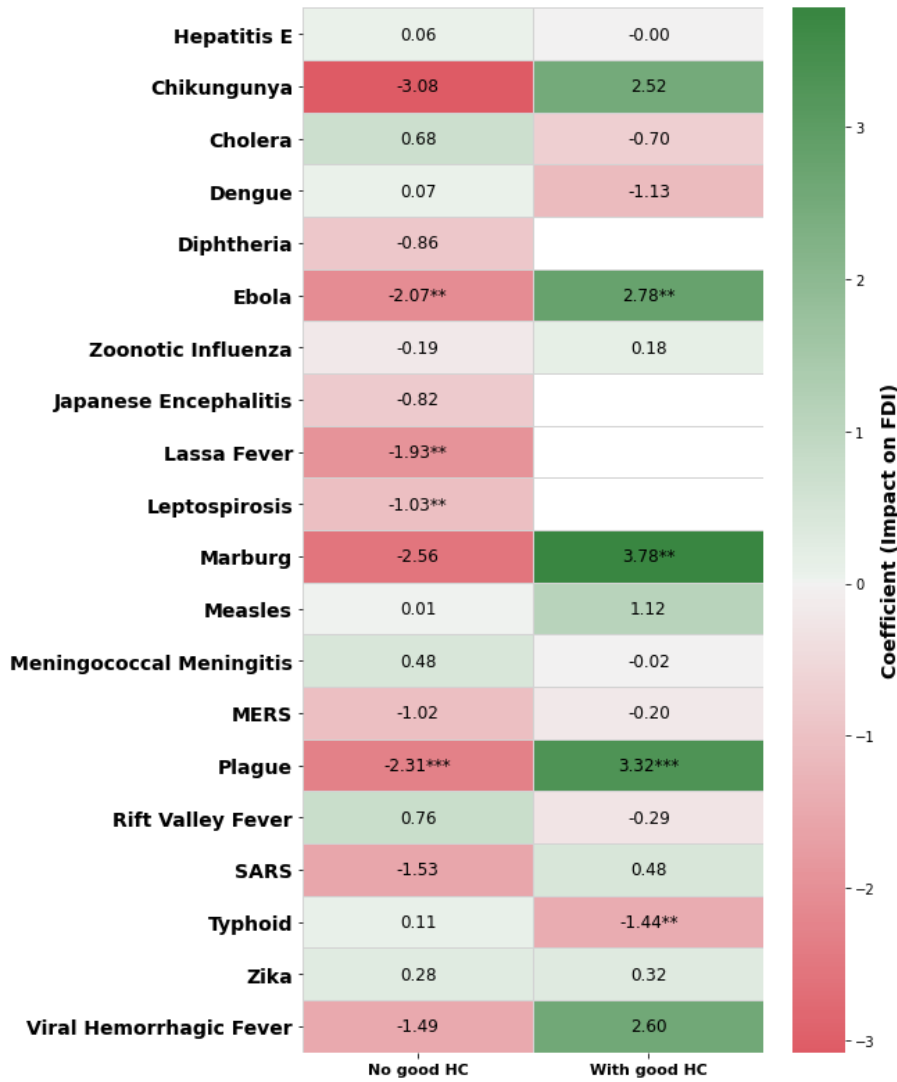
(2005)).

Taken together, these findings reinforce the idea that healthcare system strength is not uniformly protective across all types of outbreaks. Its mitigating power depends both on how a disease spreads and on how central clinical response is to containment. In contexts where frontline care and public trust are pivotal, nursing workforce density is not only a health asset, but a strategic economic safeguard.

Other Results (Hypothesis 3)

Figure 2.8 summarizes outbreak-specific estimates from two-way fixed effects regressions. Each bar reflects the change in FDI inflows associated with a given epidemic shock, both in countries with weaker health systems (No good HC) and in those with stronger nursing capacity (With good HC). The contrast between these two categories reveals how frontline healthcare strength reshapes investor responses to health crises.

Figure 2.8: Impact of Epidemic Outbreaks on FDI Inflows with and without Strong Healthcare Systems



Note: This heatmap reports two-way fixed effects regression estimates of the effect of epidemic outbreaks on FDI inflows, distinguishing between countries with weaker healthcare systems (“No good HC”) and those with stronger healthcare capacity (“With good HC”), proxied by nurse and midwife density above the annual median (50th percentile). Numbers inside cells represent estimated coefficients, with stars denoting statistical significance (*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$).

Source: Author’s calculations based on WDI, CDC, and WHO

Results indicate that several of the most severe and high-fatality outbreaks, particularly Ebola, Plague, and Marburg, are associated with sharp FDI declines in countries with weaker systems (-2.07 , -2.31 , and -2.56 percentage points, respectively). However, when nurse density is above the median, these effects are substantially mitigated or even reversed, with positive coefficients of $+2.78$ for Ebola, $+3.32$ for Plague, and $+3.78$ for Marburg. This contrast illustrates that investor behavior depends not only on the occurrence of the outbreak itself but also on the credibility and visibility of the health system response.

For other diseases, such as Chikungunya and Viral Hemorrhagic Fever, the buffering effect of health-

care strength is also evident. FDI responses shift from strongly negative (-3.08 and -1.49) to positive values ($+2.52$ and $+2.60$), suggesting that stronger nursing coverage can transform investor expectations even in the face of less well-studied or emerging pathogens. In contrast, for outbreaks such as Dengue or Typhoid, where prevention relies more on vector control and broader public health infrastructure than on clinical workforce capacity, no consistent buffering effect is observed.

Taken together, these results reinforce the idea that nurses and midwives act as both health responders and economic stabilizers. Their presence ensures faster isolation, community-level communication, and continuity of essential care, thereby reducing the likelihood of systemic disruptions in economic activity. These findings are consistent with literature emphasizing the role of frontline healthcare capacity in containing epidemics and stabilizing societal functioning (World Health Organization (2020); Aiken et al. (2014); Kruk et al. (2017); Evans et al. (2015); Moon et al. (2015)). They also align with studies showing that resilient health systems can bolster investor confidence by signaling institutional preparedness and governance capacity (Yu et al. (2023); Correia et al. (2022); Adda (2016)).

2.6 Robustness test

To ensure the reliability of the main findings, I conduct a series of robustness tests corresponding to each of the three core hypotheses. These checks use alternative model specifications and estimation strategies to assess whether the results are sensitive to sample selection, fixed effects, or model dynamics.²

2.6.1 Robustness for H1: Short-Term Impact of Epidemics on FDI

To assess the robustness of the main results, Table 2.7.8 in Appendix 2.7 reports estimates from a model using only country fixed effects, excluding time fixed effects. This specification controls for time-invariant country characteristics but does not capture global shocks or trends common across countries in the same year (e.g., global recessions or pandemics). As expected, the overall R^2 is slightly lower compared to the baseline model, reflecting the omission of time-specific variation. Nevertheless, the direction and significance of most coefficients remain consistent with the main findings.

Key outbreaks like Ebola, MERS, Lassa Fever, Plague, and Leptospirosis still show significant negative effects on FDI, and the direction of estimates remains stable overall. Interestingly, in this version SARS and Japanese Encephalitis become statistically significant, with a negative effect on FDI inflows. This result suggests that when global shocks are not explicitly accounted for, the outbreak appears to have had a more severe country-specific impact on investment. This highlights the importance of controlling for time effects. Nonetheless, the direction and significance of key coefficients remain largely consistent,

²All robustness regressions include the full set of control variables used in the main specification. Coefficients for these variables are reported in Appendix Tables 2.7.9, 2.7.10, 2.7.12, 2.7.13, 2.7.17, and 2.7.18.

supporting the robustness of the main findings.

As another robustness check, Appendix 2.7 Table 2.7.11 shows the results from models that include time fixed effects only, without country fixed effects. This approach enables me to control for global shocks that may affect all countries in a given year, such as financial crises, global trade slowdowns, or large-scale pandemics. However, it does not account for unobserved differences across countries, including political systems, geography, or long-term investment environments. Even with this change, the core story holds. Diseases like MERS, Lassa Fever, and Leptospirosis continue to show significant negative impacts on FDI inflows. In fact, the effect of MERS and Lassa Fever appears even stronger in this version, reinforcing the idea that these outbreaks had serious economic consequences beyond just health.

Some differences also emerge, for instance, Plague and Ebola, which were both significant in the baseline model, still negative but no longer show statistically significant effects here. This suggests that their impact may have been more country-specific potentially tied to the domestic context or the institutional response rather than driven by global investor sentiment. On the other hand, Diphtheria, which was not significant in the main model, now emerges as negatively associated with FDI. This shift may reflect certain country-year episodes where outbreaks of Diphtheria coincided with weakened investor confidence, particularly when global factors are held constant.

Overall, while this model does not capture differences between countries, the fact that several diseases still have strong and significant effects gives us more confidence in the robustness of the results. The relatively R^2 (0.246) also shows that a good share of the variation in FDI can be explained by year-to-year global factors, which makes sense in a world of increasingly integrated capital markets.

To make sure the results are not overly sensitive to how I define an epidemic year, I built a more flexible version of the outbreak indicators. Instead of marking only the exact year when a disease appears, this version captures broader outbreak windows. In this case, if a country experienced multiple outbreaks of the same disease within five years of each other, I group those into a single episode and mark all years in that window with a 1. This helps account for the fact that in many countries, especially those with weaker health systems epidemics are not always short-lived. Their effects can linger and even resurface over several years. This new approach better reflects the reality on the ground: health shocks often stretch across more than one calendar year and can disrupt investment decisions over a longer horizon.

Table 2.7.14 in Appendix 2.7 shows the results from a robustness check using wider outbreak windows that include multiple years of disease activity, rather than just single-year outbreaks. The model still includes both country and time fixed effects, just like the main analysis. The main results still hold. Key outbreaks like Ebola, MERS, Plague, Lassa Fever, and Leptospirosis continue to have a significant negative effect on FDI inflows, even with the broader definition. This suggests that my findings are not just driven by how I define outbreak timing. There are a few small changes: for example, MERS

remains significant but at the 10% level instead of 5%. Overall, this robustness test confirms that the main conclusions are solid. Even when I allow for longer periods of disruption, the same diseases still show up as harmful to investment.

2.6.2 Robustness for H2: Dynamic Response of FDI to Epidemic Shocks

To test the robustness of the dynamic FDI response to epidemic shocks, I construct a general epidemic indicator coded as 1 if a country experiences at least one outbreak in a given year, and 0 otherwise. This binary measure captures overall exposure to health shocks, abstracting from disease-specific characteristics to focus on broader macroeconomic effects.

Following the approach of Jordà et al. (2022), I use a Local Projection Method to trace the average trajectory of FDI inflows over five years after an epidemic shock. As shown in Figure 2.7.5, the impulse response exhibits a U-shaped pattern: FDI declines in the first year, reaches a trough in year one, and begins to recover by year two, peaking around year three before stabilizing.

These dynamics are consistent with the main results for Hypothesis 2, confirming that the negative impact of epidemics on FDI is transitory rather than permanent. While initial disruptions reflect uncertainty and delayed investment decisions, recovery generally occurs within a few years, highlighting the resilience of capital flows to non-financial shocks over the medium term (Kose et al. (2020); United Nations Conference on Trade and Development (UNCTAD) (2022); Kleinert and Sturm (2021)).

Following the baseline results using the general epidemic shock variable, I further explore whether this average global response masks important regional differences. While the global impulse response reveals a temporary U-shaped pattern in FDI flows, countries are not affected equally. To investigate this heterogeneity, I disaggregate the Local Projection estimates by region, as shown in Figure 2.7.6. This approach helps capture shared institutional, economic, and geographic characteristics within regions that may shape how epidemics influence investment behavior.

The results highlight striking variation. Sub-Saharan Africa faces the steepest and most persistent FDI decline, likely due to limited health infrastructure and heightened investor sensitivity. The Middle East and North Africa display a modest and short-lived dip, while Asia and the Pacific show a shallow contraction followed by partial recovery. Latin America and the Caribbean, in contrast, exhibit a delayed but stronger rebound after three years of decline. These differences underscore the importance of regional resilience and institutional capacity in shaping FDI dynamics following epidemic shocks.

2.6.3 Robustness for H3: Moderating Role of Healthcare System Capacity

To further assess the robustness of the buffering role of healthcare system capacity, I re-estimate the baseline specification using alternative definitions of healthcare quality.

First, I apply a stricter threshold for physician availability, classifying countries as having a well-developed healthcare system if physician density exceeds the annual median (50th percentile). The results, reported in Table 2.7.15, remain broadly consistent with the baseline estimates. In particular, the interaction terms between epidemic outbreaks and healthcare capacity continue to be positive and statistically significant for Vector-borne Flea and Direct Contact diseases, confirming the robustness of the moderating effect.

Second, I replace physician density with the Global Health Security Index (GHS Index)³, a composite measure capturing countries' preparedness for infectious disease prevention, detection, and response. Using this alternative proxy yields qualitatively similar results (Table 2.7.16): countries with higher health security experience a significantly weaker adverse impact of epidemic outbreaks on FDI inflows. The magnitude and statistical significance of the interaction terms are comparable to those obtained in the main specification, reinforcing the conclusion that stronger healthcare systems mitigate the negative effects of epidemic shocks.

2.7 Conclusion

This study examined the impact of epidemic outbreaks on foreign direct investment (FDI) inflows, with particular attention to how health system capacity shapes resilience. Using a panel of 98 countries from 2000–2022 and a dataset covering 20 outbreaks, three main hypotheses were tested, and the results provide consistent and policy-relevant insights.

First (**H1**), epidemic outbreaks are found to reduce FDI inflows in the short run, confirming that health shocks act as economic shocks. The negative effect is particularly pronounced for severe outbreaks such as Ebola, MERS, and Lassa Fever. These results remain robust across different specifications, reinforcing the idea that epidemics heighten risk and uncertainty in ways that deter foreign investors.

Second (**H2**), the local projection analysis revealed that the impact of epidemics on FDI is not uniform but unfolds dynamically depending on the mode of transmission. Outbreaks spread through airborne transmission lead to sharp immediate declines in FDI, with recovery beginning only after the second year. Direct-contact diseases show an initial drop followed by signs of rebound after one year, though this recovery is often interrupted by overlapping outbreaks. By contrast, water- and food-borne diseases

³The Global Health Security (GHS) Index is the first comprehensive assessment and benchmarking of health security and related capabilities across the 195 countries that are States Parties to the International Health Regulations (IHR, 2005). The GHS Index aims to promote measurable improvements in national health security and to strengthen international capacity to prevent, detect, and respond to infectious disease threats that may lead to epidemics and pandemics. Further details are available at <https://ghsindex.org/>.

exhibit the most persistent decline, with losses extending into the fourth year, reflecting the difficulty of controlling these outbreaks in regions with weak infrastructure. This heterogeneity underscores that investors react not only to the presence of an epidemic but also to its perceived manageability, regional concentration, and the capacity of affected countries to contain it. Importantly, many of the long-lasting outbreaks (e.g., water- and food-borne, or direct contact) are concentrated in Sub-Saharan Africa and low-income countries, suggesting that regional vulnerabilities amplify the duration and depth of FDI losses.

Third (**H3**), the moderation analysis demonstrated that stronger healthcare systems, particularly higher nurse density, significantly buffer the negative impact of epidemics on FDI. The consistent results for nursing density suggest that the frontline health workforce plays a critical role not only in outbreak management but also in sustaining investor confidence during crises.

Taken together, these findings highlight three key messages. First, epidemics are not merely public health events but also economic shocks that can deter investment for years. Second, the economic impact of epidemics varies by disease transmission mode and is shaped by regional contexts. Third, strengthening healthcare systems, especially the health workforce, offers a viable pathway to reducing the economic costs of epidemics, complementing their core role in protecting lives.

Looking forward, future research could expand along several dimensions: examining how sectoral FDI is differently affected, assessing cross-border spillovers in highly integrated regions, or exploring how institutional quality interacts with health capacity to moderate shocks. As global connectivity and climate change heighten epidemic risks, integrating health system strengthening into broader economic resilience strategies will remain an urgent priority for policymakers.

Appendix

Table 2.7.1: Definition of Variables

Variables	Definition	Source
FDIGDP	FDI inflow (% of GDP)	World Bank WDI database
GDPpc	GDP per capita (constant 2015 US\$)	World Bank WDI database
Natres	Total natural resource rents (% of GDP)	World Bank WDI database
GDPg	GDP growth (annual %)	World Bank WDI database
Politic	Political Stability and Absence of Violence/Terrorism	World Bank WDI database
Trade	Trade (% of GDP)	World Bank WDI database
GovEx	Government expenditure to GDP ratio	World Bank WDI database
Hepatitis_E		Global Dataset
Chikungunya		Global Dataset
Cholera		Global Dataset
Dengue		Global Dataset
Diphtheria		Global Dataset
Ebola		Global Dataset
Zoonotic_Influenza		Global Dataset
Japanese_Encephalitis		Global Dataset
Lassa_Fever		Global Dataset
Leptospirosis		Global Dataset
Marburg		Global Dataset
Measles		Global Dataset
Meningococcal_Meningitis		Global Dataset
MERS		Global Dataset
Plague		Global Dataset
Rift_Valley_Fever		Global Dataset
SARS		Global Dataset
Typhoid		Global Dataset
Zika		Global Dataset
Viral_Hemorrhagic_Fever		Global Dataset

Notes: This table provides definitions and sources of the variables. All disease variables are binary indicators equal to 1 for country and year observations in which a laboratory-confirmed outbreak of the named disease was reported; 0 otherwise. Outbreak identification follows the Global Dataset of pandemic- and epidemic-prone diseases (Torres Munguía et al. (2022)), complemented with WHO and CDC reports. Sample: 98 countries, 2000–2021.

Table 2.7.2: Country and Time Fixed Effects Result

Disease Outbreak Effects on FDI Inflows					
Disease	Coefficient	Std. Error	Disease	Coefficient	Std. Error
Hepatitis E	0.090	(0.845)	SARS	-1.587	(1.167)
Chikungunya	-2.242	(2.327)	Marburg	-1.365	(1.778)
Cholera	0.705	(0.737)	Measles	0.488	(0.581)
Dengue	-0.403	(0.465)	Meningococcal Disease	0.187	(0.496)
Diphtheria	-0.301	(0.859)	MERS	-1.202**	(0.533)
Ebola	-1.508**	(0.702)	Plague	-1.344*	(0.721)
Viral Haemorrhagic Fever	-1.869	(1.290)	Rift Valley Fever	0.666	(1.289)
Japanese Encephalitis	-0.829	(0.798)	Typhoid	-0.231	(0.317)
Lassa Fever	-1.907**	(0.795)	Zika	0.489	(0.425)
Leptospirosis	-1.613***	(0.608)			
Zoonotic Influenza	-0.011	(0.331)			
Total Observations:		1,944 across 98 countries			
(R^2) for all:		0.071 - 0.073			

Notes: Table reports coefficients on all 20 disease outbreak dummies from two-way (country and year) fixed-effects regressions of FDI inflows. All regressions include country and time fixed effects.

Source: Author's calculations based on WDI, CDC, and WHO.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

^a Lagged one period.

^b Natural log transformation.

Tables 2.7.3 and 2.7.4 present the estimated effects of key host country characteristics on FDI inflows, controlling for time and country fixed effects.

Table 2.7.3: Country and Time Fixed effects result, Effect of Outbreaks on FDI: Only Control Variables

Control Variables	Disease-Specific Models (Part 1)										
	Hepatitis E	Chikungunya	Cholera	Dengue	Diphtheria	Ebola	Zoonotic_Influenza	Japanese_Encephalitis	Lassa Fever	Leptospirosis	Marburg
Political Stability ^a	0.180 (0.328)	0.191 (0.325)	0.176 (0.325)	0.179 (0.327)	0.179 (0.327)	0.181 (0.327)	0.179 (0.327)	0.179 (0.327)	0.169 (0.325)	0.179 (0.327)	0.185 (0.326)
GDP Growth ^a	0.068** (0.033)	0.068** (0.033)	0.068** (0.033)	0.081** (0.033)	0.081** (0.033)	0.096** (0.033)	0.081** (0.033)	0.081** (0.033)	0.084** (0.033)	0.080** (0.033)	0.081** (0.033)
Natural Resources ^a	-0.012 (0.074)	-0.012 (0.073)	-0.013 (0.074)	-0.012 (0.074)	-0.013 (0.074)	-0.014 (0.074)	-0.012 (0.074)	-0.011 (0.074)	-0.012 (0.074)	-0.013 (0.074)	-0.012 (0.074)
Trade Openness ^a	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)	0.044** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)
GDP per Capita ^{a,b}	-2.055 (2.771)	-2.128 (2.760)	-2.059 (2.773)	-2.065 (2.774)	-2.059 (2.774)	-2.029 (2.806)	-2.057 (2.775)	-2.060 (2.770)	-2.067 (2.770)	-2.053 (2.770)	-2.051 (2.771)
General expenditure ^a	0.150** (0.067)	0.149** (0.067)	0.154** (0.065)	0.150** (0.067)	0.150** (0.067)	0.151** (0.067)	0.150** (0.067)	0.150** (0.067)	0.151** (0.067)	0.151** (0.067)	0.150** (0.067)
Observations	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944
R ²	0.071	0.072	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071
Countries	98	98	98	98	98	98	98	98	98	98	98

Notes: Table reports first part of coefficients on the control variables only from two-way (country and year) fixed-effects regressions estimating the effect of 20 epidemic outbreaks on FDI inflows. All regressions include country and time fixed effects.

Source: Author's calculations based on WDI, CDC, and WHO.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

^a Lagged one period.

^b Natural log transformation.

Table 2.7.4: Country and Time Fixed effects result, Effect of Outbreaks on FDI: Only Control Variables

Control Variables	Disease-Specific Models (Part 2)								
	Measles	Meningococcal	MERS	Plague	Rift Valley	SARS	Typhoid	Haemorrhagic	Zika
Political Stability ^a	0.177 (0.328)	0.171 (0.326)	0.164 (0.328)	0.171 (0.328)	0.180 (0.327)	0.194 (0.331)	0.179 (0.327)	0.176 (0.327)	0.151 (0.340)
GDP Growth ^a	0.068** (0.033)	0.068** (0.033)	0.068** (0.033)	0.068** (0.033)	0.068** (0.033)	0.068** (0.033)	0.068** (0.033)	0.068** (0.033)	0.068** (0.033)
Natural Resources ^a	-0.012 (0.074)	-0.012 (0.074)	-0.016 (0.075)	-0.012 (0.074)	-0.013 (0.074)	-0.012 (0.074)	-0.012 (0.074)	-0.013 (0.074)	-0.013 (0.074)
Trade Openness ^a	0.043** (0.019)	0.043** (0.019)	0.044** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)	0.043** (0.019)
GDP per Capita ^{a,b}	-2.054 (2.770)	-2.060 (2.773)	-2.151 (2.768)	-2.071 (2.771)	-2.059 (2.771)	-2.164 (2.832)	-2.055 (2.771)	-2.061 (2.771)	-1.964 (32.793)
General expenditure ^a	0.150** (0.0.67)	0.149** (0.067)	0.152** (0.065)	0.150** (0.0.67)	0.150** (0.0.67)	0.149** (0.0.67)	0.150** (0.0.67)	0.150** (0.0.67)	0.154** (0.0.68)
Observations	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944
R^2	0.071	0.071	0.072	0.071	0.071	0.071	0.071	0.071	0.073
Countries	98	98	98	98	98	98	98	98	98

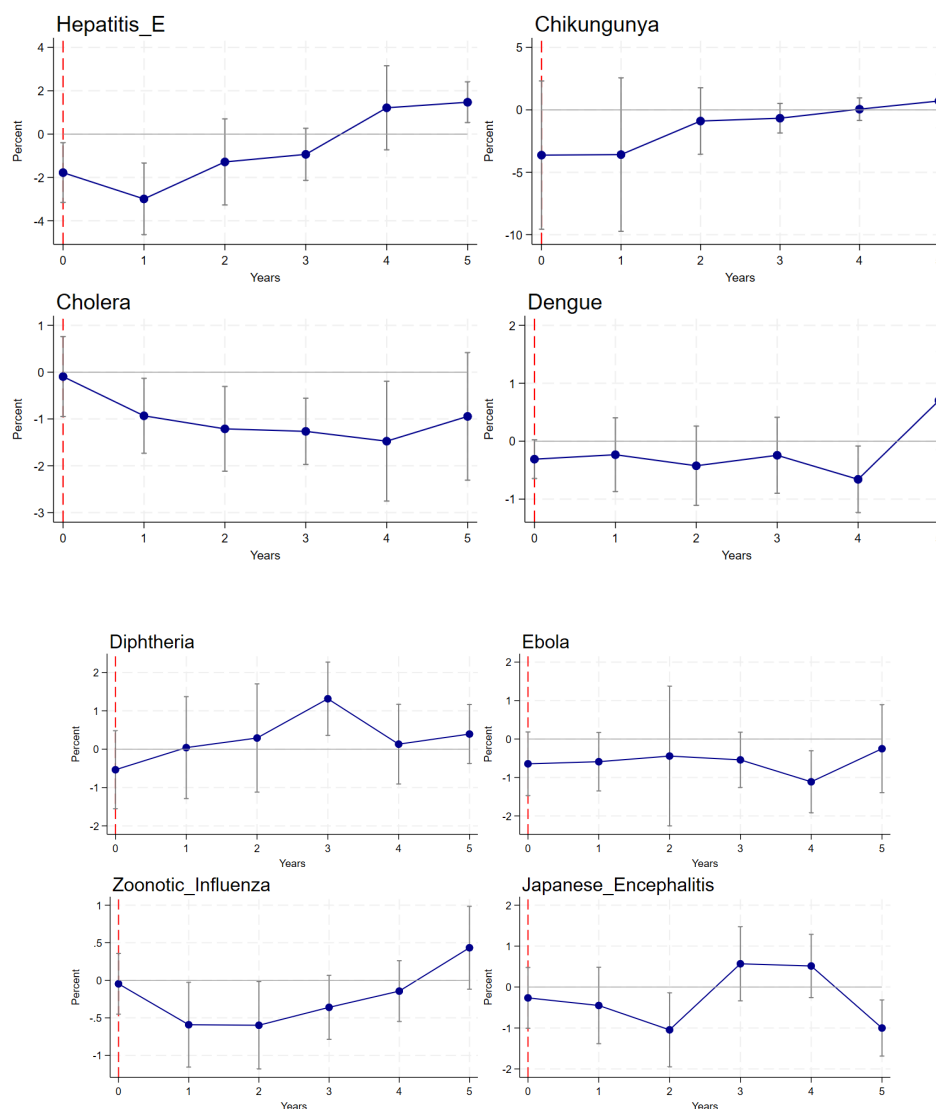
Notes: Table reports second part of coefficients on the control variables only from two-way (country and year) fixed-effects regressions estimating the effect of 20 epidemic outbreaks on FDI inflows. All regressions include country and time fixed effects.

Source: Author's calculations based on WDI, CDC, and WHO. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

^a Lagged one period.

^b Natural log transformation.

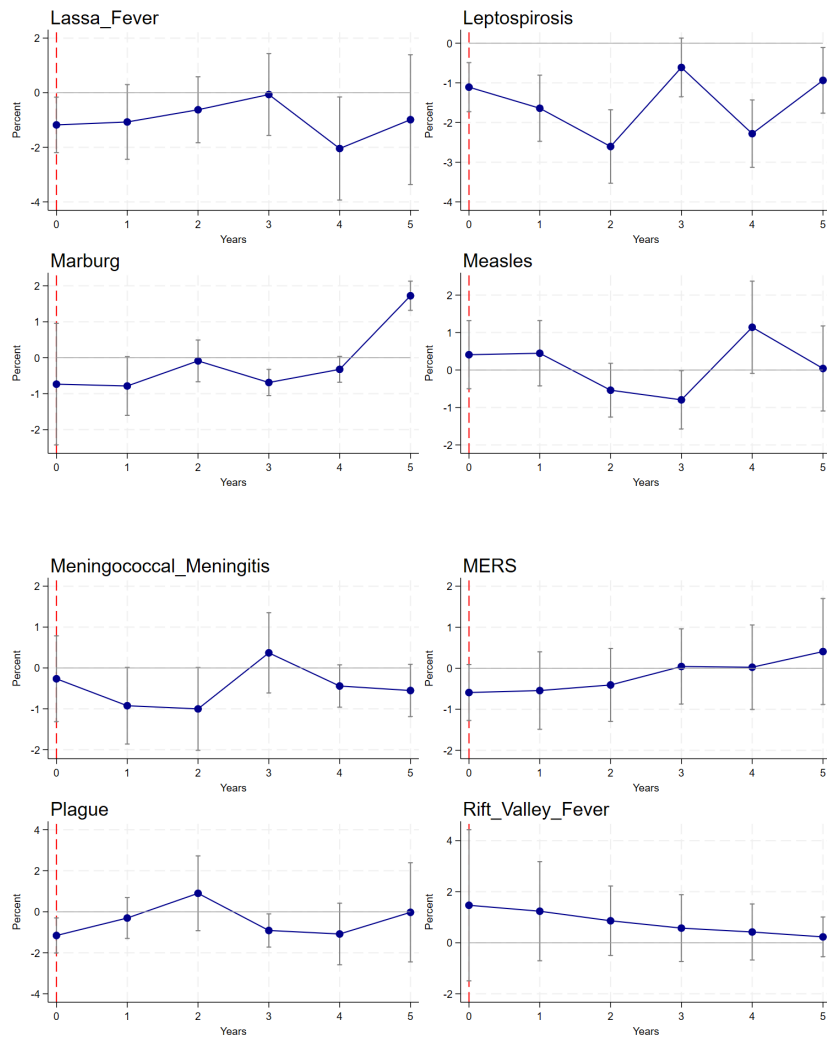
Figure 2.7.1: Response of FDI to Global Epidemic Outbreaks: Evidence from LPM – Part 1



Note: This figure displays the estimated impulse responses of FDI to 20 epidemic outbreaks using the local projection method. Shaded areas represent 90% confidence intervals.

Source: Author's calculations based on WDI, CDC, and WHO.

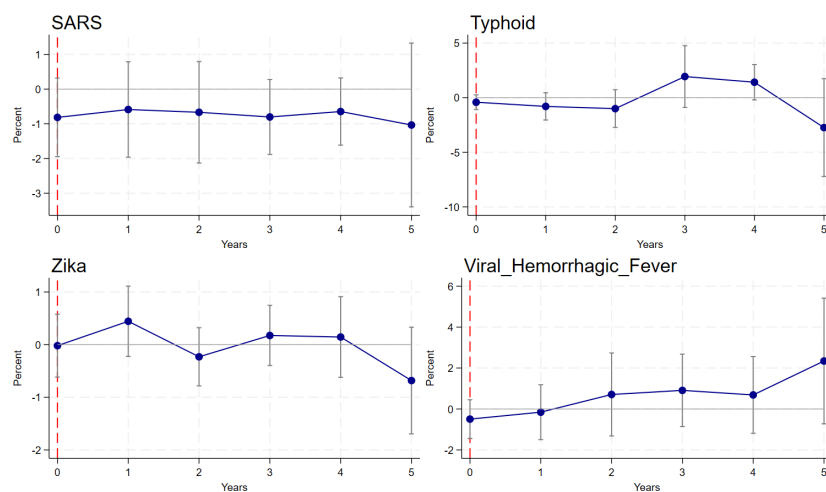
Figure 2.7.2: Response of FDI to Global Epidemic Outbreaks: Evidence from LPM – Part 2



Note: This figure displays the estimated impulse responses of FDI to 20 epidemic outbreaks using the local projection method. Shaded areas represent 90% confidence intervals.

Source: Author's calculations based on WDI, CDC, and WHO.

Figure 2.7.3: Response of FDI to Global Epidemic Outbreaks: Evidence from LPM – Part 3



Note: This figure displays the estimated impulse responses of FDI to 20 epidemic outbreaks using the local projection method. Shaded areas represent 90% confidence intervals.

Source: Author's calculations based on WDI, CDC, and WHO.

Figure 2.7.4: Impact of Epidemic Outbreaks on FDI by Transmission Type and Region

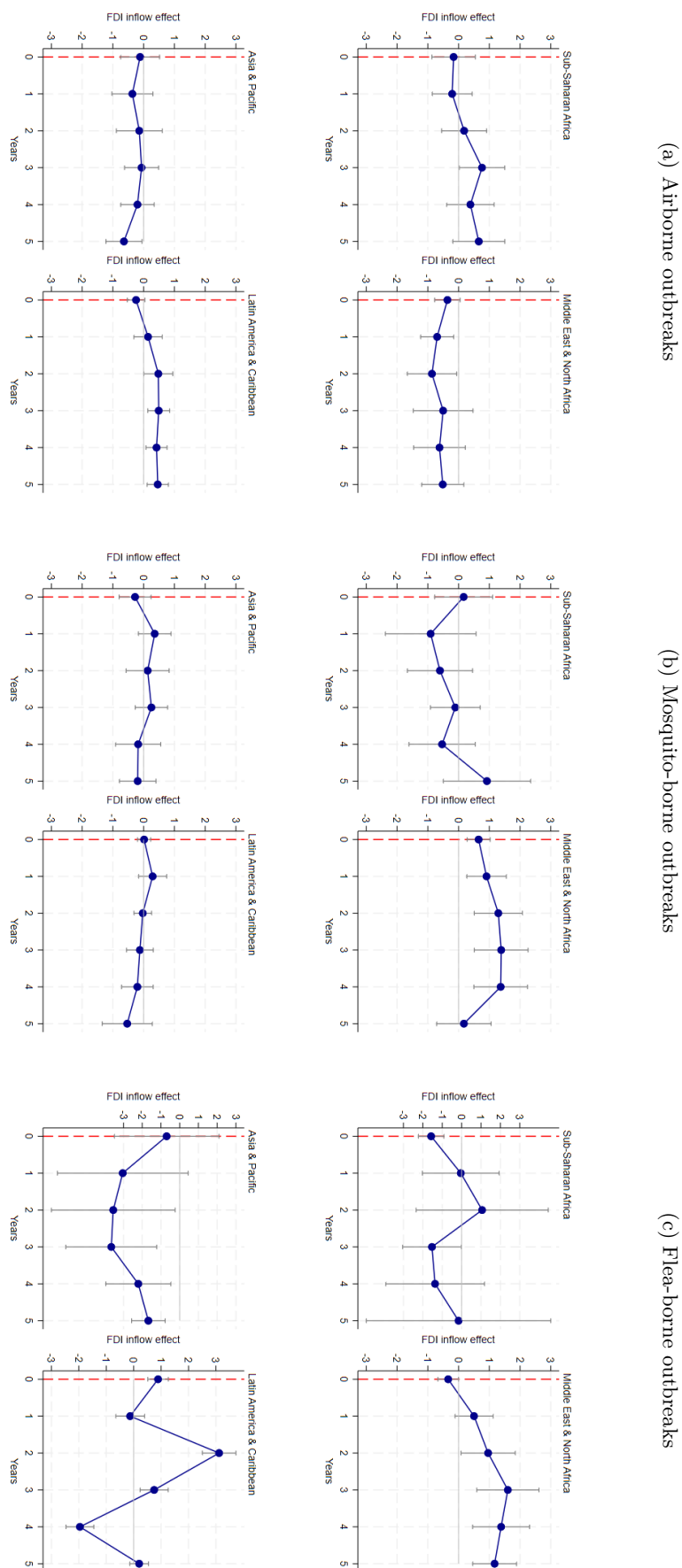


Table 2.7.5: Classification of Epidemic Outbreaks by Transmission Route

Transmission Type	Diseases Included
Water/Food-borne	Hepatitis E, Cholera, Typhoid, Leptospirosis
Vector-borne (Mosquito)	Chikungunya, Dengue, Japanese Encephalitis, Rift Valley Fever, Zika
Direct Contact	Ebola, Marburg, Viral Hemorrhagic Fever, Lassa Fever, Diphtheria
Airborne	Zoonotic Influenza, Measles, Meningococcal Meningitis, MERS, SARS
Vector-borne (Flea)	Plague

Notes: Diseases are grouped by their *predominant transmission route during human outbreaks* (how people acquire infection), not by ecological origin or spillover pathway. Multi-route diseases are assigned to the primary route observed in outbreaks, following WHO/CDC guidance.

Table 2.7.6: Classification of Epidemics by Case Fatality Rate (CFR)

CFR Class	CFR Range	Example Diseases
Very Low	< 1%	Chikungunya, Zika
Low	1–4.99%	Cholera, Dengue, Measles, Hepatitis E
Moderate	5–19.99%	SARS, Lassa Fever, Meningitis, Typhoid, Leptospirosis
High	20–49.99%	MERS, Plague, Japanese Encephalitis, Zoonotic Influenza
Very High	≥ 50%	Ebola, Marburg, Viral Hemorrhagic Fevers

Notes: The table shows the case fatality ratio (CFR). CFR is the proportion of deaths among confirmed cases, reflecting disease lethality. Following the WHO risk severity scale, diseases are grouped into five CFR categories.

Table 2.7.7: Classification of Epidemics by Basic Reproduction Number (R_0)

R_0 Class	R_0 Range	Example Diseases
Low	<2	MERS, Marburg, Lassa Fever, Japanese Encephalitis
Moderate	2–3.49	Ebola, Typhoid, Plague, Rift Valley Fever
High	3.5–5.49	SARS, Cholera, Chikungunya, Dengue
Very High	≥5.5	Measles, Zika

Notes: The table shows the average number of secondary cases generated by one primary case in a fully susceptible population. The bins shown are illustrative; example diseases are assigned based on typical literature estimates. Actual values vary by setting and intervention timing

Table 2.7.8: Country Fixed Effect Results (Robustness)

Disease Outbreak Effects on FDI Inflows					
Disease	Coefficient	Std. Error	Disease	Coefficient	Std. Error
Hepatitis E	-0.0293	(0.949)	Marburg	-0.873	(1.677)
Chikungunya	-2.383	(2.375)	Measles	0.148	(0.529)
Cholera	0.601	(0.741)	Meningococcal Meningitis	0.290	(0.513)
Dengue	-0.547	(0.424)	MERS	-1.172**	(0.491)
Diphtheria	0.356	(0.773)	Plague	-1.335**	(0.649)
Ebola	-1.450**	(0.718)	Rift Valley Fever	0.864	(1.187)
Zoonotic Influenza	-0.0576	(0.299)	SARS	-1.709**	(0.791)
Japanese Encephalitis	-1.259*	(0.689)	Typhoid	-0.294	(0.251)
Lassa Fever	-1.928**	(0.777)	Zika	0.368	(0.339)
Leptospirosis	-1.819***	(0.498)	Viral Hemorrhagic Fever	-2.078	(1.388)
Total Observations:		1,944 across 98 countries			
Model Fit (R^2):		0.051			

Notes: The table shows results of the robustness check using country fixed effects only (no year fixed effects) for all 20 epidemic outbreaks. Standard errors in parentheses are heteroskedasticity-robust and clustered by country.

Source: Author's calculations based on WDI, CDC, and WHO.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7.9: Country Fixed Effect Results (Robustness): Control Variables Only

Control Variables	Disease-Specific Models (Part 1)									
	Hepatitis E	Chikungunya	Cholera	Dengue	Diphtheria	Ebola	Zoonotic_Influenza	Japanese_Encephalitis	Lassa Fever	Leptospirosis
Political Stability ^a	0.0504 [0.304]	0.0562 [0.303]	0.0427 [0.298]	0.0484 [0.303]	0.0515 [0.303]	0.0507 [0.303]	0.0503 [0.303]	0.0498 [0.304]	0.0384 [0.303]	0.0506 [0.303]
GDP Growth ^a	0.0643** [0.0265]	0.0643** [0.0265]	0.0647** [0.0264]	0.0641** [0.0265]	0.0643** [0.0265]	0.0652** [0.0264]	0.0640** [0.0264]	0.0643** [0.0265]	0.0645** [0.0265]	0.0642** [0.0265]
Natural Resources ^a	0.00328 [0.0668]	0.00301 [0.0668]	0.00316 [0.0668]	0.00372 [0.0669]	0.00348 [0.0672]	0.00153 [0.0669]	0.00374 [0.0680]	0.00330 [0.0668]	0.00370 [0.0668]	0.00350 [0.0668]
Trade Openness ^a	0.0458** [0.0187]	0.0454** [0.0187]	0.0460** [0.0187]	0.0457** [0.0187]	0.0458** [0.0187]	0.0464** [0.0188]	0.0459** [0.0188]	0.0457** [0.0187]	0.0458** [0.0187]	0.0458** [0.0187]
GDP per Capita ^{a,b}	-1.612 [1.819]	-1.617 [1.818]	-1.575 [1.809]	-1.611 [1.818]	-1.611 [1.819]	-1.575 [1.820]	-1.625 [1.854]	-1.619 [1.822]	-1.601 [1.818]	-1.618 [1.819]
General Expenditure ^a	0.148** [0.0687]	0.147** [0.0686]	0.151** [0.0670]	0.148** [0.0687]	0.148** [0.0688]	0.149** [0.0686]	0.148** [0.0681]	0.148** [0.0687]	0.150** [0.0687]	0.149** [0.0688]
Observations	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944
R ²	0.049	0.049	0.049	0.049	0.050	0.049	0.049	0.049	0.049	0.049
Countries	98	98	98	98	98	98	98	98	98	98

Notes: The table reports the first part of the coefficients of the robustness check on the control variables only from the country fixed effect for all 20 epidemic outbreaks.

Source: Author's calculations based on WDI, CDC, and WHO.

^a Lagged one period.

^b Natural log transformation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7.10: Country Fixed Effect Results (Robustness): Control Variables Only

Control Variables	Disease-Specific Models (Part 2)									
	Marburg	Measles	Meningococcal	MERS	Plague	Rift Valley	SARS	Typhoid	Zika	Hemorrhagic
Political Stability ^a	0.0538 [0.303]	0.0511 [0.303]	0.0376 [0.302]	0.0214 [0.303]	0.0415 [0.305]	0.0517 [0.303]	0.0700 [0.306]	0.0502 [0.303]	0.0482 [0.304]	0.0383 [0.307]
GDP Growth ^a	0.0643** [0.0265]	0.0643** [0.0265]	0.0640** [0.0267]	0.0638** [0.0263]	0.0642** [0.0265]	0.0643** [0.0265]	0.0641** [0.0264]	0.0643** [0.0265]	0.0643** [0.0265]	0.0651** [0.0267]
Natural Resources ^a	0.00299 [0.0668]	0.00354 [0.0669]	0.00312 [0.0669]	-0.00150 [0.0678]	0.00330 [0.0668]	0.00320 [0.0668]	0.00294 [0.0669]	0.00332 [0.0668]	0.00350 [0.0668]	0.00432 [0.0661]
Trade Openness ^a	0.0459** [0.0187]	0.0457** [0.0187]	0.0459** [0.0188]	0.0466** [0.0188]	0.0456** [0.0187]	0.0456** [0.0187]	0.0458** [0.0188]	0.0457** [0.0187]	0.0458** [0.0187]	0.0460** [0.0189]
GDP per Capita ^{a,b}	-1.607 [1.818]	-1.624 [1.834]	-1.588 [1.830]	-1.575 [1.820]	-1.619 [1.819]	-1.621 [1.819]	-1.734 [1.861]	-1.612 [1.818]	-1.626 [1.826]	-1.658 [1.819]
General Expenditure ^a	0.148** [0.0687]	0.149** [0.0687]	0.147** [0.0689]	0.151** [0.0691]	0.148** [0.0687]	0.148** [0.0688]	0.149** [0.0690]	0.148** [0.0688]	0.148** [0.0687]	0.151** [0.0694]
Observations	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944
R ²	0.049	0.049	0.049	0.051	0.049	0.049	0.050	0.049	0.049	0.051
Countries	98	98	98	98	98	98	98	98	98	98

Notes: The table reports the second part of the coefficients of the robustness check on the control variables only from the country fixed effect for all 20 epidemic outbreaks.

Source: Author's calculations based on WDI, CDC, and WHO.

^a Lagged one period.

^b Natural log transformation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7.11: Time Fixed Effect Results (Robustness)

Disease Outbreak Effects on FDI Inflows					
Disease	Coefficient	Std. Error	Disease	Coefficient	Std. Error
Hepatitis E	0.707	(1.136)	Marburg	-0.773	(2.172)
Chikungunya	-1.596	(1.865)	Measles	1.097**	(0.551)
Cholera	0.453	(0.712)	Meningococcal Meningitis	-0.00931	(0.746)
Dengue	-0.194	(0.553)	MERS	-2.232***	(0.682)
Diphtheria	-1.461**	(0.723)	Plague	-0.435	(0.829)
Ebola	-0.591	(0.815)	Rift Valley Fever	1.558	(1.665)
Zoonotic_Influenza	0.0345	(0.329)	SARS	-2.093**	(1.047)
Japanese_Encephalitis	-1.208**	(0.604)	Typhoid	0.274	(0.613)
Lassa Fever	-3.433***	(0.962)	Zika	0.555	(0.562)
Leptospirosis	-2.670***	(0.750)	Viral Hemorrhagic Fever	0.150	(0.954)
Total Observations:	1,944 across 98 countries				
Model Fit (R^2):	0.246				

Notes: The table shows results of the robustness check using time fixed effects only. Standard errors in parentheses are heteroskedasticity-robust and clustered by country.

Source: Author's calculations based on WDI, CDC, and WHO.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7.12: Time Fixed Effect Results (Robustness): Control Variables Only (Part 1)

Control Variables	Disease-Specific Models (Part 1)									
	Hepatitis E	Chikungunya	Cholera	Dengue	Diphtheria	Ebola	Zoonotic Influenza	Japanese Encephalitis	Lassa Fever	Leptospirosis
Political Stability ^a	0.602* (0.344)	0.600* (0.344)	0.601* (0.345)	0.600* (0.344)	0.598* (0.344)	0.597* (0.344)	0.601* (0.345)	0.600* (0.344)	0.613* (0.343)	0.599* (0.344)
GDP Growth ^a	0.0808* (0.0422)	0.0805* (0.0424)	0.0812* (0.0418)	0.0807* (0.0423)	0.0803* (0.0423)	0.0813* (0.0425)	0.0806* (0.0423)	0.0807* (0.0423)	0.0812* (0.0422)	0.0806* (0.0422)
Natural Resources ^a	-0.0177 (0.0250)	-0.0175 (0.0251)	-0.0182 (0.0253)	-0.0177 (0.0250)	-0.0177 (0.0250)	-0.0175 (0.0251)	-0.0176 (0.0251)	-0.0177 (0.0250)	-0.0172 (0.0250)	-0.0177 (0.0250)
Trade Openness ^a	0.0557*** (0.00671)	0.0556*** (0.00671)	0.0557*** (0.00668)	0.0557*** (0.00670)	0.0557*** (0.00671)	0.0557*** (0.00672)	0.0557*** (0.00671)	0.0557*** (0.00671)	0.0557*** (0.00671)	0.0557*** (0.00671)
GDP per Capita ^{a,b}	-0.760** (0.317)	-0.763** (0.316)	-0.753** (0.316)	-0.761** (0.316)	-0.761** (0.316)	-0.766** (0.318)	-0.762** (0.319)	-0.762** (0.316)	-0.776** (0.316)	-0.762** (0.316)
General Expenditure ^a	0.0101 (0.0654)	0.00934 (0.0652)	0.0107 (0.0652)	0.00989 (0.0654)	0.00956 (0.0654)	0.00937 (0.0652)	0.0101 (0.0655)	0.00996 (0.0654)	0.00936 (0.0652)	0.0104 (0.0654)
Observations	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944
R ²	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
Countries	98	98	98	98	98	98	98	98	98	98

Notes: The table reports the first part of the coefficients of the robustness check on the control variables only from the time fixed effect for all 20 epidemic outbreaks.

Source: Author's calculations based on WDI, CDC, and WHO.

^a Lagged one period.

^b Natural log transformation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7.13: Time Fixed Effect Results (Robustness): Control Variables Only (Part 2)

Control Variables	Disease-Specific Models (Part 2)									
	Marburg	Measles	Meningococcal	MERS	Plague	Rift Valley	SARS	Typhoid	Zika	Hemorrhagic Fever
Political Stability ^a	0.601* (0.344)	0.615* (0.343)	0.601* (0.345)	0.586* (0.347)	0.600* (0.344)	0.605* (0.343)	0.596* (0.345)	0.601* (0.344)	0.599* (0.344)	0.602* (0.345)
GDP Growth ^a	0.0809* (0.0422)	0.0810* (0.0422)	0.0807* (0.0421)	0.0796* (0.0419)	0.0806* (0.0422)	0.0806* (0.0423)	0.0817* (0.0425)	0.0807* (0.0423)	0.0807* (0.0422)	0.0807* (0.0423)
Natural Resources ^a	-0.0176 (0.0250)	-0.0172 (0.0249)	-0.0177 (0.0251)	-0.0143 (0.0254)	-0.0176 (0.0250)	-0.0175 (0.0250)	-0.0184 (0.0249)	-0.0177 (0.0250)	-0.0175 (0.0251)	-0.0178 (0.0252)
Trade Openness ^a	0.0557*** (0.00670)	0.0558*** (0.00670)	0.0557*** (0.00670)	0.0559*** (0.00647)	0.0557*** (0.00671)	0.0558*** (0.00669)	0.0559*** (0.00670)	0.0557*** (0.00670)	0.0557*** (0.00670)	0.0557*** (0.00672)
GDP per Capita ^{a,b}	-0.763** (0.317)	-0.770** (0.315)	-0.762** (0.322)	-0.695** (0.314)	-0.763** (0.318)	-0.758** (0.316)	-0.757** (0.316)	-0.761** (0.316)	-0.764** (0.316)	-0.761** (0.317)
General Expenditure ^a	0.00989 (0.0653)	0.00955 (0.0654)	0.01000 (0.0653)	0.0139 (0.0654)	0.00994 (0.0653)	0.00971 (0.0653)	0.00959 (0.0654)	0.0101 (0.0654)	0.0103 (0.0653)	0.0100 (0.0653)
Observations	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944
R ²	0.049	0.049	0.049	0.051	0.049	0.049	0.050	0.049	0.049	0.051
Countries	98	98	98	98	98	98	98	98	98	98

Notes: The table reports the second part of the coefficients of the robustness check on the control variables only from the time fixed effect for all 20 epidemic outbreaks.

Source: Author's calculations based on WDI, CDC, and WHO.

^a Lagged one period.

^b Natural log transformation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7.14: Country and Time Fixed Effects, window- Robustness

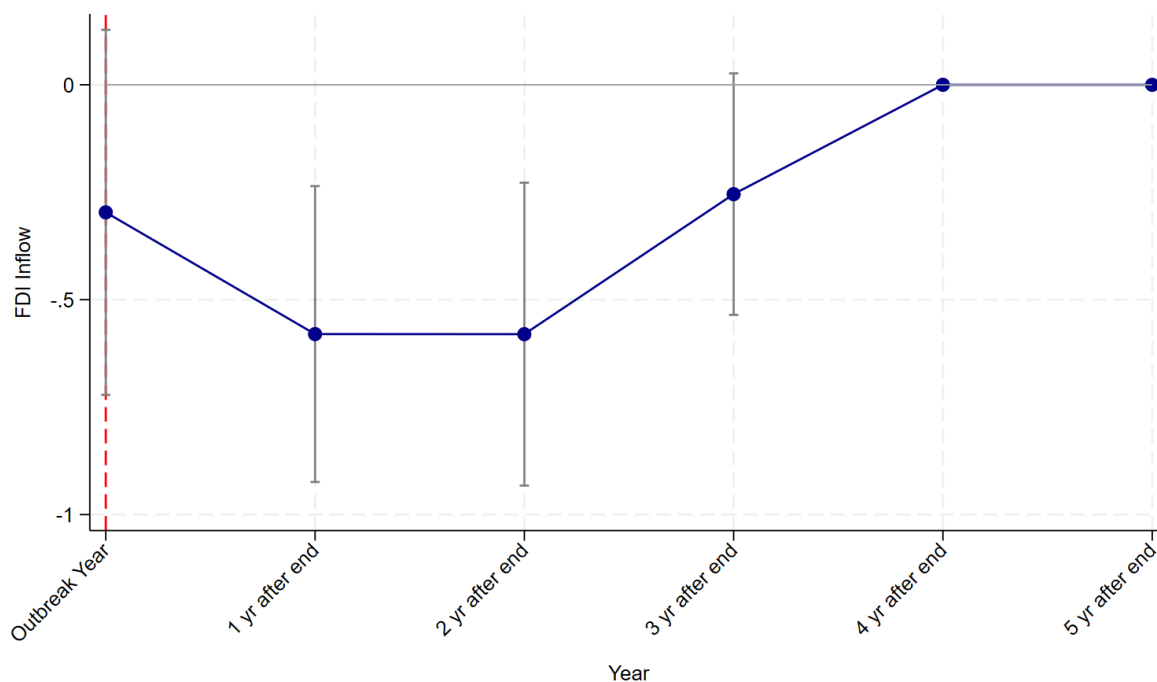
Robustness: Disease Outbreak Effects on FDI Inflows					
Disease	Coefficient	Std. Error	Disease	Coefficient	Std. Error
Hepatitis E	0.560	(0.818)	SARS	-1.587	(1.167)
Chikungunya	-1.876	(2.237)	Marburg	-1.284	(1.371)
Cholera	0.545	(0.834)	Measles	0.502	(0.449)
Dengue	-0.399	(0.485)	Meningococcal Disease	0.153	(0.625)
Diphtheria	-0.301	(0.859)	MERS	-1.153*	(0.583)
Ebola	-1.340**	(0.660)	Plague	-1.406**	(0.681)
Viral Haemorrhagic Fever	-0.532	(0.549)	Rift Valley Fever	0.783	(1.194)
Japanese Encephalitis	-0.829	(0.798)	Typhoid	-0.231	(0.317)
Lassa Fever	-2.176***	(0.731)	Zika	0.669	(0.438)
Leptospirosis	-2.176***	(0.731)			
Zoonotic Influenza	-0.126	(0.407)			
Total Observations:		1,944 across 98 countries			
(R^2) for all:		0.071 - 0.073			

Notes: Each coefficient represents the estimated effect of a disease outbreak on FDI inflows from separate regression models using 5-year outbreak windows. All regressions include country and time fixed effects.

Source: Author's calculations based on WDI, CDC, and WHO.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

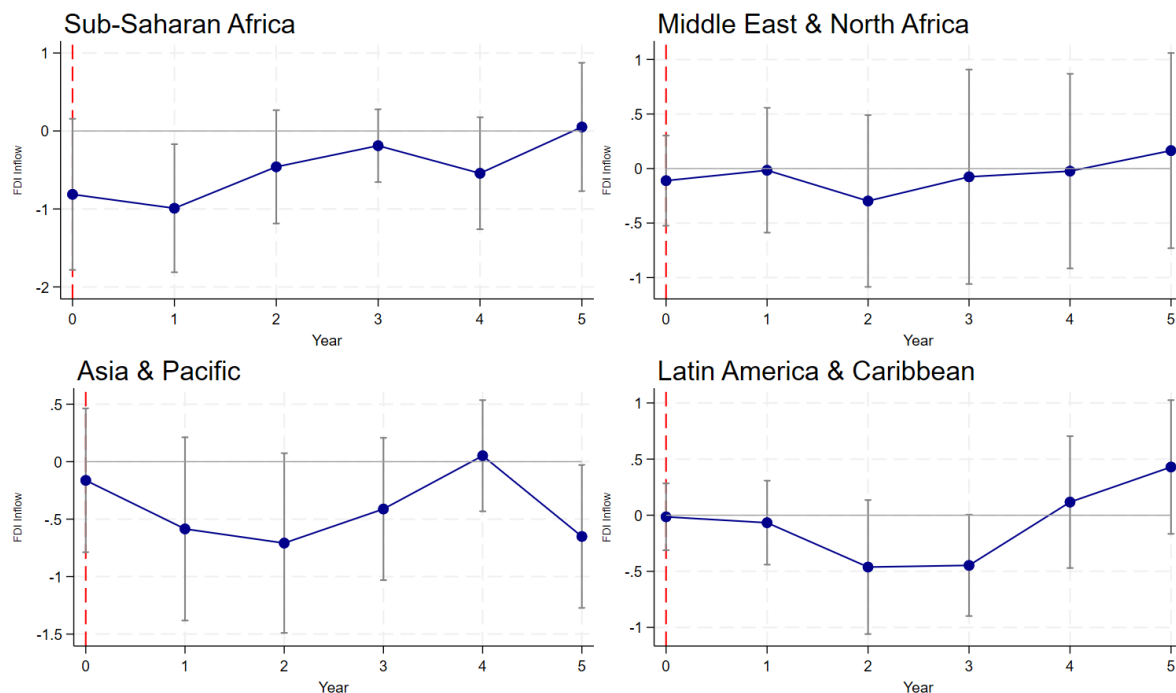
Figure 2.7.5: Impulse Response of FDI to all Infectious Diseases Outbreaks as a single Shock



Note: This Figure shows the impulse response of FDI inflows to all infectious disease outbreaks as a single shock. The solid line indicates the estimated response, vertical bars represent 90% confidence intervals.

Source: Author's calculations based on WDI, CDC, and WHO

Figure 2.7.6: Region-Specific response of FDI after pandemics



Note: This Figure shows the Region-Specific response of FDI after pandemics. The solid line indicates the estimated response, and vertical bars represents 90% confidence intervals. *Source:* Author's calculations based on WDI, CDC, and WHO

Table 2.7.15: Healthcare Workforce Capacity and FDI: Physicians as Buffers by Transmission Route

Variables	Airborne Outbreak	Water/Food-Borne Outbreak	Mosquito-Borne Outbreak	Vector-borne Flea Outbreak	Direct Contact Outbreak
FDI/GDP	-0.0441 (0.315)	0.292 (0.857)	0.346 (0.498)	-2.277*** (0.541)	-1.318* (0.672)
Good Healthcare system	-0.342 (0.384)	0.521 (0.953)	-0.270 (0.568)	3.355*** (0.818)	1.649** (0.830)
Observations	1,743	1,743	1,743	1,743	1,743
R-squared	0.061	0.062	0.062	0.061	0.061
Number of Countries	97	97	97	97	97

Notes: This table reports two-way fixed-effects regression estimates of the moderating role of healthcare capacity, proxied by physicians' density. The indicator for "Good Healthcare System" equals 1 if a country's nurse density is above the annual median (50th percentile) in a given year. Interaction terms capture how epidemic outbreaks (by transmission type) affect FDI inflows in countries with relatively stronger healthcare systems. All regressions include country and time fixed effects. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Source: Author's calculations based on WDI, CDC, and WHO.

Table 2.7.16: Healthcare Workforce Capacity and FDI: GHS index as Buffers by Transmission Route

Dependent Variable	FDI/GDP				
Variables	Airborne Outbreak	Water/Food-Borne Outbreak	Mosquito-Borne Outbreak	Vector-borne Flea Outbreak	Direct Contact Outbreak
Epidemic Outbreak	-0.0282 (0.261)	0.487 (0.756)	0.556 (0.481)	-1.836*** (0.479)	-2.143** (0.893)
Health Security Index ⁺	-0.245 (0.381)	0.271 (0.969)	-0.536 (0.510)	3.990*** (0.601)	1.914** (0.865)
Observations	1,944	1,944	1,944	1,944	1,944
R-squared	0.071	0.071	0.071	0.072	0.075
Number of Countries	98	98	97	98	98

Notes: This table reports two-way fixed-effects regression estimates of the moderating role of healthcare capacity, proxied by GHS index, on transmission route. The indicator for Health Security Index⁺ equals 1 if a country's GHS index is above the annual median (50th percentile) in a given year. Interaction terms capture how epidemic outbreaks (by transmission type) affect FDI inflows in countries with relatively stronger healthcare systems. All regressions include country and time fixed effects.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Source: Authors' calculations based on WDI, CDC, and WHO.

Table 2.7.17: Country and Time Fixed effects result, Effect of Outbreaks on FDI: window-Robustness-Only Control Variables

Control Variables	Disease-Specific Models (Part 1)										
	Hepatitis E	Chikungunya	Cholera	Dengue	Diphtheria	Ebola	Zoonotic_Influenza	Japanese_Encephalitis	Lassa Fever	Leptospirosis	Marburg
Political Stability ^a	0.179 [0.326]	0.188 [0.325]	0.172 [0.325]	0.178 [0.327]	0.179 [0.327]	0.183 [0.326]	0.180 [0.328]	0.179 [0.327]	0.149 [0.326]	0.179 [0.327]	0.186 [0.326]
GDP Growth ^a	0.0684** [0.0329]	0.0684** [0.0330]	0.0687** [0.0327]	0.0681** [0.0330]	0.0681** [0.0330]	0.0699** [0.0329]	0.0681** [0.0331]	0.0681** [0.0330]	0.0694** [0.0330]	0.0680** [0.0330]	0.0683** [0.0329]
Natural Resources ^a	-0.0127 [0.0742]	-0.0120 [0.0738]	-0.0132 [0.0743]	-0.0122 [0.0747]	-0.0130 [0.0746]	-0.0146 [0.0744]	-0.0124 [0.0751]	-0.0128 [0.0744]	-0.0121 [0.0743]	-0.0127 [0.0744]	-0.0133 [0.0744]
Trade Openness ^a	0.0434** [0.0191]	0.0431** [0.0191]	0.0435** [0.0191]	0.0433** [0.0191]	0.0434** [0.0191]	0.0442** [0.0192]	0.0434** [0.0191]	0.0434** [0.0191]	0.0435** [0.0191]	0.0434** [0.0191]	0.0437** [0.0191]
GDP per Capita ^{a,b}	-2.055 [2.771]	-2.128 [2.760]	-2.059 [2.773]	-2.065 [2.774]	-2.059 [2.774]	-2.029 [2.806]	-2.057 [2.775]	-2.060 [2.770]	-2.067 [2.770]	-2.053 [2.770]	-2.051 [2.771]
General expenditure ^a	0.150** [0.067]	0.149** [0.067]	0.154** [0.065]	0.150** [0.067]	0.150** [0.067]	0.151** [0.067]	0.150** [0.067]	0.150** [0.067]	0.151** [0.067]	0.151** [0.067]	0.150** [0.067]

Notes: Robust standard errors in parentheses. Each column represents a separate regression model examining the effect of a specific disease outbreak on FDI flows. All regressions include country and time fixed effects.

Source: Author's calculations based on WDI, CDC, and WHO.

^a Lagged one period.

^b Natural log transformation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7.18: Country and Time Fixed effects result, Effect of Outbreaks on FDI: window-Robustness-Only Control Variables

Control Variables	Disease-Specific Models (Part 2)								
	Measles	Meningococcal	MERS	Plague	Rift Valley	SARS	Typhoid	Zika	Haemorrhagic
Political Stability ^a	0.178 [0.329]	0.171 [0.328]	0.155 [0.328]	0.171 [0.327]	0.180 [0.327]	0.194 [0.331]	0.179 [0.327]	0.174 [0.327]	0.170 [0.331]
GDP Growth ^a	0.0685** [0.0330]	0.0681** [0.0330]	0.0676** [0.0328]	0.0686** [0.0331]	0.0679** [0.0330]	0.0685** [0.0331]	0.0681** [0.0330]	0.0681** [0.0330]	0.0681** [0.0330]
Natural Resources ^a	-0.0125 [0.0744]	-0.0125 [0.0745]	-0.0155 [0.0749]	-0.0122 [0.0744]	-0.0131 [0.0744]	-0.0123 [0.0745]	-0.0128 [0.0744]	-0.0130 [0.0743]	-0.0126 [0.0741]
Trade Openness ^a	0.0431** [0.0191]	0.0436** [0.0192]	0.0437** [0.0191]	0.0434** [0.0191]	0.0434** [0.0191]	0.0437** [0.0191]	0.0434** [0.0191]	0.0434** [0.0191]	0.0436** [0.0192]
GDP per Capita ^{a,b}	-2.065 [2.770]	-2.060 [2.773]	-2.151 [2.768]	-2.071 [2.771]	-2.059 [2.771]	-2.164 [2.832]	-2.055 [2.771]	-2.078 [2.776]	-2.024 [2.775]
General expenditure ^a	0.150** [0.067]	0.149** [0.067]	0.152** [0.065]	0.150** [0.067]	0.150** [0.067]	0.149** [0.067]	0.150** [0.067]	0.150** [0.067]	0.151** [0.0673]

Notes: Robust standard errors in parentheses. Each column represents a separate regression model examining the effect of a specific disease outbreak on FDI flows. This table continues the results from Part 1. All regressions include country and time fixed effects.

Source: Author's calculations based on WDI, CDC, and WHO.

^a Lagged one period.

^b Natural log transformation.

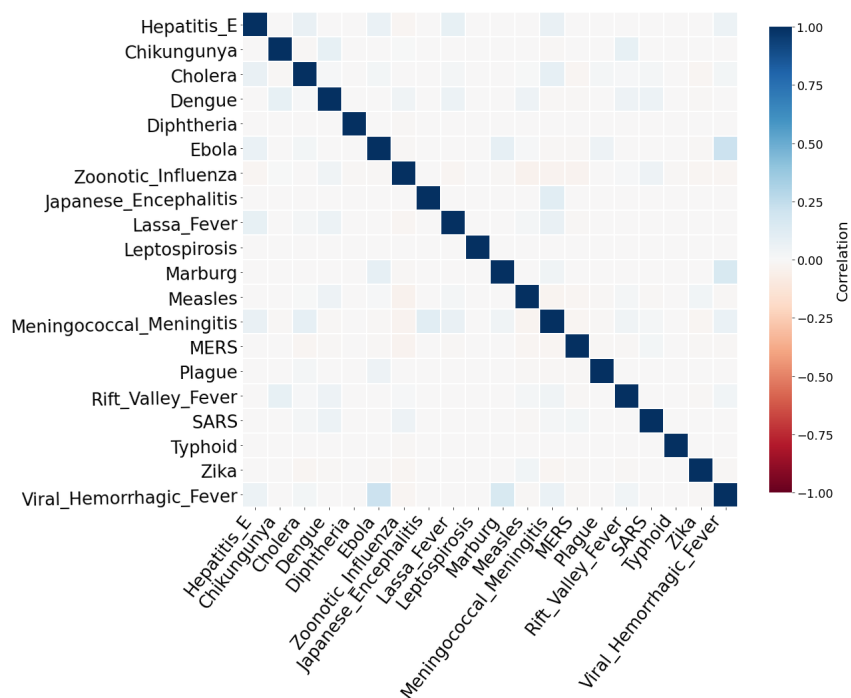
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7.19: Countries Included in Analysis by Regional Classification

Country	Region	Country	Region
Angola	Sub-Saharan Africa	Mauritania	Sub-Saharan Africa
Benin	Sub-Saharan Africa	Mozambique	Sub-Saharan Africa
Burkina Faso	Sub-Saharan Africa	Namibia	Sub-Saharan Africa
Burundi	Sub-Saharan Africa	Niger	Sub-Saharan Africa
Cabo Verde	Sub-Saharan Africa	Nigeria	Sub-Saharan Africa
Cameroon	Sub-Saharan Africa	Rwanda	Sub-Saharan Africa
Central African Rep.	Sub-Saharan Africa	Senegal	Sub-Saharan Africa
Chad	Sub-Saharan Africa	South Africa	Sub-Saharan Africa
Congo, Dem. Rep.	Sub-Saharan Africa	Sudan	Sub-Saharan Africa
Congo, Rep.	Sub-Saharan Africa	Togo	Sub-Saharan Africa
Côte d'Ivoire	Sub-Saharan Africa	Uganda	Sub-Saharan Africa
Ethiopia	Sub-Saharan Africa	Zambia	Sub-Saharan Africa
Gabon	Sub-Saharan Africa	Zimbabwe	Sub-Saharan Africa
Gambia, The	Sub-Saharan Africa		
Ghana	Sub-Saharan Africa		
Guinea	Sub-Saharan Africa		
Guinea-Bissau	Sub-Saharan Africa		
Kenya	Sub-Saharan Africa		
Liberia	Sub-Saharan Africa		
Madagascar	Sub-Saharan Africa		
Malawi	Sub-Saharan Africa		
Mali	Sub-Saharan Africa		
Middle East & North Africa			
Algeria	MENA	Lebanon	MENA
Bahrain	MENA	Morocco	MENA
Egypt, Arab Rep.	MENA	Oman	MENA
Iran, Islamic Rep.	MENA	Qatar	MENA
Iraq	MENA	Saudi Arabia	MENA
Jordan	MENA	Syrian Arab Rep.	MENA
Kuwait	MENA	Tunisia	MENA
		UAE	MENA
		West Bank and Gaza	MENA
		Yemen, Rep.	MENA
Asia & Pacific			
Afghanistan	Asia & Pacific	Myanmar	Asia & Pacific
Azerbaijan	Asia & Pacific	Nepal	Asia & Pacific
Bangladesh	Asia & Pacific	Pakistan	Asia & Pacific
Cambodia	Asia & Pacific	Philippines	Asia & Pacific
China	Asia & Pacific	Russian Federation	Asia & Pacific
Fiji	Asia & Pacific	Singapore	Asia & Pacific
India	Asia & Pacific	Thailand	Asia & Pacific
Indonesia	Asia & Pacific	Türkiye	Asia & Pacific
Kazakhstan	Asia & Pacific	Viet Nam	Asia & Pacific
Korea, Rep.	Asia & Pacific		
Kyrgyz Republic	Asia & Pacific		
Lao PDR	Asia & Pacific		
Malaysia	Asia & Pacific		
Mongolia	Asia & Pacific		
Latin America & Caribbean			
Argentina	LAC	Honduras	LAC
Bolivia	LAC	Jamaica	LAC
Brazil	LAC	Mexico	LAC
Chile	LAC	Nicaragua	LAC
Colombia	LAC	Panama	LAC
Costa Rica	LAC	Paraguay	LAC
Ecuador	LAC	Peru	LAC
El Salvador	LAC	Uruguay	LAC
Guatemala	LAC	Venezuela, RB	LAC
Haiti	LAC		

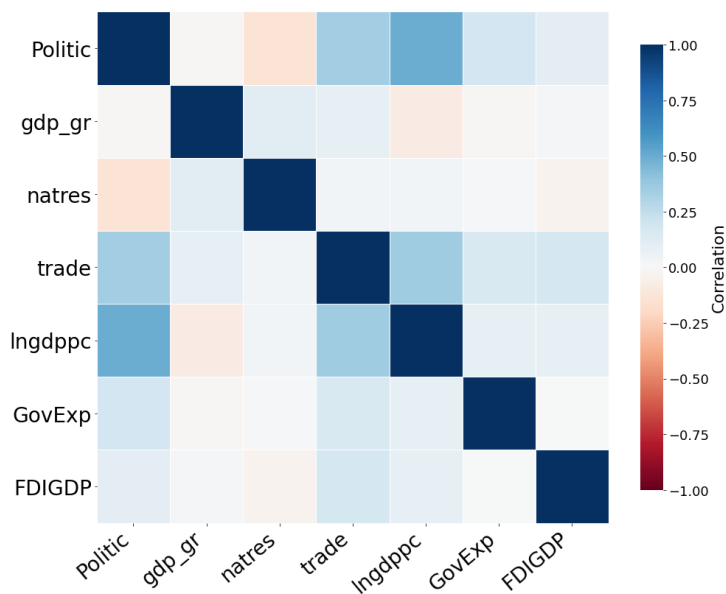
Note: MENA = Middle East & North Africa; LAC = Latin America & Caribbean

Figure 2.7.7: Correlation matrix of Outbreaks Variables



Note: This figure displays the correlation matrix of Outbreak Variables

Figure 2.7.8: Correlation matrix of Control Variables



Note: This figure displays the correlation matrix of Control Variables.

Chapter 3

Chapter 3

Psychosocial risk factors, resources and workers' mental health ¹

Co-written with Jean-Vincent Koster¹ & Wassim Le Lann².

3.1 Introduction

Work significantly contributes to molding personal welfare and independence. Recognized as a crucial social factor, it significantly impacts the physical and mental well-being of individuals, as noted by Marmot et al. (2008). Consequently, both researchers and policymakers are increasingly focusing on comprehending the intricate connection between employment and how it affects health. The European Agency for Safety and Health at Work (2013) underscores that hazards stemming from deficient design, organization, and management of work, compounded by unfavorable social environments, are significant determinants of employee health and well-being. These risks may result in detrimental psychological, physical, and social outcomes, underscoring the imperative for a systematic and well-coordinated strategy to mitigate them.

Research spanning sociology, epidemiology, and medicine has explored how workers' mental health is influenced by various factors related to work. These studies can be categorized into two distinct groups, the first group refers to physical risks such as car-

¹This chapter was presented at the 27th Annual Conference of the International Network for Economic Research (INFER) at Sapienza Università di Roma (Sep 10-12, 2025) and subsequently at the Séminaire doctoral du LEO at the University of Orléans (Feb 22, 2025).

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diovascular diseases, skin diseases, weight gain, etc. (see, e.g., Karasek (1979), Harvey et al. (2017), Leijten et al. (2015), Huisman et al. (2008), Bentley et al. (2015), Plaisier et al. (2007), Tyssen et al. (2000), Bonde (2008), Chen et al. (2005)), and the second group, which our study also emphasizes on this group, refers to psychological risks such as stress, anxiety, suicide, decrease in self-confidence refers (Brunner (1997), Brooker and Eakin (2001), Cox et al. (2000), EU-OSHA (2007)). The studies conducted in the second group emphasize the psycho-social risks that workers are exposed to at work, and these risks directly and indirectly affect their mental health and well-being. A crucial aspect to consider here is the mechanism by which psycho-social risks influence mental health.

The hypothesized mechanism underlying these associations is the stress hypothesis. In terms of psychological mechanisms, Cole et al. (2002) found that the effect of a composite work stressor measure on psychological distress was almost entirely explained by mediation through self-esteem and mastery. This finding suggests that bad working conditions may affect mental health by devaluing people's sense of self-worth and eroding the sense of mastery over the work situation (Brooker and Eakin (2001)). Unfulfilled demands and little control over work may undermine work mastery beliefs. Conflict at work and poor social support may lower self-esteem.

Understanding the link between psychosocial risks and mental health has major economic and social relevance. It shapes labor supply and productivity, drives healthcare and social protection spending, and is unevenly distributed across jobs and sectors. The WHO estimates that depression and anxiety lead to about 12 billion lost working days and roughly \$1 trillion in lost productivity each year worldwide, a figure projected to rise to \$6 trillion by 2030. WHO (2013, 2017) projected that, by 2030, mental health problems (particularly depression) will be the leading cause of mortality and morbidity globally.

While previous studies have established a strong association between exposure to psychosocial risks at work and the occurrence of depressive disorders, there remains a need for a more nuanced understanding of the intricate relationships between specific psychosocial risk factors and a broader spectrum of mental health outcomes. Our research aims to fill this gap by disentangling the relative impacts of different psychosocial risks

on distinct mental health issues beyond depressive disorders, such as loss of motivation, attention deficit, eating disorders, and fatigue syndromes. To achieve this, we propose a comprehensive analytical framework that integrates advanced statistical techniques, including structural equation modeling and path analysis, to unravel the complex interplay between multiple psychosocial risk factors, individual characteristics, and various mental health outcomes. This multi-faceted approach will not only enhance our understanding of the nuanced relationships but also inform targeted interventions and workplace policies by identifying the most detrimental psychosocial risk factors and vulnerable employee groups, enabling more effective prevention and support strategies.

Building on this, we use data from the French *Medical Monitoring of Employees' Exposure to Occupational Risks*, a medical survey representative of a population of nearly 25 million workers affiliated with the French general social security regime, and collected by trained occupational physicians. This dataset leverages a large sample size with validated assessment tools, enabling us to robustly quantify the relationships between workers' exposure to psychosocial risks (RPS), access to resources, and their mental health.

We first construct binary outcomes measuring the presence of depressive syndromes among workers using the PHQ-9, a scientifically validated questionnaire for identifying and monitoring depressive disorders (Kroenke et al., 2001). To capture the cross-sectional heterogeneity in workers' exposure to RPS, we construct RPS proxies falling into the six categories of psychosocial hazards identified by the INRS² using mainstream RPS assessment tools (Karasek (1979), Siegrist (1996)). This process enables us to comprehensively assess the spectrum of RPS to which workers may be exposed, while integrating methods commonly used by labor safety professionals.

Workers exposed to similar psychosocial hazards may have unequal access to various resources that could serve as protective buffers against adverse mental health outcomes (EU-OSHA (2014)). In particular, resources accessible within the workplace or associated with workers' engagement in their professional activities could serve as intervention tar-

²The National Research and Safety Institute for the Prevention of Occupational Accidents and Diseases (INRS) contributes to the prevention of workplace accidents and occupational diseases through the identification of occupational hazards and their impact on health, and the promotion of solutions to prevent risks across multiple stakeholders.

gets to mitigate the adverse impacts of RPS. To capture this phenomenon, we therefore construct resources proxies falling into three categories: collective resources, organizational resources, and professional resources. Our final sample includes 8 resources proxies and 10 RPS proxies covering (i) intensity and working hours, (ii) emotional demand, (iii) lack of autonomy, (iv) deteriorated social relationships at work, (v) conflicts of values, and (vi) job insecurity.

We first document a strong bivariate association between workers' exposure to RPS and the prevalence of depressive disorders. While only 0.4% of survey respondents not exposed to any categories of RPS suffer from a major depressive disorder, this proportion rises to 40.6% for those exposed to the six categories of RPS, representing an 8-fold increase in the prevalence of major depression relative to the overall sample. A similar pattern emerges when considering the association between workers' RPS and the prevalence of depressive symptoms, such as loss of motivation, fatigue syndromes, nutritional disorders, and attention deficits. Furthermore, by employing predictive logistic regressions and controlling for workers' socio-demographic characteristics, work contract type, and employers' characteristics, we find that the majority of the predictive power for depressive disorders among workers stems from information on their exposure to RPS.

The rest of this paper is organized as follows: Section 2 describes our data and methodology, Section 3 presents our empirical analysis, and Section 4 conclusion.

3.2 Data and methodology

To assess the link between working conditions and workers' mental health, we utilize the French *Medical Monitoring of Employees' Exposure to Occupational Risks* 2017 survey (SUMER 2017). This survey was jointly launched and managed by multiple public administrations, including the medical labor inspection. It provides a mapping of employees' exposures to the main occupational risks in France, allowing for the definition of priority prevention actions for stakeholders involved in the fields of labor and occupational health.

The data collection took place between April 2016 and September 2017 and was carried out by trained occupational physicians.

The population covered by the survey includes all employees under the general and agricultural social security regimes, employees in hospital public services, state and local government employees, and employees of large public enterprises. Overall, the sample ($n = 20,605$) used in our analysis is representative of nearly 25 million employees in France. Furthermore, this survey integrates several scientifically validated questionnaires to assess workers' mental health and exposure to occupational risks, such as the PHQ-9 or the Karasek questionnaire, allowing a robust assessment of the links between mental health and working conditions.

Workers' mental health is assessed using the Patient Health Questionnaire (PHQ-9), a widely used tool for identifying depression and monitoring changes in symptoms over time (Kroenke et al., 2001). The questionnaire comprises nine questions based on the diagnostic criteria for major depressive disorder in the *Diagnostic and Statistical Manual of Mental Disorders*, encompassing various aspects of mood, interest, energy, appetite, sleep, and concentration (see Appendix 3.4). Respondents indicate the frequency of each symptom experienced over the past two weeks on a scale ranging from never to almost every day.

We use the PHQ-9 to construct binary outcomes representing the presence of depressive disorders among workers, following Kroenke et al. (2001). Workers are classified as experiencing *major depressive disorder* when five or more of the nine depressive symptoms have been present at least “more than half of the time” over the past two weeks, and one of these symptoms is depressed mood or anhedonia. They are classified as experiencing *other depressive disorder* if 2 to 4 depressive symptoms have been present at least “more than half of the time” over the past two weeks, and one of these symptoms is depressed mood or anhedonia. The presence of suicidal thoughts always counts as a symptom regardless of its frequency.

To capture characteristics of work design that may have adverse effects on workers' mental health, we integrate the concept of psychosocial risks. Psychosocial risks refer to

certain aspects of work design and the organization and management of work that may lead to adverse physical, psychological, and social outcomes among workers (EU-OSHA (2014)). Exposure to psychosocial risks is typically assessed through questionnaires among workers. A common example is the demand-control-support (DCS) model, which classifies psychosocial risks along three dimensions: high psychological demand, low decision latitude, and low social support. However, multiple alternative approaches exist to capture psychosocial risks that may not fall into these categories (Siegrist (1996)). To assess the complete range of psychosocial risks workers may be exposed to, we build on the taxonomy of psychosocial risks constructed by the National Research and Safety Institute for the Prevention of Occupational Accidents and Diseases (INRS).³ The INRS taxonomy is designed for the French context, making it easily relatable to the SUMER questionnaire. It classifies psychosocial risk factors into six categories: intensity and working hours, emotional demand, lack of autonomy, deteriorated social relationships at work, conflicts of values, and job insecurity. Table 3.1 displays the taxonomy as well as the proxies available in our dataset and retained for this study.⁴

³This institution's mission is to contribute to the prevention of workplace accidents and occupational diseases through the identification of occupational hazards, the understanding of their impact on health, and the promotion of solutions to prevent risks across multiple stakeholders.

⁴For further details on the computation of proxies based on the DCS model, see the Appendix 3.4.

Table 3.1: Taxonomy of psychosocial risks

Psychosocial Risk Factors	Description	Available Proxies
<i>Intensity and working hours</i>	Work overload, existence of unrealistic or vague objectives, long working days, contradictory instructions, work at atypical hours, unpredictability of working hours...	High psychological demand (DCS model)
<i>Emotional demand</i>	Tensions with the public, contact with suffering or human distress, requirement to hide one's emotions...	Tense situations with the public (face-to-face or by phone).
<i>Lack of autonomy</i>	Limited room for maneuver to do one's job, imposed work pace, inability to develop skills, non-participation in decisions...	Low decision latitude (DCS model).
<i>Deteriorated social relationships at work</i>	Conflictual relationships with colleagues or with hierarchy, no career perspective, lack of recognition...	Low social support at work (DCS model); low prospects for promotion (Siegrist's questionnaire); mismatch between professional position and education (Siegrist's questionnaire); perception of effort-salary imbalance (Siegrist's questionnaire).
<i>Conflicts of values</i>	Not being proud of one's work, not being able to do quality work...	Frequency of tasks conflicting with personal values in the last 12 months.
<i>Job insecurity</i>	Fear of losing one's job, non-maintenance of salary level, precarious employment contract, restructuring, uncertainty about the future of one's profession...	Feelings of job insecurity.

Note: This table represents the taxonomy of psychosocial risks and the proxies available in the database.

Source: Safety Institute for the Prevention of Occupational Accidents and Diseases (INRS)

While exposure to psychosocial risks might be associated with an increased likelihood of adverse mental health outcomes among employees, access to various resources in the workplace can be expected to mitigate this likelihood by providing support and buffers against the negative impacts of these risks. The taxonomy of resources presented in table 3.2 delineates three essential categories of support mechanisms available to workers in their professional settings: collective resources, organizational resources, and professional resources. Collective resources encompass the support derived from integration into a co-

hesive work collective, including the presence of friendly colleagues and hierarchical superiors who prioritize the well-being of their subordinates. Organizational resources pertain to the means provided by the organization to facilitate employees in fulfilling their roles effectively, such as access to clear and sufficient information, collaborative opportunities with superiors, and adequate material and personnel resources. Finally, professional resources encompass the knowledge, skills, values, and ethical standards defining a worker's relationship with and commitment to their work, including professional competence of colleagues, meaningful work assignments, opportunities for appropriate training, and the ability to collaborate effectively.

Table 3.2: Taxonomy of resources

Type of resource	Definition	Available Proxies
<i>Collective resources</i>	Set of resources mobilized through integration into a work collective	Friendly colleagues; hierarchical superior concerned about the well-being of subordinates.
<i>Organizational resources</i>	Set of means made available to employees by the organization so that they can carry out their mission.	Clear and sufficient information to perform one's job; hierarchical superior succeeds in easily collaborating with subordinates; sufficient material means to accomplish the mission; professional competence of colleagues.
<i>Professional resources</i>	Set of knowledge, skills, values, and professional ethics that define and characterize a worker's relationship and attachment to their activity.	Meaningful work; sufficient and appropriate training.

Note: This table represents the taxonomy of resources that workers may have to carry out their tasks. *Source:* Authors' synthesis using expert elicitation (co-author's field experience), organized to align with common distinctions in the psychosocial resources literature and mapped to available survey proxies.

Our final dataset includes 10 variables measuring workers' exposure to psychosocial risks (RPS) and 8 variables measuring workers' access to resources (RES). The list of variable names and definitions can be found in Table 3.4.1 in Appendix 3.4. To ensure the comparability of the risk estimates derived from our regression analyse,⁵ RPS variables were encoded in a binary fashion, representing the exposure or absence of exposure

⁵The exact econometric specification we test is presented later in the paper in the *Main results* section.

to a given psychosocial risk. A similar encoding was used for RES proxies, representing the presence or absence of a given resource. Figures 3.4.1 and 3.4.2 in Appendix 3.4 display the correlation matrices of the RPS and RES variables, showing that there is no systematic association between the variables retained for this study.

Table 3.3: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	20605	42.45	10.67	15	77
Gender Female	20605	0.41	0.49	0	1
Immigrant Status	20605	0.03	0.17	0	1
Couple	20605	0.73	0.44	0	1
Higher Socio-Economic Status	20605	0.24	0.43	0	1
Single Parent	20605	0.03	0.18	0	1
Log-Average Income	20605	10.175	0.225	9.811	10.884

Notes: This table reports summary statistics for the control variables used in the empirical analysis. Binary variables are coded 0/1.

Source: Authors' calculations based on the SUMER 2017 survey microdata (France).

Table 3.3 presents summary statistics for the control variables used in our analysis. These variables encompass demographic characteristics and socio-economic indicators relevant to our study's focus. The age range spanned from 15 to 77 years. Gender distribution indicated that approximately 41% of the participants identified as female.

Regarding immigration status, (EU and non-EU) a proportion (3%) of the sample identified as immigrants. The majority of participants reported being in a couple relationship (73%), whereas a percentage identified as single parents (3%). Socio-economic status, as measured by the higher socio-economic status variable, showed that around 24% of participants fell into this category.

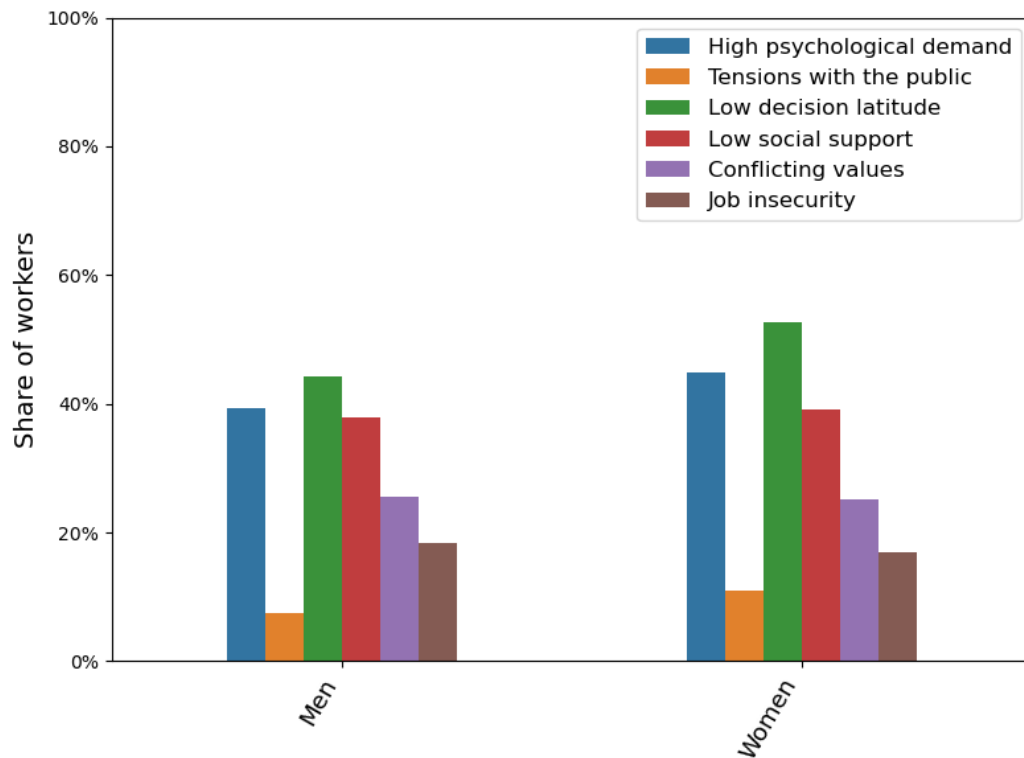
Furthermore, we examined participants' log-average income, revealing an average income of 10.175, with a standard deviation of 0.225. The range of log-average income extended from 9.811 to 10.884.

3.3 Empirical analysis

3.3.1 Descriptive statistics

In this section, we start by examining the distribution of RPS exposure in the sample, and the bivariate relation between RPS exposure and mental health outcomes before discussing our main results. For this purpose, we retain six indicators representative of each of the RPS categories: high psychological demand, tensions with the public, low decision latitude, low social support, conflicting values, and job insecurity. Figure 3.1 illustrates the distribution of exposure to RPS across genders, highlighting that women tend to experience higher exposure to RPS. For instance, 53% of female workers report experiencing low decision latitude, whereas this proportion falls to 44% among male workers. Women are also more likely to report a high psychological demand and situation of tensions with the public.

Figure 3.1: Psychosocial risks exposure distribution by gender

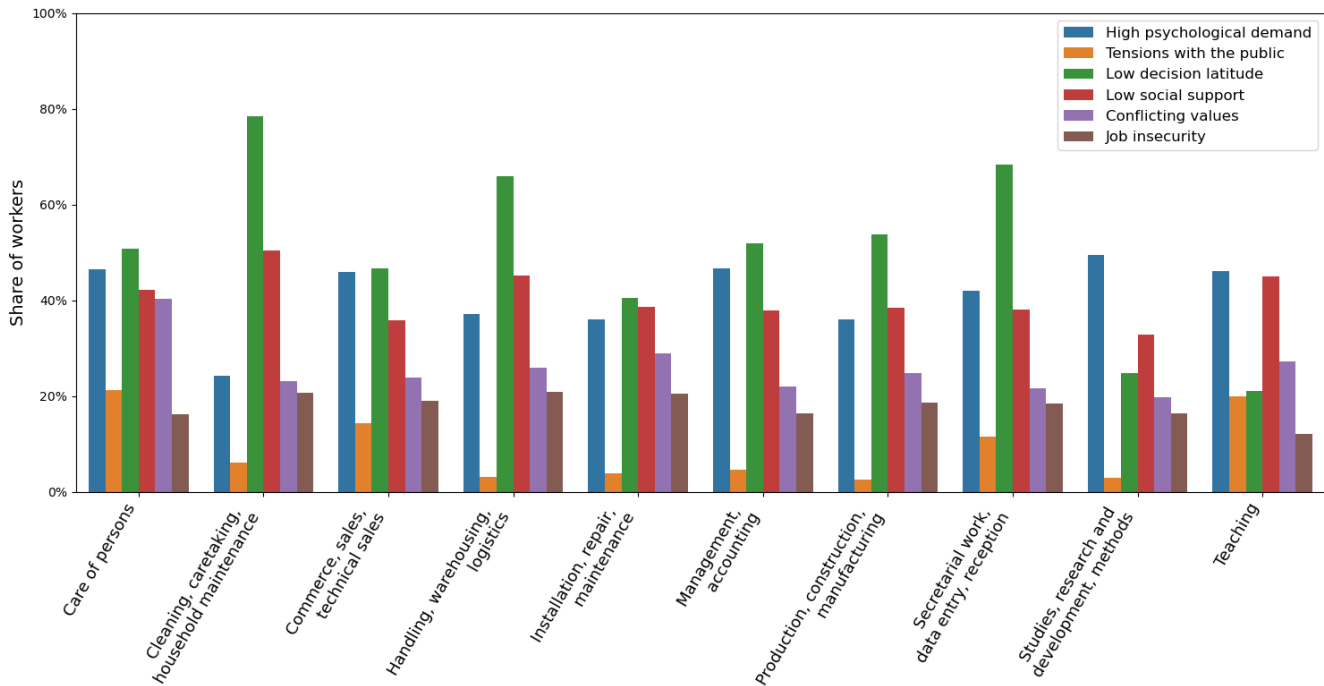


Note: This figure displays workers' exposure to the six families of psychosocial risks based on their gender.

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

As highlighted by Figure 3.2, the exposure of workers to RPS is significantly influenced by their occupations. For instance, occupations in personal care and teaching activities exhibit a notably higher likelihood of encountering tensions with the public. Conversely, workers in roles such as cleaning, caretaking, logistics, and secretarial work are more prone to experiencing lower decision latitude in their jobs.

Figure 3.2: Psychosocial risks distribution by function

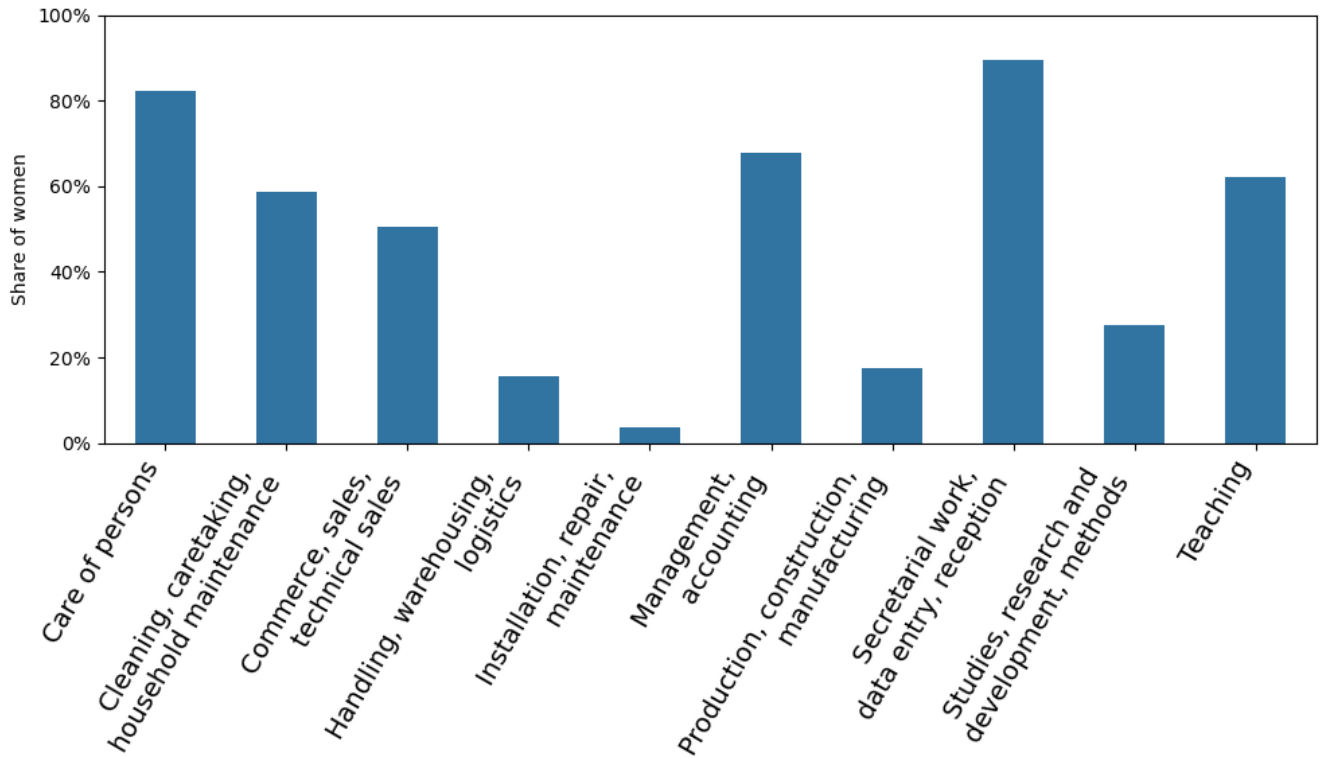


Note: This figure displays workers' exposure to the six families of psychosocial risks based on their work functions.

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.3 highlights significant gender disparities in the distribution of occupations. Women are more commonly found in roles related to personal care, cleaning, caretaking, secretarial work, and teaching, whereas men are more prevalent in fields such as logistics, maintenance, construction, and research activities. Therefore, part of the gender gap in RPS exposure can be attributed to the gendered distribution of occupations between men and women.

Figure 3.3: Gender distribution across occupations

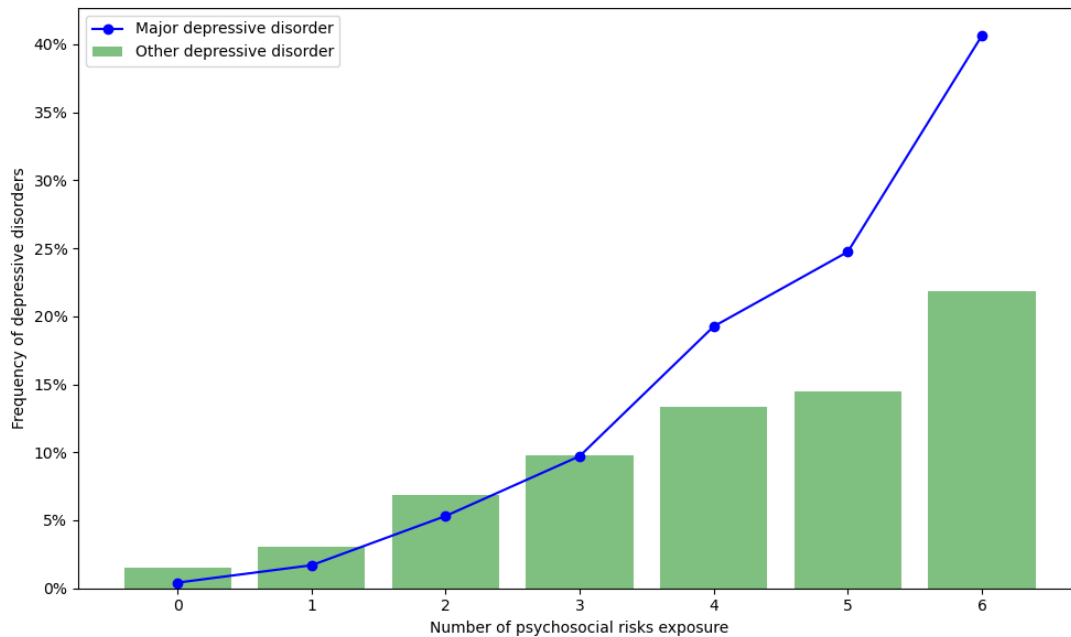


Note: This figure displays the distribution of women across occupations.

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.4 displays the prevalence of depressive disorders among workers based on their exposure to RPS, emphasizing a strong association between the occurrence of depressive disorders and workers' exposure to RPS. In the overall sample, 4.6% (5.2%) of workers are categorized as suffering from a major (other) depressive disorder. However, 40.6% (21.9%) of workers exposed to each of the six families of RPS are categorized as suffering from a major (other) depressive disorder, representing more than a 8-fold (4-fold) increase in the prevalence of major (other) depression relative to the sample average. In contrast, only 0.4% (1.5%) of workers not exposed to any category of RPS are categorized as suffering from a major (other) depressive disorder. A similar association can be observed with depressive symptoms.

Figure 3.4: Prevalence of depressive disorders by psychosocial risks exposure

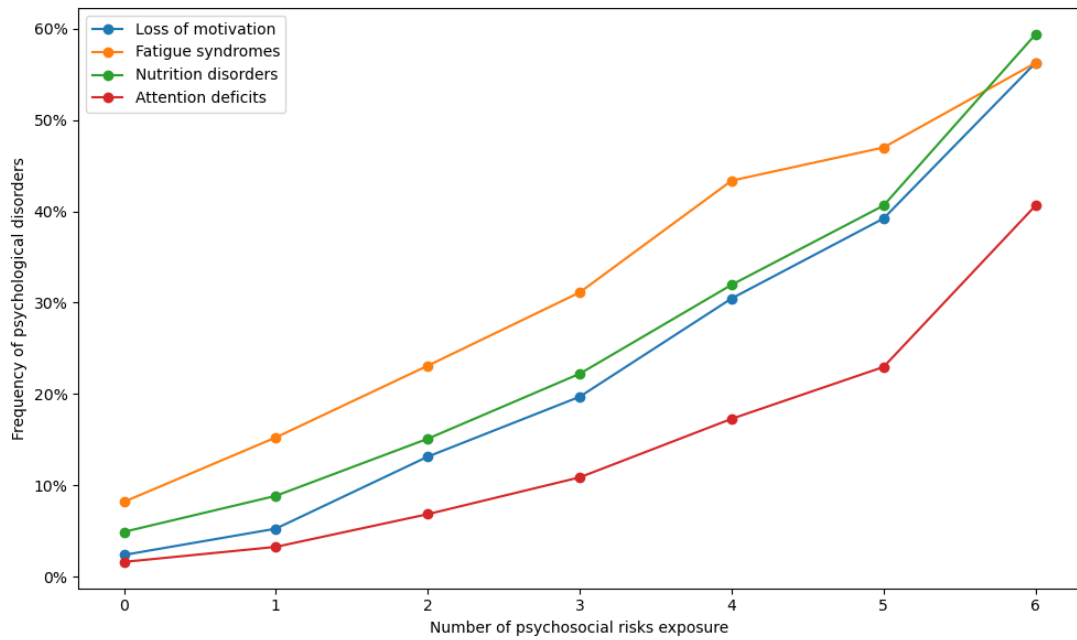


Note: This figure displays the prevalence of depressive disorders among workers, assessed using the PHQ-9, as a function of their exposure to psychosocial risks. Six psychosocial risks consistent with the INRS taxonomy were retained: (a) high psychological demand, (b) contact with the public, (c) low decision latitude, (d) exposure to verbal or physical assault in the workplace, (e) tasks conflicting with personal values, and (f) a feeling of job insecurity.

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.5 illustrates the proportion of workers that have experienced symptoms such as loss of motivation, fatigue syndromes, nutrition disorders, and attention deficits for at least half of the time in the two weeks preceding the completion of the PHQ9 questionnaire, based on their exposure to RPS. As in the case of depressive disorders, the prevalence of workers affected by these symptoms sharply increases with their number of RPS exposures: more than half of workers exposed to the six categories of RPS are affected by loss of motivation, fatigue disorders, nutrition disorders, and 40% are affected by attention deficits. When considering workers with no RPS exposure, these proportions fall to 2.4%, 8.2%, 4.9%, and 1.6%, respectively. Overall, these results highlight an extremely strong association between poor working conditions and workers' adverse mental health outcomes.

Figure 3.5: Prevalence of depressive symptoms by psychosocial risks exposure

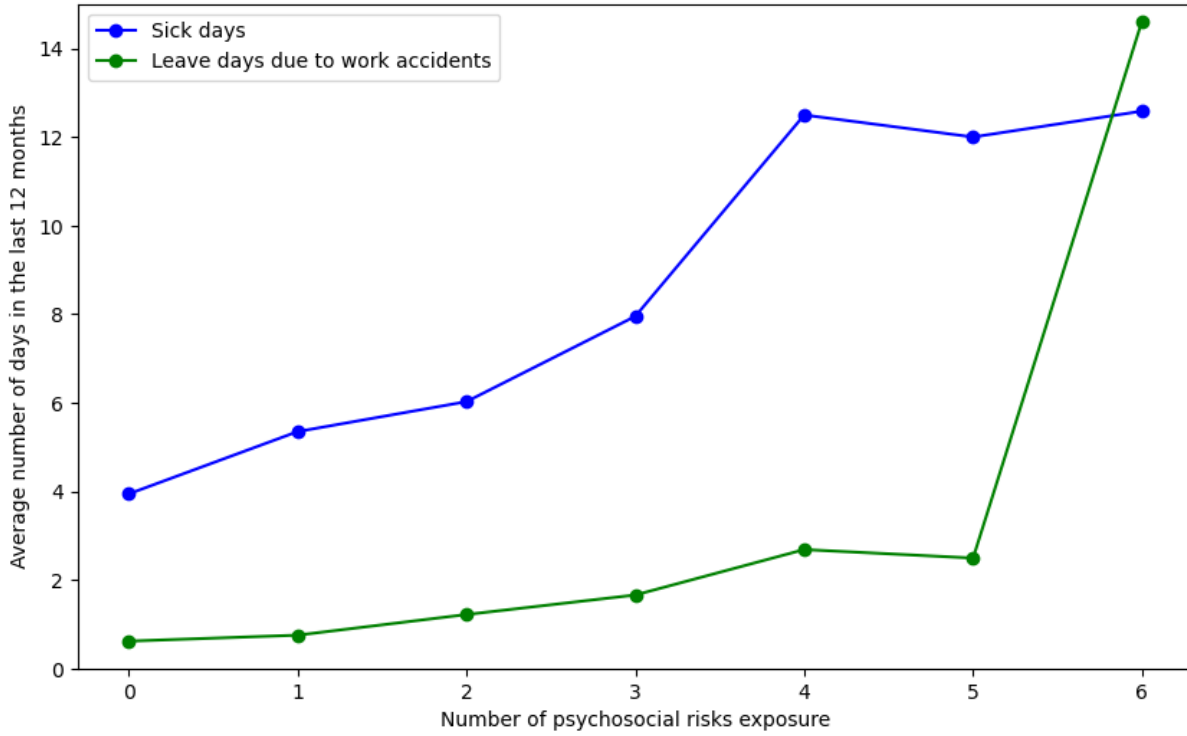


Note: This figure displays the frequency of workers having experienced depressive symptoms at least half of the time in the last two weeks before the completion of the PHQ9, based on their exposure to psychosocial risks. Six psychosocial risks consistent with the INRS taxonomy were retained: (a) high psychological demand, (b) contact with the public, (c) low decision latitude, (d) exposure to verbal or physical assault in the workplace, (e) tasks conflicting with personal values, and (f) a feeling of job insecurity.

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

As depicted by figure 3.6, adverse working conditions are also associated with a higher likelihood of work incapacity, as the average number of days of work incapacity due to sickness or work-related accidents also increases with workers' exposure to RPS.

Figure 3.6: Work incapacity by psychosocial risks exposure



Note: This figure displays the average number of days of work incapacity in the past twelve months as a function of workers' psychosocial risk exposure. Six categories of psychosocial risks consistent with the INRS taxonomy were retained: (a) high psychological demand, (b) contact with the public, (c) low decision latitude, (d) exposure to verbal or physical assault in the workplace, (e) tasks conflicting with personal values, and (f) a feeling of job insecurity.

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

3.3.2 Main results

To investigate the relation between mental health outcomes and the work environment, we consider the following logistic regression model:

$$P(Y_i = 1|X_i, RPS_i, RES_i) = \frac{1}{1 + \exp(-(\alpha + X_i\beta + RPS_i\theta + RES_i\gamma))}, \quad (3.1)$$

with Y_i representing the presence of depressive disorder (or symptom) for individual i , X_i , RPS_i , and RES_i representing the vectors of control variables, psychosocial risk exposures, and resource access for individual i . The associated vectors of parameters for these variables are denoted by β , θ , and γ , respectively, with α an intercept term, which can

be estimated using MLE.

The parameter vectors θ and γ enable the computation of the odds ratio associated with each psychosocial risk and resource. The odds ratio associated with the j -th RPS variable is given by:

$$OR_j = \exp(\theta_j). \quad (3.2)$$

In our setting, OR_j represents the ratio of odds for presenting a depressive disorder (or a specific depressive symptom) among workers exposed to RPS_j compared to those not exposed to this RPS. An odds ratio of 1 indicates no difference in the odds of experiencing an adverse mental health outcome between these two workers groups, meaning that RPS_j is not associated with the risk of suffering from a depressive disorder. Conversely, an odds ratio greater (lower) than one indicates that the presence of RPS_j is associated with an increased (decreased) likelihood of experiencing a depressive disorder. Considering our interpretation of psychosocial risks and resources, we expect odds ratios associated with RPS variables to be equal to or greater than one, and odds ratios associated with RES variables to be equal to or lower than one.

The proper estimation of risk and protective parameters requires specifying an appropriate set of controls. We incorporate workers' sociodemographic characteristics, along with details regarding their work contracts and employers, as control variables in our model. Specifically, the following list of variables is included as controls: gender, age, relationship status, presence of young children at home, employment under a long-term work contract (CDI), number of weekly working hours, socioeconomic status indicated by executive or higher intellectual professions, and the employer's public/private nature.

Table 3.4: Models predictive performance

Model Outcome	(1) Controls	(2) RPS	(3) RPS + Resources
Major depressive disorder	0.610	0.831	0.854
Other depressive disorder	0.546	0.713	0.740
Depressive disorder	0.567	0.782	0.809
Loss of motivation	0.543	0.765	0.789
Attention deficits	0.596	0.762	0.780
Nutrition disorders	0.584	0.718	0.728
Fatigue syndromes	0.594	0.708	0.713

Note: This table displays the logistic regressions' predictive performance as measured by the AUC for seven mental health outcomes and three model specifications. The model specifications include (1) control variables, (2) controls and RPS variables, (3) controls, RPS and RES variables. The model's predictive performance was evaluated on a randomly selected test sample of 5,215 observations, representing 25% of the overall sample.

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Before estimating risk and protective parameters in equation (3.1), we start by assessing the importance of these variables in explaining workers' mental health outcomes. To do so, we compare the performance of multiple models in predicting mental health outcomes. We start by randomly partitioning our sample into a training sample and a test sample. The training sample represents 75% of the initial sample and is utilized to estimate our models, while the test sample comprises all the observations excluded from the training sample and is used to evaluate models predictive performance. We consider three types of predictive models: (i) a logistic regression including only control variables, (ii) a logistic regression including controls and RPS variables, and (iii) a logistic regression including controls, RPS variables, and RES variables. Comparing the relative performance of these predictive models allows us to gain insight into the predictive accuracy gains derived from including information on workers' psychosocial risks exposure and resources access.

Table 3.4 displays the model predictive performance, as measured by the AUC, for seven mental health outcomes. The AUC is a widely used metric for assessing model predictive performance, taking values between 0 and 1. An AUC of 0.5 indicates a predictive model performing no better than random guessing, while a value of 1 indicates

a predictive model having perfect discriminatory power. Our results show that in each case, predictive models including only control variables yield predictive performance just slightly better than random guessing. On the other hand, the inclusion of RPS and RES variables yields significant gains in predictive accuracy for each of the mental health outcomes. Specifically, we find that the logistic regression model including both RPS and RES variables exhibits good predictive power for major depressive disorder and depressive disorder (major and other) with an AUC above 0.8. Next, we focus on drawing inference on the risk and protective parameters in equation (3.1) derived from the full sample.

Table 3.5: Summary of Logistic Regression Results for Depressive disorder (major and other)

Variable	Model (1)		Model (2)		Model (3)	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Age	0.996*	(0.992–1.000)	0.991***	(0.986–0.996)	0.991***	(0.986–0.996)
Gender: woman	1.285***	(1.170–1.412)	1.171***	(1.057–1.298)	1.185***	(1.066–1.318)
Couple	0.690***	(0.622–0.766)	0.690***	(0.617–0.772)	0.733***	(0.652–0.824)
Single Parent	1.220*	(0.972–1.532)	1.129	(0.874–1.459)	1.189	(0.919–1.538)
Immigrant Status	1.262*	(0.986–1.616)	1.412**	(1.081–1.844)	1.364**	(1.032–1.803)
Log-Average Income	0.711**	(0.538–0.939)	0.702**	(0.515–0.957)	0.713**	(0.519–0.980)
High Socioeconomic Status	0.840**	(0.725–0.973)	0.984	(0.833–1.163)	0.985	(0.832–1.167)
Intercept	4.793	(0.291–78.901)	1.017	(0.045–22.913)	10.867*	(0.444–265.723)
Psychosocial risk	✗		✓		✓	
Resource	✗		✗		✓	
R^2	0.011		0.162		0.192	

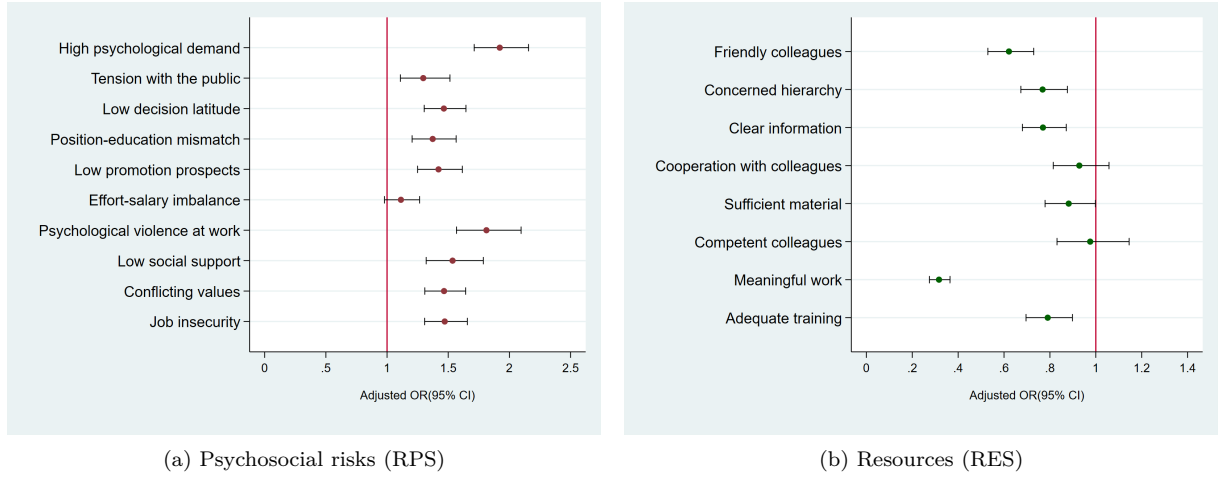
Notes: OR = odds ratio; 95% CI = 95% confidence interval. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Table 3.5 displays the statistical significance of control variables for the three previous models, considering depressive disorder (major and other) as our dependent variable. Overall, we found a robust association between age, gender, and relationship status and the risk of suffering from a depressive disorder. Holding all other factors constant, we found that as workers get older, they are less likely to suffer from depression, older workers appear to be more resilient, potentially due to greater job experience, better work-life balance, and more established social support network (De Lange et al. (2006)), also, women are more likely to suffer from depressive disorder regardless of their exposure to psychosocial hazards. This result suggests a direct effect of gender on the risk of experiencing depressive disorder, aligning with extensive research highlighting women's

heightened vulnerability to mental health issues (Franklin et al. (2022), Milner et al. (2021), Plaisier et al. (2008)).

Conversely, individuals in a relationship are less likely to suffer from depression, a result consistent with Plaisier et al. (2008) and possibly explained by the supportive nature of relationships (Still (2014)). An individual who is married or in a relationship is likely to be more integrated into society, as having a relationship acts as a link or a tie to other groups through the partner. These results are consistent with what Durkheim mentioned: an individual who is married is likely to have more support than a non-married individual (Durkheim (2005)). However, working as an immigrant (regardless of being European or non-European), can increase the likelihood of suffering from depression. Migrant workers can be at high risk of exposure to workplace hazards and face additional work-related risk factors and unfavorable social determinants of health. These work-related risks can result in a higher incidence of occupational injuries and work-related diseases among migrant workers, compared with non-migrant workers (International Labour Organization (2020), Hargreaves et al. (2019)). Interestingly, we observe a statistically significant negative association between higher socioeconomic status, higher average income, and depressive disorder. This last finding suggests that exposure to poorer working conditions might be a critical mechanism explaining the mental health gap associated with socioeconomic status (Dieker et al. (2019)).

Figure 3.7: Adjusted Odds Ratios (OR) with 95% CI for RPS and RES for Depressive disorder (major and other)



Note: The figure compares how psychosocial risks (left) and workplace resources (right) relate to the odds of having a depressive disorder. Dots are adjusted odds ratios (OR) with 95% CIs; the red vertical line marks OR=1. Values to the right of 1 indicate higher odds (risk); values to the left indicate lower odds (protective). *Source:* Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.7 illustrates the psychological risks and resources utilized as independent variables in the logistic regression analysis. The red line represents a threshold for the adjusted odds ratio. A value above the red line (1), such as 2.5 or 3, signifies a higher level of psychosocial risk at work associated with major depressive disorder. Conversely, an odds ratio below the red line (1), such as 0.5, indicates a higher level of resources at work associated with major depressive disorder.

Through logistic regression analysis, we identified key psychosocial risks that significantly impact Depressive disorder (major+other). High Psychological Demand, Psychological violence at work (mobbing), Low Social Support, Low Decision Latitude, Tasks Conflicting with Personal Values and Job Insecurity emerged as the primary influencers, as evidenced by their odds ratios exceeding 1 in the analysis. These findings underscore the substantial impact of these psychological factors on the occurrence of Depressive disorder. Conversely, we identified key resource factor that significantly impact Depressive disorder. Meaningful Work emerged as the primary influencer, as evidenced by its odds ratios below 1 in the analysis. These findings highlight the substantial positive impact of this resource factor on reducing the occurrence of Depressive disorder.

In addition to examining Depressive disorder among workers, we tried to examine other mental illnesses that can reflect the conditions of the workers' psychosocial risk and affect them. For this purpose, based on the PHQ-9 questionnaire, we defined four important mental illnesses, which are: Loss of Motivation, Attention deficits, Nutrition disorders, and Fatigue syndromes.

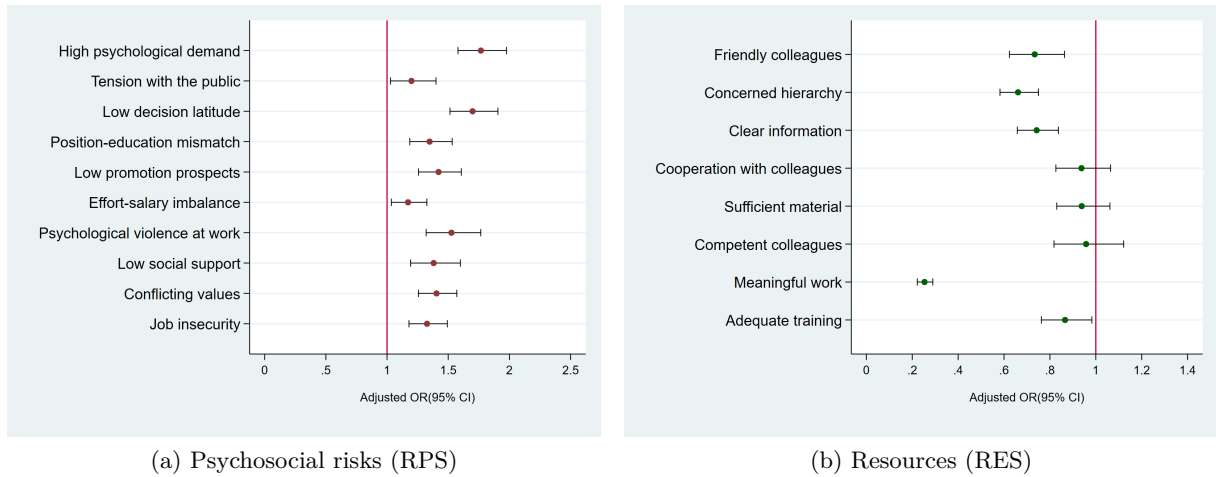
Table 3.6: Logistic Regression Results for Loss of Motivation

Variable	Model (1)		Model (2)		Model (3)	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Age	0.997	(0.993–1.002)	0.994**	(0.989–0.999)	0.994**	(0.989–0.999)
Gender: woman	1.030	(0.939–1.130)	0.909*	(0.822–1.002)	0.929	(0.837–1.030)
Couple	0.723***	(0.653–0.802)	0.731***	(0.655–0.816)	0.775***	(0.691–0.869)
Single Parent	1.110	(0.877–1.405)	1.022	(0.790–1.322)	1.094	(0.843–1.421)
Immigrant Status	1.294**	(1.019–1.644)	1.424***	(1.098–1.847)	1.366**	(1.038–1.796)
Log-Average Income	0.782*	(0.599–1.022)	0.831	(0.618–1.116)	0.841	(0.621–1.140)
High Socioeconomic Status	0.828***	(0.719–0.953)	1.014	(0.864–1.190)	1.001	(0.850–1.178)
Intercept	1.914	(0.130–28.145)	0.187	(0.009–3.646)	2.234	(0.104–47.613)
Psychosocial risk	✗		✓		✓	
Resource	✗		✗		✓	
R^2	0.006		0.145		0.185	

Notes: Odds ratios (OR) greater than 1 indicate higher odds of reporting a loss of motivation; OR less than 1 indicate lower odds. Model (1) includes baseline covariates (age, gender, couple status, single-parent status, immigrant status, log income, high socioeconomic status). Model (2) additionally includes psychosocial risk indicators (RPS). Model (3) further adds workplace resource indicators (RES). In this sample, couple status is consistently protective; immigrant status is positively associated in Models (2)–(3); age consistently protective association in Models (2)–(3); high socioeconomic status is protective only in Model (1). **Gender:** women in Model (2) exhibit marginally lower odds. Overall model fit improves when RPS/RES are added (R^2 : 0.006 $\rightarrow$ 0.145 $\rightarrow$ 0.185).

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.8: Adjusted Odds Ratios (OR) with 95% CI for RPS and RES for Loss of Motivation



Note: The figure compares how psychosocial risks (left) and workplace resources (right) are associated with the odds of reporting loss of motivation. Dots are adjusted odds ratios (OR) with 95% CIs; the red vertical line marks $OR = 1$. Values to the right of 1 indicate higher odds (risk); values to the left indicate lower odds (protective). *Source:* Authors' calculations based on the SUMER 2017 survey microdata (France)

In our investigation, Figure 3.8 displays six key psychosocial risks and one crucial resource factor affecting motivation. These risks include high psychological demands, low social support, low decision latitude, psychological violence at work (mobbing), conflicts between work and personal values, and low prospects for promotion. Each of these factors significantly increases the likelihood of motivation loss. However, engaging in meaningful work acts as a buffer, reducing the risk of motivational decline. Addressing these factors can help organizations enhance motivation levels and overall job satisfaction proactively.

Our analysis shows that the odds ratios for psychosocial risks are above 1, clearly indicating their significant contribution to the likelihood of motivation loss. Conversely, the odds ratios for meaningful work are below 1, highlighting its strong effectiveness in reducing the risk of motivational decline.

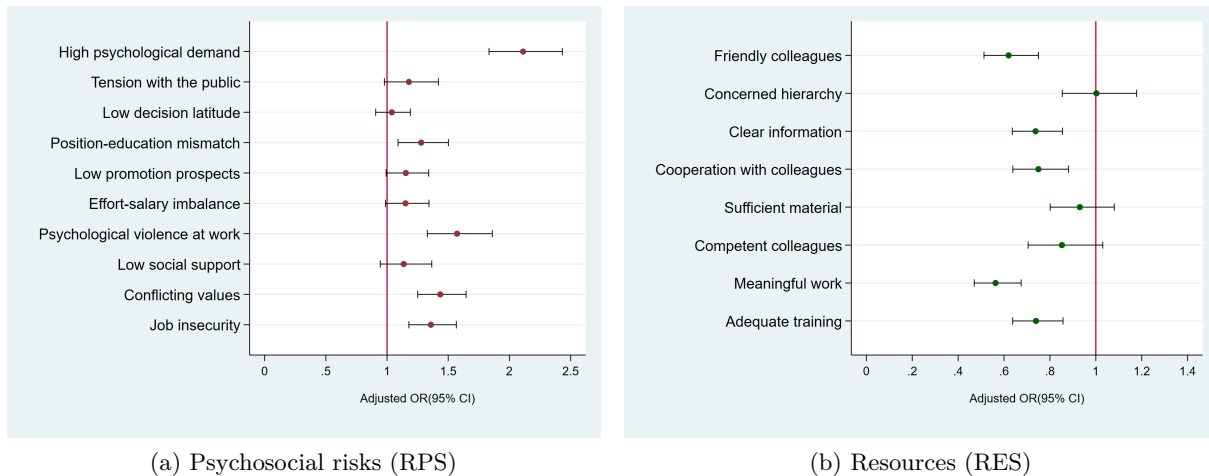
Table 3.7: Logistic Regression Results for Attention Deficits

Variable	Model (1)		Model (2)		Model (3)	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Age	1.009***	(1.003–1.014)	1.007**	(1.001–1.013)	1.007**	(1.001–1.014)
Gender: woman	1.812***	(1.607–2.044)	1.697***	(1.498–1.924)	1.692***	(1.491–1.920)
Couple	0.664***	(0.583–0.757)	0.678***	(0.592–0.776)	0.715***	(0.622–0.821)
Single Parent	1.238	(0.938–1.635)	1.148	(0.857–1.536)	1.179	(0.880–1.580)
Immigrant Status	1.036	(0.737–1.456)	1.157	(0.813–1.647)	1.152	(0.804–1.650)
Log-Average Income	1.197	(0.849–1.686)	1.097	(0.716–1.583)	1.120	(0.771–1.627)
High Socioeconomic Status	0.739***	(0.612–0.892)	0.752***	(0.617–0.916)	0.763***	(0.626–0.932)
Intercept	0.006***	(0.000–0.218)	0.004***	(0.000–0.186)	0.031*	(0.000–1.327)
Psychosocial risk	✗		✓		✓	
Resource	✗		✗		✓	
R^2	0.020		0.110		0.126	

Notes: Odds ratios (OR) > 1 indicate higher odds of reporting attention deficits; OR < 1 indicate lower odds. Model (1) includes baseline covariates (age, gender, couple status, single-parent status, immigrant status, log income, high socioeconomic status); Model (2) additionally includes psychosocial risk indicators (RPS); Model (3) further adds workplace resource indicators (RES). In this sample, women exhibit higher odds across all models; couple status is consistently protective; high socioeconomic status is protective; age shows a consistently protective in all Models. Immigrant status and log income are not statistically significant at conventional levels. Model fit improves with the inclusion of RPS/RES (R^2 : 0.020 → 0.110 → 0.126).

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.9: Adjusted Odds Ratios (OR) with 95% CI for RPS and RES For Attention Deficits



Note: The figure compares how psychosocial risks (left) and workplace resources (right) are associated with the odds of reporting attention deficits. Dots are adjusted odds ratios (OR) with 95% CIs; the red vertical line marks OR = 1. Values to the right of 1 indicate higher odds (risk); values to the left indicate lower odds (protective). Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

As shown in Figure 3.9, significant psychosocial risks and essential resources have been identified with ($p < 0.01$) significant levels that profoundly impact concentration levels. These risks include high psychological demands, psychological violence at work

(mobbing), conflicts between work and personal values, job insecurity, and mismatches between professional roles and education. Each of these factors significantly increases the likelihood of attention deficits. In contrast, engaging in meaningful work and having friendly colleagues and supportive hierarchical superiors emerge as strong protective factors, substantially reducing the likelihood of attention deficits.

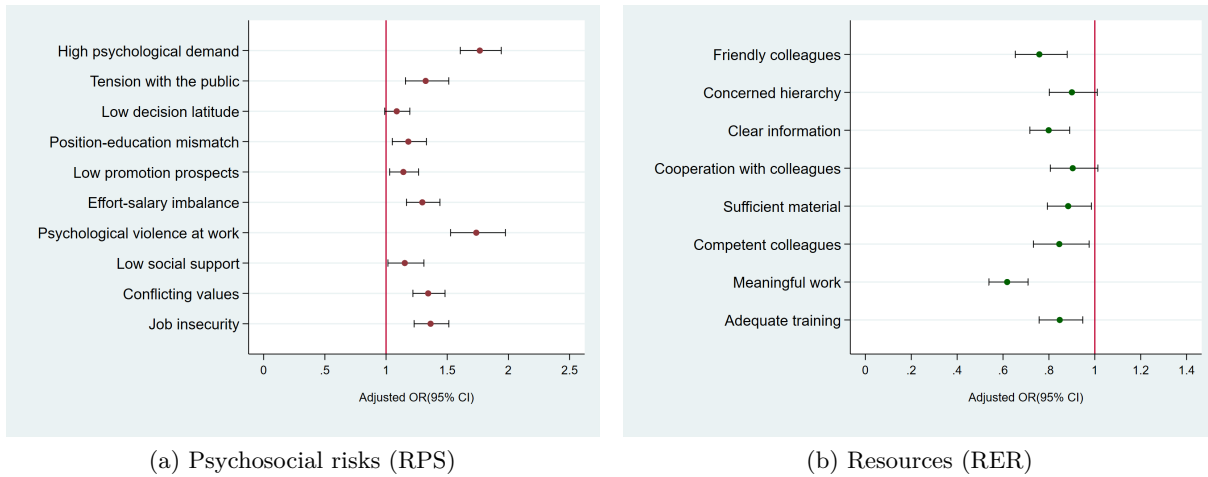
Table 3.8: Logistic Regression Results for Nutrition Disorders

Variable	Model (1)		Model (2)		Model (3)	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Age	0.989***	(0.985–0.993)	0.986***	(0.981–0.990)	0.986***	(0.981–0.990)
Gender: woman	1.485***	(1.366–1.614)	1.390***	(1.274–1.517)	1.385***	(1.268–1.513)
Couple	0.748***	(0.681–0.821)	0.741***	(0.672–0.817)	0.764***	(0.693–0.843)
Single Parent	1.222*	(0.995–1.501)	1.140	(0.923–1.409)	1.154	(0.933–1.427)
Immigrant Status	1.188	(0.946–1.491)	1.312**	(1.035–1.663)	1.300**	(1.023–1.651)
Log-Average Income	0.759**	(0.591–0.976)	0.684***	(0.524–0.895)	0.709**	(0.541–0.930)
High Socioeconomic Status	0.807***	(0.707–0.922)	0.847**	(0.736–0.974)	0.853**	(0.740–0.983)
Intercept	3.977	(0.317–49.786)	4.227	(0.284–62.794)	14.918*	(0.968–229.852)
Psychosocial risk	✗		✓		✓	
Resource	✗		✗		✓	
R^2	0.015		0.094		0.103	

Notes: Odds ratios (OR) greater than 1 indicate higher odds of reporting nutrition disorders; OR less than 1 indicate lower odds. Model (1) includes baseline covariates (age, gender, couple status, single-parent status, immigrant status, log income, high socioeconomic status); Model (2) additionally includes psychosocial risk indicators (RPS); Model (3) further adds workplace resource indicators (RES). In this sample, women have higher odds across all models; couple status and high socioeconomic status are consistently protective; age shows a consistent protective association. Immigrant status is positively associated and statistically significant in Models (2)–(3). Log income is negatively associated with nutrition disorders and statistically significant across models. Model fit improves with the inclusion of RPS/RES (R^2 : 0.015 $\rightarrow$ 0.094 $\rightarrow$ 0.103).

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.10: Adjusted Odds Ratios (OR) with 95% CI for RPS and RES for Nutrition Disorders



Note: The figure compares how psychosocial risks (left) and workplace resources (right) are associated with the odds of reporting nutrition disorders. Dots are adjusted odds ratios (OR) with 95% CIs; the red vertical line marks $OR = 1$. Values to the right of 1 indicate higher odds (risk); values to the left indicate lower odds (protective). *Source:* Authors' calculations.

The positioning of variables relative to the OR line indicates the direction in which these variables affect nutrition disorders. Figure 3.10 clearly shows this. According to this figure, high psychological demands, tensions with the public, conflicts between job tasks and personal values, job insecurity, psychological violence at work (mobbing), and feelings of effort-salary imbalance are key psychosocial risks that pivotal affect nutrition disorders. Each of these factors significantly heightens the propensity for nutrition disorders among individuals. Conversely, engaging in meaningful work as a potent buffer substantially diminishes the likelihood of nutrition disorders.

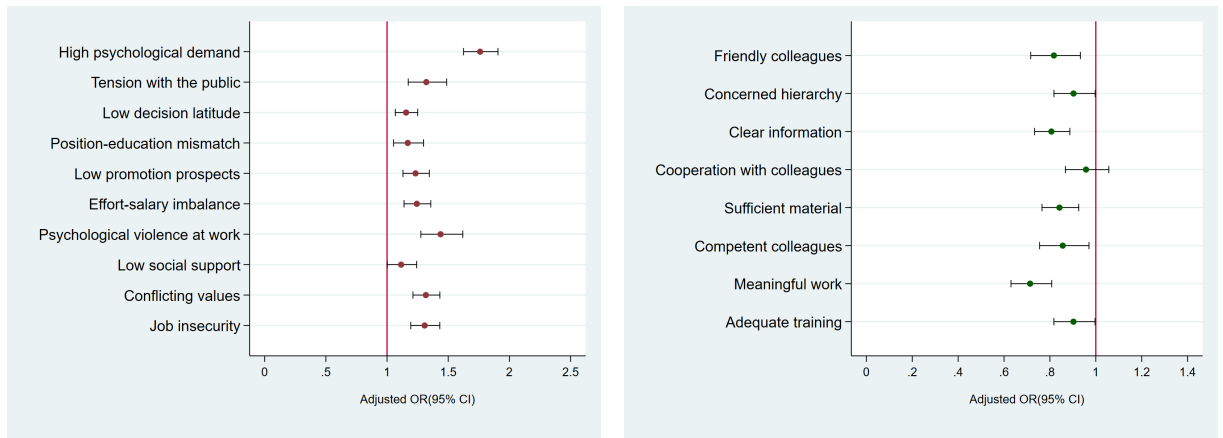
Table 3.9: Logistic Regression Results for Fatigue Syndromes

Variable	Model (1)		Model (2)		Model (3)	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Age	0.997	(0.994–1.001)	0.996*	(0.993–1.000)	0.996*	(0.993–1.000)
Gender: woman	1.485***	(1.384–1.594)	1.396***	(1.296–1.503)	1.386***	(0.993–1.494)
Couple	0.782***	(0.722–0.848)	0.773***	(0.711–0.841)	0.790***	(0.726–0.859)
Single Parent	1.109	(0.920–1.337)	1.027	(0.843–1.251)	1.028	(0.843–1.253)
Immigrant Status	0.764**	(0.614–0.952)	0.824*	(0.657–1.034)	0.820*	(1.654–1.028)
Log-Average Income	0.808*	(0.651–1.002)	0.727***	(0.577–0.915)	0.758**	(0.601–0.957)
High Socioeconomic Status	0.860**	(0.767–0.964)	0.905	(0.801–1.022)	0.912	(0.807–1.030)
Intercept	2.397	(0.274–20.955)	2.64	(0.260–26.888)	6.348	(0.606–66.442)
Psychosocial risk	✗		✓		✓	
Resource	✗		✗		✓	
R^2	0.011		0.080		0.086	

Notes: Odds ratios (OR) greater than 1 indicate higher odds of reporting fatigue syndromes; OR less than 1 indicate lower odds. Model (1) includes baseline covariates (age, gender, couple status, single-parent status, immigrant status, log income, high socioeconomic status). Model (2) additionally includes psychosocial risk indicators (RPS). Model (3) further adds workplace resource indicators (RES). In this sample, women exhibit higher odds across models; couple status and age are consistently protective. Immigrant status and log income are associated with lower odds (protective) across models, while high socioeconomic status is protective in Model (1) only. Overall model fit improves with the inclusion of RPS/RES (R^2 : 0.011 $\rightarrow$ 0.080 $\rightarrow$ 0.086).

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.11: Adjusted Odds Ratios (OR) with 95% CI for RPS and RES For Fatigue syndromes



(a) Psychosocial risks (RPS)

(b) Resources (RES)

Note: The figure compares how psychosocial risks (left) and workplace resources (right) are associated with the odds of reporting fatigue syndromes. Dots are adjusted odds ratios (OR) with 95% CIs; the red vertical line marks OR = 1. Values to the right of 1 indicate higher odds (risk); values to the left indicate lower odds (protective). *Source:* Authors' calculations based on the SUMER 2017 survey microdata (France)

Our investigation, shown in Figure 3.11, identifies significant psychosocial risks and essential resource factors that affect fatigue syndromes. These risks include high psychological demands, conflicts between job tasks and personal values, job insecurity, feelings of

effort-salary imbalance, psychological violence at work (mobbing), and Tensions with the public. Each of these factors significantly increases the likelihood of fatigue syndromes. In contrast, engaging in meaningful work emerges as a strong protective factor, reducing the likelihood of fatigue syndromes.

3.3.3 Robustness test

To validate the robustness and reliability of our previous findings and to address potential confounding variables, we conducted a comprehensive robustness assessment. The outcomes of a logistic regression analysis investigating the correlation between various factors and the presence of Other Depressive Disorder and Major Depressive Disorder are presented in Appendix 3.4 tables 3.4.2 and 3.4.3.

Our robustness assessment produced results consistent with our initial findings. Across both models, Figures 3.4.3 and 3.4.4 in Appendix 3.4 (for Other Depressive Disorder and Major Depressive Disorder, respectively) show significant psychosocial risk factors. Factors such as high psychological demand, psychological violence at work (mobbing), low social support, low decision latitude, tasks conflicting with personal values, and job insecurity, plus low prospects for promotion and a mismatch between professional positions and education, were found to be primary influencers, as indicated by odds ratios exceeding 1 in the analysis. These results underscore the considerable impact of these psychological factors on the occurrence of other/depressive disorders.

Furthermore, we also identified key resource factors that significantly influence other/Major depressive disorders. Factors such as Meaningful Work emerged as primary influencers, as evidenced by odds ratios below 1 in the analysis. These findings emphasize the significant positive impact of these resource factors in mitigating the occurrence of other/major depressive disorders.

3.4 Conclusion

This study sheds light on the significant relationship between workers' exposure to psychosocial risks and their mental health, with a particular emphasis on the French workforce. Our findings reveal that exposure to high psychological demands, lack of decision latitude, low social support, job insecurity, and emotional strain significantly contribute to the prevalence of depressive disorders, attention deficits, fatigue syndromes, and other mental health challenges. Importantly, these psychosocial risks are not evenly distributed across genders or occupations, highlighting the need for more tailored interventions.

Moreover, access to workplace resources, such as meaningful work, clear communication, and supportive colleagues, serves as a protective factor against these adverse outcomes. By integrating these resources into workplace policies, organizations can mitigate the detrimental effects of psychosocial risks and improve the overall well-being of their employees.

The implications of this research are twofold: First, the results underscore the necessity for employers and policymakers to recognize and address psychosocial risks as integral to occupational health strategies. Second, the findings provide a clear direction for interventions aimed at reducing workplace-induced mental health issues by fostering a supportive and resource-rich environment. Future research should continue to explore the complexities of these relationships, particularly across different socio-economic and occupational settings, to develop more targeted and effective prevention strategies.

Appendix

Patient Health Questionnaire

Over the past 2 weeks, how often have you been bothered by the following issues:

1. Little interest or pleasure in doing things.
2. Feeling sad, depressed, or hopeless.
3. Difficulty falling asleep or staying asleep, or sleeping too much.
4. Feeling tired or having little energy.
5. Having little appetite or eating too much.
6. Having a poor opinion of oneself, feeling worthless, or feeling like you have disappointed your family or yourself.
7. Having trouble concentrating, for example, when reading the newspaper or watching TV.
8. Moving or speaking so slowly that others could notice, or, on the contrary, being so restless that you had difficulty sitting still compared to usual.
9. Thinking that it would be better to be dead or considering harming yourself in some way.

Never; Several days; More than half the time; Almost every day

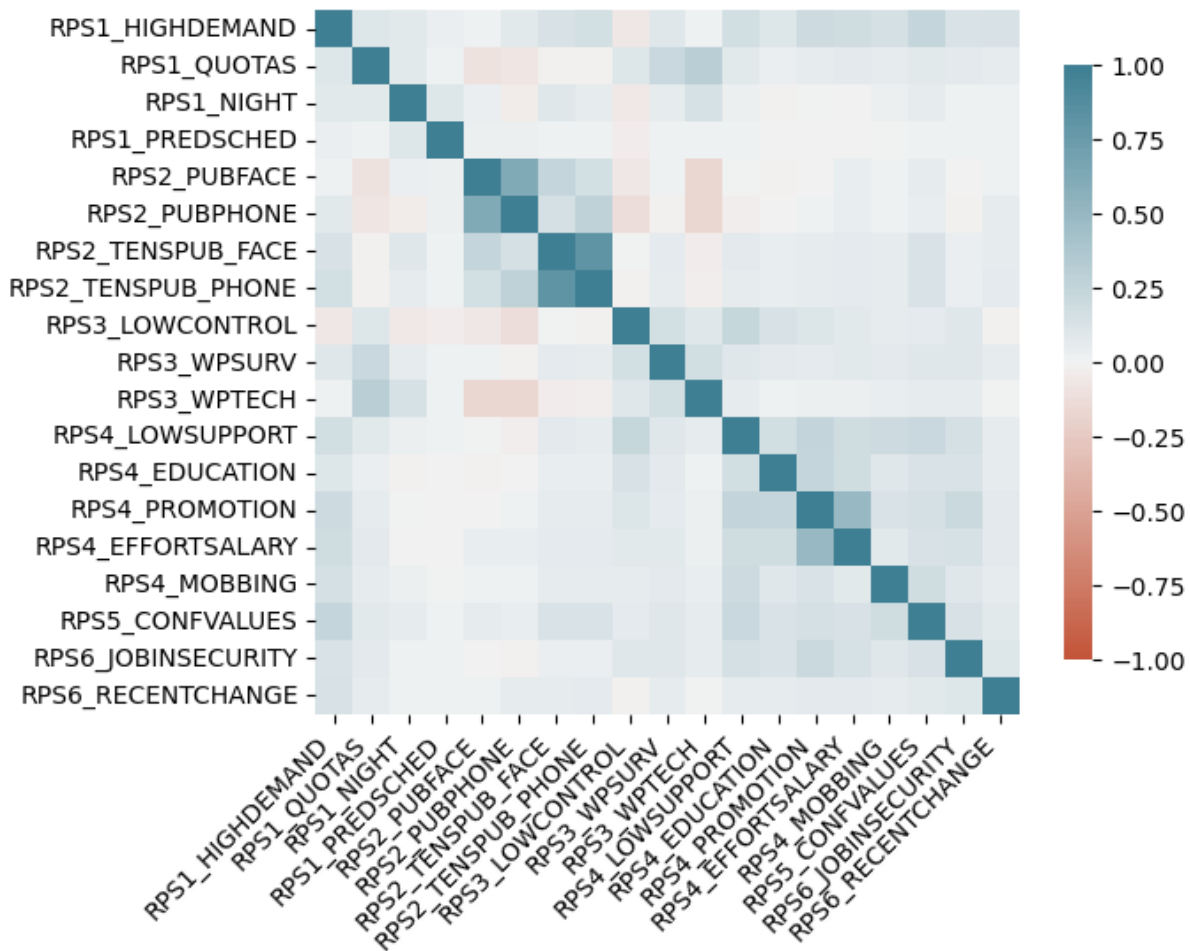
Additional tables and figures

Table 3.4.1: Variable names and definitions

Type	Variable name	Label
Psychosocial risk exposures	RPS1_HIGHDEMAND	High psychological demand (DCS model)
	RPS2_TENSPUB_FACE	Tensions with the public (face to face)
	RPS2_TENSPUB_PHONE	Tensions with the public (phone)
	RPS3_LOWCONTROL	Low decision latitude (DCS model)
	RPS4_LOWSUPPORT	Low social support (DCS model)
	RPS4_EDUCATION	Perceptions of a mismatch between position and education (Siegrist's questionnaire)
	RPS4_PROMOTION	Perceptions of low promotion prospects (Siegrist's questionnaire)
	RPS4_EFFORTSALARY	Perceptions of effort-salary imbalance (Siegrist's questionnaire)
	RPS5_CONFVALUES	Tasks occasionally or often conflicting with personal values in the last 12 months
	RPS6_JOBINSECURITY	Feeling that job security is threatened
Workers' resources	RES1_FRIENDLY	Friendly colleagues
	RES1_HIERARCHY	Supervisor concerned about the well-being of subordinates
	RES2_INFO	Clear information to perform the job
	RES2_HIERARCHYCOOP	Supervisor succeeds in getting subordinates to collaborate
	RES2_SUFFMAT	Sufficient material resources
	RES2_SKILLCOLL	Colleagues professionally competent
	RES3_MEANINGFULWORK	Whether a worker finds his work to be meaningful
	RES3_TRAINING	Sufficient and appropriate training

Note: This table presents the variable names and their definitions.

Figure 3.4.1: Correlation matrix of psychosocial risk exposure variables



Note: This figure displays the correlation matrix of psychosocial risks exposure variables.

Figure 3.4.2: Correlation matrix of workers' resources variables



Note: This figure displays the correlation matrix of workers resources variables.

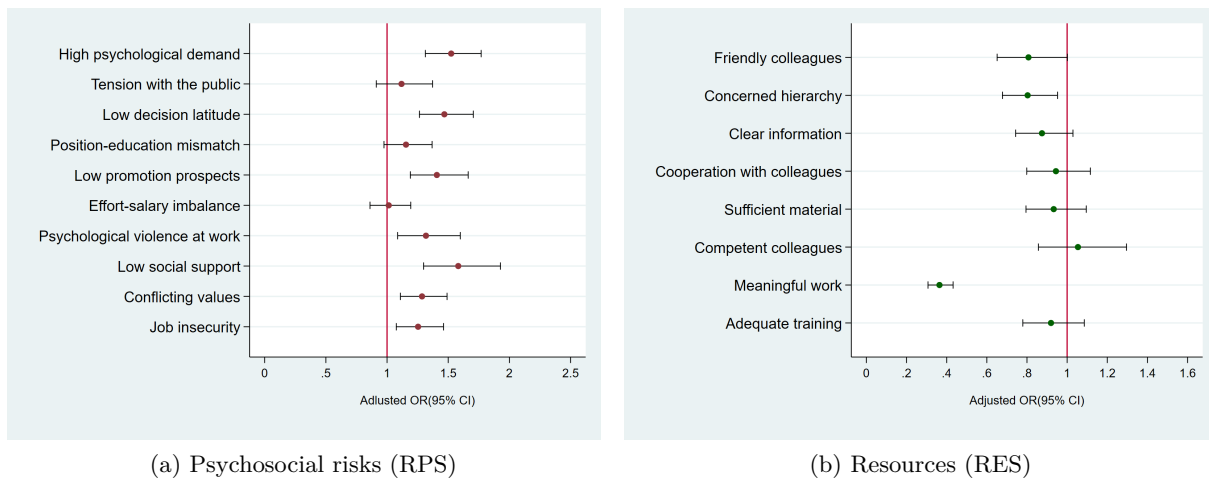
Table 3.4.2: Logistic Regression Results for Other Depressive Disorder

Variable	Model (1)		Model (2)		Model (3)	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Age	0.989***	(0.983–0.995)	0.985***	(0.979–0.991)	0.985***	(0.979–0.992)
Gender: woman	1.021	(0.900–1.159)	0.939	(0.823–1.072)	0.956	(0.836–1.094)
Couple	0.763***	(0.662–0.879)	0.779***	(0.675–0.899)	0.816***	(0.705–0.945)
Single Parent	1.089	(0.791–1.499)	1.008	(0.720–1.410)	1.059	(0.752–1.493)
Immigrant Status	1.400**	(1.025–1.912)	1.479**	(1.064–2.054)	1.418**	(1.007–1.996)
Log-Average Income	0.718*	(0.492–1.049)	0.770	(0.516–1.150)	0.782	(0.522–1.172)
High Socioeconomic Status	0.890	(0.733–1.080)	1.041	(0.841–1.288)	1.026	(0.828–1.271)
Intercept	2.933	(0.065–132.420)	0.420	(0.007–23.798)	1.951	(0.033–115.008)
Psychosocial risk	✗		✓		✓	
Resource	✗		✗		✓	
R^2	0.006		0.086		0.105	

Notes: Odds ratios (OR) greater than 1 indicate higher odds of meeting criteria for other depressive disorder; OR less than 1 indicate lower odds. Model (1) includes baseline covariates (age, gender, couple status, single-parent status, immigrant status, log income, high socioeconomic status). Model (2) additionally includes psychosocial risk indicators (RPS). Model (3) further adds workplace resource indicators (RES). In this sample, age is positively associated across all models; couple status is consistently protective; gender (women vs. men) and single-parent status are not statistically significant. Immigrant status is negatively associated in all models. Log income shows a protective association in Model (1) only; high socioeconomic status is not statistically significant. Overall model fit improves with the inclusion of PSR/RES (R^2 : 0.006 $\rightarrow$ 0.086 $\rightarrow$ 0.105).

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.4.3: Adjusted Odds Ratios (OR) with 95% CI for RPS and RES for Other Depressive Disorder



Note: The figure compares how psychosocial risks (left) and workplace resources (right) are associated with the odds of reporting other depressive disorders. Dots are adjusted odds ratios (OR) with 95% CIs; the red vertical line marks OR = 1. Values to the right of 1 indicate higher odds (risk); values to the left indicate lower odds (protective). *Source:* Authors' calculations based on the SUMER 2017 survey microdata (France)

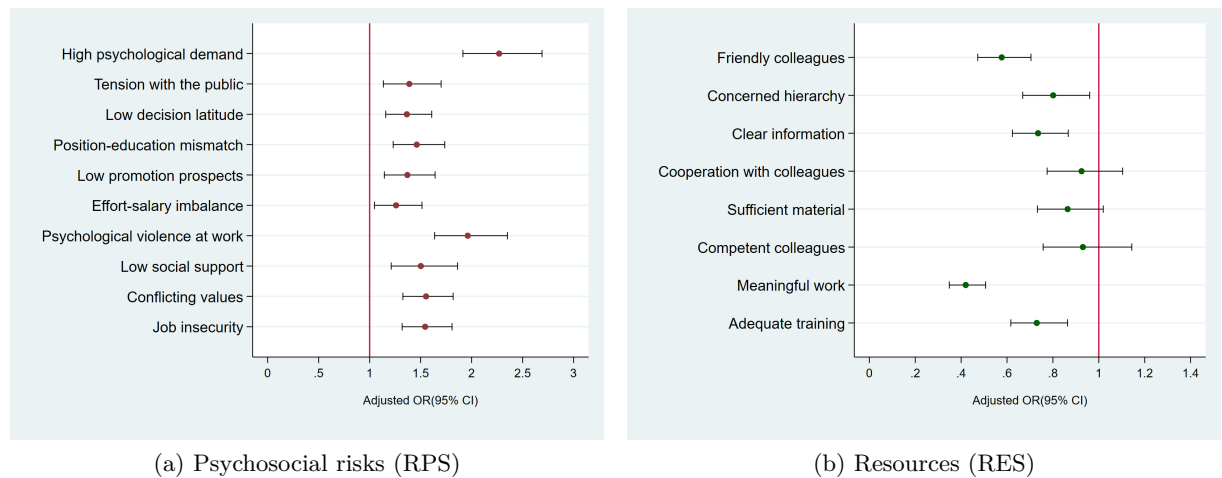
Table 3.4.3: Logistic Regression Results for Major Depressive Disorder

Variable	Model (1)		Model (2)		Model (3)	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Age	1.003	(0.998–1.009)	0.999	(0.992–1.006)	1.000	(0.993–1.007)
Gender: woman	1.613***	(1.412–1.843)	1.479***	(1.280–1.710)	1.488***	(1.284–1.724)
Couple	0.648***	(0.560–0.749)	0.666***	(0.570–0.777)	0.719***	(0.613–0.844)
Single Parent	1.322*	(0.981–1.782)	1.205	(0.864–1.680)	1.265	(0.907–1.763)
Immigrant Status	1.074	(0.741–1.555)	1.187	(0.811–1.736)	1.149	(0.779–1.694)
Log-Average Income	0.728	(0.495–1.071)	0.692*	(0.452–1.059)	0.705	(0.453–1.095)
High Socioeconomic Status	0.799**	(0.647–0.988)	0.924	(0.731–1.168)	0.944	(0.743–1.199)
Intercept	2.121	(0.0231–54.299)	0.237	(0.003–17.313)	2.309	(0.027–194.423)
Psychosocial risk	✗		✓		✓	
Resource	✗		✗		✓	
R^2	0.016		0.180		0.204	

Notes: Odds ratios (OR) greater than 1 indicate higher odds of meeting criteria for major depressive disorder (MDD); OR less than 1 indicate lower odds. Model (1) includes baseline covariates (age, gender, couple status, single-parent status, immigrant status, log income, high socioeconomic status). Model (2) additionally includes psychosocial risk indicators (RPS). Model (3) further adds workplace resource indicators (RES). In this sample, women have higher odds across all models; couple status is consistently protective. Single-parent status is marginally negative in Model (1) only. Age and immigrant status are not statistically significant. Log income shows a weak protective association in Model (2) only; high socioeconomic status is protective in Model (1) only. Overall model fit improves with the inclusion of RPS/RES (R^2 : 0.016 $\rightarrow$ 0.180 $\rightarrow$ 0.204).

Source: Authors' calculations based on the SUMER 2017 survey microdata (France)

Figure 3.4.4: Adjusted Odds Ratios (OR) with 95% CI for RPS and RES for Major Depressive Disorder



Note: The figure compares how psychosocial risks (left) and workplace resources (right) are associated with the odds of reporting major depressive disorder. Dots are adjusted odds ratios (OR) with 95% CIs; the red vertical line marks OR=1. Values to the right of 1 indicate higher odds (risk); values to the left indicate lower odds (protective). *Source:* Authors' calculations based on the SUMER 2017 survey microdata (France)

General Conclusion

General conclusion

We live in a time when people face new challenges every day, some severe enough to cost lives. Dangerous diseases, many shaped by human activity and mobility, continue to test the limits of our systems. Even with decades of scientific and economic progress, public-health shocks still have the power to reshape societies, not only through illness and loss but through deep disruptions to economic stability and social well-being. The economy is especially sensitive to such shocks: without credible tools to respond, countries can face rising poverty, unemployment, and falling productivity.

Yet external threats are only part of the story. Internal pressures, especially mental health strains such as anxiety, burnout, and depression, are growing in scale and are often underestimated in economic debate, despite their direct effects on labour supply, productivity, and long-run development. As this thesis has argued, building resilience today means addressing both visible crises and hidden vulnerabilities. A healthy economy depends on a healthy system and healthy people.

This thesis examined these issues through a consistent lens of *vulnerability*, exposure, sensitivity, and buffers, applied across macro and micro settings.

Chapter 1: Ebola's Shadow on African Economies, FDI and Remittances

The first chapter treats the West African Ebola crisis as a *regional* (*cross-border, adjacent-country*) economic event, not only a country-specific shock. It asks how two key external flows, foreign direct investment (FDI) and remittances, responded in directly affected countries and in their neighbours. In this chapter, a country-year panel is built for 28 African economies, combining macro data from the World Development Indicators

with epidemiological information from the WHO and CDC. A custom exposure measure identifies the epicentre and codes proximate neighbours to reflect shared supply chains, transport, labour mobility, and tourism. Two complementary strategies are used. First, a local projection framework traces short- to medium-term responses of FDI and remittances around the outbreak, so both the initial dip and the path back toward baseline are visible. Second, a system GMM specification is used as a robustness check to address endogeneity concerns and to validate longer-run relationships. The results show, FDI declines sharply in directly affected economies and, to a smaller but clear extent, in neighbouring countries, consistent with regional co-movement when operating constraints are shared. Remittances behave differently; in affected countries, they increase or remain stable, reflecting household risk-sharing and the stabilising role of migrant support. About neighbours, the results do not report changes. Reading the two flows together sharpens interpretation; investment is delay-prone under uncertainty, while remittances often act as a cushion. These patterns remain after checks that vary the timing of exposure, reweight the sample, and exclude large recipients. The chapter establishes that “neighbour exposure” is measurable and policy-relevant, and that analysing FDI and remittances side by side reveals resilience on one margin and retreat on another.

Chapter 2: Public Health as a Buffer for FDI: The Role of Healthcare Services

The second chapter widens the lens to multiple epidemics and asks two linked questions: How large is the *impact* of an outbreak on FDI? And what does the *return path* look like? The sample spans 98 countries across Africa, Asia, Latin America and the Caribbean, the Middle East and North Africa; results are reported for the full sample with robustness by world-region groupings. The analysis covers 20 major outbreaks from 2000 to 2022. Outbreak timing and disease classifications come from Torres Munguía et al. (2022), which harmonises WHO Disease Outbreak News with the WHO Coronavirus Dashboard; macro controls are from the World Bank’s World Development Indicators (WDI). Dated epidemic information is linked to country–year FDI inflows and standard determinants (growth, openness, and political stability), and augmented with a tractable proxy for front-

line health capacity: nurse and midwife density, observed on the same scale. A two-way fixed-effects design (country and year) estimates average changes in FDI during epidemic years, controlling for macroeconomic fundamentals to separate health-related effects from background conditions. Local projections then trace the evolution of FDI in the years that follow, allowing dynamic responses to differ by transmission mode (e.g., direct contact, zoonotic). To assess buffering, epidemic exposure is interacted with nurse/midwife density within the fixed-effects framework; the test is explicitly about the depth of the initial drop. Three results stand out. First, on average, FDI falls in impact when health risk increases, but the *recovery profile* varies by context; some cases return toward trend within a few years, others remain in a longer trough. Second, responses differ by transmission mode in ways that align with plausible channels into firms and public administration (workforce availability, logistics reliability, administrative continuity). Third, countries with higher nurse/midwife density experience *smaller impact effects* on FDI during epidemics, especially for higher-fatality or contact-intensive diseases. This supports a clear interpretation: credible frontline capacity functions as an economic *buffer* on the margin investors notice most, the size of the initial disruption.

Chapter 3: Psychosocial Risk Factors, Resources, and Workers' Mental Health

The third chapter turns to the micro level and documents how vulnerability is lived at work. It examines how psychosocial conditions, demands, control, support, role clarity, and job insecurity are associated with mental-health outcomes among workers in France. The analysis uses France's SUMER 2017 (Medical Monitoring of Employee Exposure to Occupational Risks), a nationally representative physician-administered survey ($n = 20,605$; April 2016-September 2017) that covers employees in the general and agricultural regimes, hospital public services, state / local government, and large public enterprises (nearly 25 million workers). It integrates validated instruments (e.g., PHQ-9 and Karasek) to measure mental health and psychosocial exposures. Mental-health outcomes include depressive symptoms, fatigue, attentional difficulties, and loss of motivation. The analysis is not tied to a specific outbreak; it documents workplace risks and resources in their own

right. Validated scales or composite indices are constructed to measure psychosocial risks and resources. Associations with mental-health outcomes are estimated using logistic regression models that adjust for demographics, sector, and contract type. Structural equation modelling complements these estimates by treating psychological well-being as a latent construct and by mapping indirect pathways through workplace conditions. Two patterns are strong and consistent. First, combinations of high demands with low control and weak support are linked to substantially worse mental-health outcomes. Second, resources, autonomy, role clarity, and supportive supervision are protective and appear to dampen the association between high demands and poor outcomes. Exposure is unequal; women and workers in healthcare, social work, and public service face higher psychosocial risks and show greater vulnerability to burnout, fatigue, and distress. The economic implications are clear; poorer mental health aligns with higher absence, presenteeism, and disengagement, costs borne by workers, employers, and the public purse.

While each chapter addresses a different layer, international finance, institutional capacity, and working conditions, they share one question: how do societies maintain continuity when public-health risks rise? The answer is multi-layered: stabilising external flows, anchoring expectations through credible public capacity, and designing work so people can absorb and adapt to strain.

Directions for Future Research

The analyses in this thesis examined how public health, economic resilience, and human vulnerability interact. They showed that health shocks, both sudden epidemics and persistent pressures, carry meaningful economic costs, and that buffers, whether institutional or psychosocial, can blunt those costs. Naturally, important questions remain. The following directions outline where future work can build most productively on this foundation.

1. Macroeconomic and Cross-Country Extensions

FDI recovery dynamics and health capacity (macro, capital flows)

This thesis shows that stronger frontline capacity buffers the *initial* investment shock. A

next step is to ask whether it also *shortens the time it takes for FDI inflows to return toward trend*. The focus here is country-level FDI (not sectors). I will compare simple recovery indicators across countries with stronger vs. weaker pre-shock health capacity (e.g., nurse/midwife density): (i) time to return to a fixed share of the pre-shock path (e.g., 90%); and (ii) the implied half-life of the shock. The aim is a clear, policy-facing answer: does credible health capacity speed the normalisation of *capital formation* after epidemics?

Sectoral footprint of epidemics and the role of health capacity (with Vignawou Lucien Ahouangbe⁶)

Complementary to item 1 (which concerns capital flows), this study looks at the *real economy*: which sectors are hit hardest and which recover fastest in terms of value added, employment, and exports. Together with *Vignawou Lucien Ahouangbe*, I will track sectors around dated outbreaks and summarise two intuitive indicators, *impact depth* and *recovery speed*, then compare these across countries with stronger vs. weaker pre-shock health capacity (e.g., health workforce or hospital-bed availability). The goal is a simple ranking of sectors by vulnerability and a map of where health capacity protects most, to guide continuity planning.

2. Microeconomic and Firm-Level Investigations

Which resources protect most, and for whom? (with Wassim Le Lann⁷). We will identify which workplace resources most effectively protect mental health, clear role definitions, modest autonomy in tasks or schedules, and supportive supervision. We will examine whether these resources soften the effect of high demands, and whether benefits are largest for women, shift workers, or specific sectors.

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3.5 Motivation

La santé ne relève pas seulement de la médecine ; elle constitue un système de risques qui façonne le fonctionnement des économies ainsi que la vie et le travail des individus. Lorsque les risques sanitaires se matérialisent, qu’il s’agisse d’épidémies ou de pressions persistantes, ils réallouent les ressources, mettent les institutions sous tension et affectent le bien-être. À l’aune des deux dernières décennies, il apparaît clairement que pays et sociétés sont vulnérables aux chocs sanitaires, tant aux niveaux macro que micro.

3.5.1 Pourquoi la santé compte pour l’économie

La santé est un élément central de la capacité économique. Lorsque les pressions sanitaires augmentent, soudainement ou à la suite de tensions prolongées, elles modifient les comportements et les anticipations et reprogramment les décisions des entreprises, des ménages et de l’État. Les effets sont systémiques plutôt qu’incidentels ; ils opèrent par un petit nombre de canaux qui, ensemble, déterminent l’évolution de la production, du revenu et du bien-être.

Premièrement, la santé façonne le *travail et le capital humain*. La maladie, la mortalité, les obligations de soin et les interruptions scolaires réduisent l’offre de travail, la productivité et l’accumulation de compétences, avec des conséquences pour la croissance d’aujourd’hui et le stock de compétences de demain (Barro et al. (2020); UNICEF et al. (2021)). Deuxièmement, elle affecte la *production et les réseaux d’approvisionnement*. Les risques sanitaires et les mesures de protection perturbent les intrants, la logistique et les services

à forte intensité de contact ; les projets ralentissent et les coûts augmentent à mesure que les entreprises reconfigurent leur organisation (Baldwin and Tomiura (2020)). Troisièmement, la pression sanitaire élargit les *bandes d'incertitude et d'anticipations* concernant la demande, les coûts et la réglementation, ce qui incite les entreprises à différer l'investissement irréversible et les embauches (Lee and McKibbin (2004); Yu et al. (2023)). Quatrièmement, elle déplace les *finances publiques* : les dépenses d'urgence et courantes de santé augmentent alors que les recettes se tassent, resserrant l'espace budgétaire précisément lorsque la crédibilité des services publics est la plus précieuse (IMF (2020)). Cinquièmement, elle modifie les *comptes extérieurs et l'accès aux marchés* à mesure que la mobilité et le tourisme s'ajustent, que la demande de matières premières évolue et que les capitaux transfrontaliers réévaluent les conditions d'exploitation (UNCTAD (2020a)).

Ces mécanismes génèrent des *impacts* immédiats et peuvent laisser des *cicatrices* de long terme : affaiblissement de la formation du capital, ralentissement de l'adoption technologique et reculs du capital humain lorsque la formation et la scolarité sont perturbées (UNICEF et al. (2021)). L'interdépendance compte également : via les transports, les chaînes d'approvisionnement, la mobilité du travail et des anticipations partagées, les effets économiques peuvent franchir les frontières même lorsque les conditions sanitaires diffèrent, de sorte qu'une lecture strictement nationale tend à sous-estimer l'empreinte des chocs (Baldwin and Tomiura (2020)).

Traiter la santé comme une variable économique clarifie ce qu'il faut mesurer et où la politique publique peut agir. Les sections qui suivent s'appuient sur ce principe pour examiner comment le risque sanitaire s'insère dans les décisions économiques et comment les capacités existantes transforment le risque en pertes.

Au niveau macroéconomique, comme indiqué plus haut, la vulnérabilité, saisie par l'exposition, la sensibilité et la capacité d'amortissement, se lit le plus clairement dans le comportement des flux privés transfrontaliers. De l'épidémie d'Ebola en Afrique de l'Ouest à SARS, MERS et, plus récemment, la COVID-19, les épidémies ont apporté des souffrances humaines étendues parallèlement à de profondes perturbations économiques. Ces chocs ont bousculé les chaînes d'approvisionnement mondiales, ralenti les mobilités,

resserré les conditions de financement et remodelé les anticipations des investisseurs, des effets particulièrement marqués dans les économies en développement. Ces régularités soulignent le rôle crucial des flux financiers externes en période de crise et l'importance de comprendre les facteurs qui orientent leur comportement : **l'investissement direct étranger (IDE)** et les **remises migratoires**.

Les flux financiers externes comptent d'autant plus que les contraintes domestiques mordent. Dans de nombreuses économies en développement, la composition du financement externe s'est déplacée depuis les années 1990 des sources publiques vers les flux privés, en particulier l'IDE et les remises, le secteur privé devenant le principal bénéficiaire des entrées. Ce basculement s'est opéré dans un contexte d'épargne intérieure limitée, de marchés de crédit peu profonds et de chocs externes récurrents, rendant ces deux flux à la fois volumineux et pertinents pour l'action publique.

Leur échelle en atteste. Dans les économies en développement, l'IDE et les remises représentent des parts significatives du revenu national ; en Afrique subsaharienne, par exemple, l'IDE a approximativement quadruplé depuis 1990 pour atteindre environ 3,8 % du PIB en 2021, tandis que les remises s'élevaient à près de 2,6 % du PIB (World Bank (2023)). Là où les ressources internes sont rares, ces entrées fournissent du capital et des devises et aident les économies à s'insérer dans les marchés et technologies mondiaux. Mais ces flux peuvent se renverser ; comprendre ce qui les stabilise ou les déstabilise est essentiel.

Compte tenu de leur ampleur et de leur réactivité, cette thèse se concentre sur l'IDE et les remises car, pour de nombreuses économies en développement, ce sont des flux privés importants dont la chronologie réagit particulièrement au risque opérationnel et au partage de risques des ménages. À l'inverse, les flux de portefeuille obéissent surtout aux cycles de liquidité et de politique monétaire mondiaux, et les flux officiels aux calendriers budgétaires, les rendant moins alignés sur les mécanismes étudiés ici.

Deux implications en découlent. Premièrement, ils constituent désormais les flux privés saillants pour de nombreuses économies en développement : suffisamment importants pour peser sur la croissance et la stabilité, et assez sensibles aux variations de risque pour

révéler la transmission des chocs sanitaires via les marchés et les ménages. Deuxièmement, leur complémentarité, l'un captant les décisions d'investissement des multinationales et leurs retombées, l'autre reflétant le partage de risques des ménages — offre une lecture plus riche de la vulnérabilité et de la capacité d'amortissement qu'un seul flux ne le permettrait. D'autres flux officiels (p.ex. l'APD) demeurent importants pour le financement du développement, mais suivent d'autres logiques et horizons d'allocation. Pris ensemble, l'IDE et les remises sont donc d'ampleur conséquente et différemment sensibles aux chocs. Les étudier côte à côte aide à identifier les conditions dans lesquelles le capital privé marque une pause, quand les réseaux familiaux prennent le relais et si une capacité sanitaire plus solide peut atténuer les contractions de l'investissement tout en préservant le coussin des remises.

Comprendre les comportements en contexte risqué suppose d'abord d'esquisser les déterminants de ces flux. Pour l'IDE, la littérature met en avant la stabilité macroéconomique, la qualité institutionnelle et l'infrastructure (Blonigen (2005); Globerman and Shapiro (2002)). Les études sur les remises soulignent leur caractère contracyclique, souvent à la hausse pour soutenir les ménages lors de ralentissements dans les pays d'origine des migrants (Rapoport and Docquier (2006a); Yang (2008)). Lors de chocs sanitaires, ces mécanismes impliquent des ajustements distincts : les entreprises retardent le démarrage et le réinvestissement à mesure que la perturbation et l'incertitude réduisent les rendements attendus, tandis que les migrants intensifient des transferts qui lissent la consommation et soutiennent les entrées de devises. Les étudier simultanément est instructif : cela révèle les conditions dans lesquelles la résilience tient, et celles où elle cède.

Au niveau micro, la vulnérabilité se vit sur les lieux de travail. Les opérations quotidiennes affrontent des tensions de dotation, des rôles mouvants, des horaires volatils et des demandes inégales entre tâches sur site et à distance. Ces conditions pèsent sur la santé mentale et la coordination et rejaillissent sur la productivité, visibles dans l'absence, le présentéisme et le turnover. Là où les organisations maintiennent des rôles clairs, des charges équitables, un encadrement soutenant et une aide accessible, les perturbations sont contenues et le rétablissement plus rapide ; là où ces conditions sont fragiles, les

dommages sont plus importants et persistants.

3.6 Vulnérabilité : définition et opérationnalisation

Pour analyser de manière cohérente les niveaux macro et micro, cette thèse adopte une lentille unique : la *vulnérabilité*. La vulnérabilité n'est pas le choc en soi ; ce sont les conditions qui transforment un choc en perte et façonnent la trajectoire de reprise. Trois dimensions complémentaires structurent l'analyse, *exposition*, *sensibilité*, *capacité d'amortissement*, choisies car elles se mappent directement sur (i) où et quand les chocs frappent, (ii) l'ampleur et la durée des mouvements des résultats clés, et (iii) les capacités qui raccourcissent les perturbations. Ce cadrage maintient la discussion mesurable et comparable entre niveaux.

L'*exposition* saisit où et quand les chocs frappent et qui se trouve sur leur trajectoire. La *sensibilité* renvoie à l'ampleur et à la persistance des mouvements des résultats une fois exposés (p. ex. pauses ou reculs des entrées de capitaux, hausse des remises, dégradation ou amélioration des conditions de travail, variations de la santé mentale). La *capacité d'amortissement* désigne les caractéristiques qui absorbent la tension et en raccourcissent les effets, ressources humaines et infrastructures de santé, préparation institutionnelle, soutiens sociaux.

Trois enseignements de la littérature motivent cette lentille dans le contexte des chocs sanitaires. **Premièrement**, les chocs sanitaires ont souvent une empreinte *régionale* sur le plan économique. Ici, « régional » désigne la *co-mouvance transfrontalière entre pays adjacents*. Parce que les voisins partagent les transports, les chaînes d'approvisionnement, la mobilité du travail, le tourisme et les politiques frontalières, une flambée en un lieu peut déclencher une perturbation économique chez le voisin même lorsque les cas locaux restent faibles. L'exposition dépasse rarement la frontière, et la sensibilité est coproduite.

Deuxièmement, si la capacité de l'État attire l'investissement, le rôle spécifique de la *capacité du système de santé comme stabilisateur économique* est peu exploré. L'impact immédiat n'est qu'une partie de l'histoire ; la *durée* de l'effet et la *trajectoire de reprise*

déterminent si les pertes s'estompent vite ou laissent des traces. Les réponses diffèrent selon le mode de transmission, car les canaux affectant entreprises et administrations (disponibilité de la main-d'œuvre, fiabilité logistique, continuité administrative) diffèrent. Pour opérationnaliser un proxy praticable et pertinent des capacités de première ligne, l'analyse empirique utilise la *densité d'infirmier·ère·s et de sages-femmes (pour 1 000 habitants)* afin de tester si une capacité plus élevée est associée à une contraction initiale plus faible de l'IDE lors des épidémies. Le proxy ne capture pas toute la résilience ; il identifie un levier actionnable et comparable.

Troisièmement, au niveau micro, la littérature est riche sur les risques psychosociaux et les ressources au travail, mais les analyses représentatives au plan national qui organisent les conditions de travail dans la lentille *exposition-sensibilité-amortissement* et quantifient leurs liens avec la santé mentale restent limitées. Étendre la même idée organisatrice des systèmes aux organisations renforce la cohérence de la thèse : la vulnérabilité est façonnée par les systèmes publics autant que par la conception du travail et les pratiques managériales.

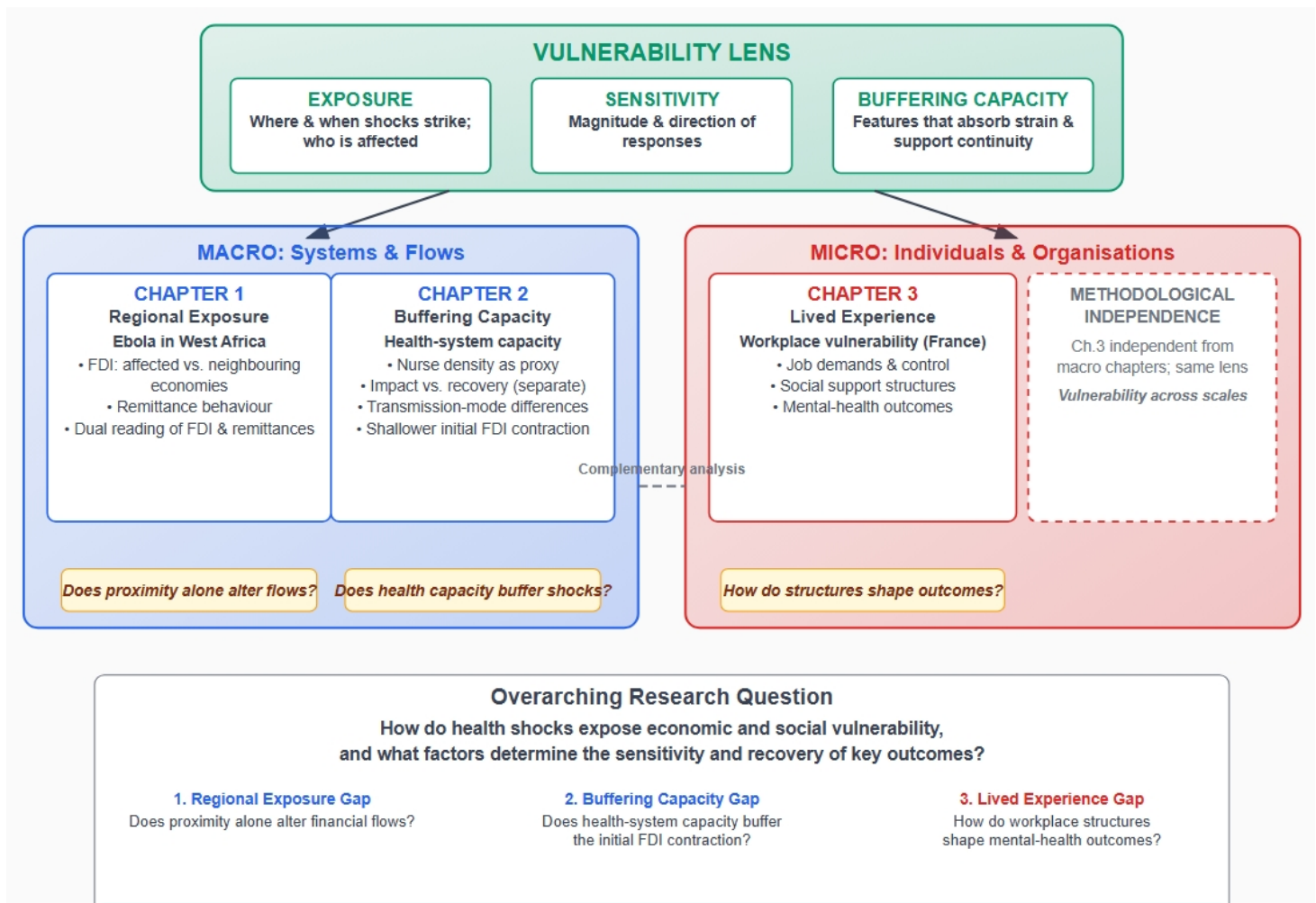
Ces considérations conduisent à la question de recherche générale suivante : **Comment les chocs sanitaires révèlent-ils la vulnérabilité économique et sociale, et quels facteurs déterminent la sensibilité et la reprise des résultats clés ?** Cette question est opérationnalisée en trois axes :

1. **Exposition régionale** : La proximité d'un choc sanitaire, distincte de l'intensité locale de l'épidémie, modifie-t-elle le volume et le comportement des principaux flux financiers (IDE et remises) ?
2. **Capacité d'amortissement** : Une capacité plus forte du système de santé rend-elle la contraction initiale de l'IDE plus faible lors des chocs sanitaires ?
3. **Expérience vécue** : Comment les pressions liées à la santé sont-elles éprouvées au niveau individuel en France, et comment l'organisation du travail façonne-t-elle la santé mentale et sa sensibilité aux conditions adverses ?

Comme le résume la Figure 3.5, la lentille de vulnérabilité couvre les niveaux macro et micro et ancre la stratégie empirique. Cette figure illustre la structure conceptuelle

de la thèse via une lentille multi-niveaux de vulnérabilité. Elle distingue les systèmes et flux macroéconomiques (gauche) et les expériences vécues au niveau micro (droite), tous deux examinés selon trois dimensions communes : exposition, sensibilité et capacité d'amortissement. Les chapitres 1 et 2 analysent les effets macroéconomiques des chocs sanitaires sur l'IDE et les remises, en mettant l'accent sur les effets régionaux et la capacité du système de santé. Le chapitre 3 se tourne vers la vulnérabilité au travail, à partir de données représentatives au niveau national pour la France, afin d'évaluer comment les conditions de travail façonnent la santé mentale. Cette structure visuelle met en évidence la cohérence d'ensemble tout en précisant l'indépendance méthodologique de l'analyse micro.

FIGURE 3.5 : Analyse multi-niveaux de la vulnérabilité aux chocs sanitaires



Note : La figure résume la lentille de vulnérabilité (exposition, sensibilité, capacité d'amortissement) et la manière dont les chapitres s'y rattachent. **Chap. 1** : exposition régionale (Ebola, Afrique de l'Ouest) ; lecture conjointe IDE & remises. **Chap. 2** : impact vs reprise ; test de l'effet amortisseur de la densité d'infirmier · ère · s ; hétérogénéité selon le mode de transmission. **Chap. 3** : structures de travail et santé mentale en France ; indépendance méthodologique.

3.7 Que sait-on ?

3.7.1 L'investissement direct étranger : moteur de croissance et vulnérabilité aux chocs sanitaires

L'investissement direct étranger (IDE) est un investissement de long terme qui établit un intérêt durable et un degré de contrôle dans une entreprise étrangère, à la différence des placements de portefeuille. L'élément distinctif est le contrôle. Pour les pays en développement, l'IDE est souvent recherché comme catalyseur du développement économique. Son

importance tient au « paquet » de bénéfices qu'il apporte, bien au-delà du seul capital.

L'IDE arrive typiquement comme un *bundled good* : technologie, pratiques managériales, formation de la main-d'œuvre et accès aux marchés d'exportation, générant des retombées via la montée en gamme des fournisseurs, le transfert de connaissances et l'insertion dans les chaînes de valeur mondiales (Javorcik (2004); Gereffi (2005); UNCTAD (2023)). Ce paquet aide à moderniser les économies hôtes, à accroître la productivité et à diversifier les structures de production ; en ce sens, l'IDE fonctionne comme un « passeport » vers l'économie mondiale. En conséquence, les gouvernements, surtout dans les économies en développement, courtisent activement l'IDE comme levier de transformation structurelle, de capacité d'exportation et de recettes en devises (UNCTAD (2023); World Bank (2020)).

Ces avantages ne sont pas automatiques. Parce que les projets sont irréversibles et planifiés sur des horizons pluriannuels, l'IDE est très sensible à la prévisibilité des politiques et aux conditions d'exploitation. Les investisseurs réévaluent en permanence les risques politiques et macroéconomiques ; les chocs sanitaires majeurs amplifient l'incertitude et perturbent les chaînes d'approvisionnement et la disponibilité de la main-d'œuvre, augmentant la valeur d'option d'attendre (Yu et al. (2023)).

La littérature empirique a largement étudié les bénéfices multiformes de l'IDE, tout en soulignant qu'ils ne sont pas automatiques et dépendent souvent des capacités d'absorption du pays hôte. Le travail fondateur de Borensztein et al. (1998) a montré que l'IDE constitue un canal majeur de transfert technologique, moteur clé de la croissance, mais met en évidence un effet de seuil : l'impact positif sur la croissance ne se matérialise que si le pays récipiendaire dispose d'un stock suffisant de capital humain pour comprendre, mettre en œuvre et adapter les technologies importées. Les bénéfices de l'IDE dépendent donc de la synergie entre investissement étranger et préparation domestique.

Les crises sanitaires sont un choc externe particulièrement puissant. La littérature sur le lien entre chocs sanitaires et IDE s'est étoffée, notamment après SARS et la COVID-19. Les études mettent en évidence une forte incertitude économique et des perturbations des facteurs d'attractivité de l'IDE. Par exemple, Lee and McKibbin (2004) estiment, pour

l'épisode SARS de 2003, des pertes à court terme importantes d'activité et de flux d'investissement dans les économies touchées, dues à la baisse de productivité, aux ruptures d'approvisionnement et à l'érosion de la confiance des investisseurs. Ils modélisent comment le choc réduit la valeur présente des rendements attendus, rendant les lieux d'accueil moins attractifs.

La pandémie de COVID-19 a servi de catalyseur à une nouvelle vague d'études empiriques qui ont confirmé et approfondi ces résultats. Le *World Investment Report 2020* UNCTAD (2020a) a documenté de manière détaillée la chute sans précédent de 40 % des flux mondiaux d'IDE, l'attribuant à des perturbations opérationnelles, à la récession macroéconomique et à une attitude généralisée d'« attentisme » de la part des investisseurs. En outre, la recherche post-COVID a commencé à explorer un changement de paradigme dans la stratégie des investisseurs. Le *World Investment Report 2024* UNCTAD (2024) souligne que l'IDE mondial a stagné autour de 1,3 billion de dollars US en 2023, avec une baisse d'environ 7 % des flux vers les pays en développement, due principalement à la fragmentation des échanges, au risque réglementaire et aux vulnérabilités des chaînes d'approvisionnement. Robinson and Dolfma (2025) distingue en outre l'*IDE de poussée proactive*, orienté vers la résilience, et l'*IDE d'échappement*, en mettant l'accent sur le rôle de la qualité institutionnelle dans les choix des investisseurs. De même, Zhao et al. (2024) montre que les reculs d'IDE induits par les pandémies sont modulés par la capacité des infrastructures, ce qui renforce l'importance de la résilience domestique. Parallèlement, des études récentes sur la stratégie « China Plus One » Lund et al. (2020) confirment que les multinationales diversifient de plus en plus leurs chaînes d'approvisionnement entre régions, les économies d'Asie du Sud-Est telles que le Vietnam, l'Inde et la Thaïlande émergeant comme alternatives majeures. Cet ensemble de travaux confirme que la capacité d'un pays à gérer un choc sanitaire constitue un signal critique de sa qualité institutionnelle et un déterminant clé de son attractivité future pour l'investissement étranger.

3.7.2 Remises migratoires : un filet de résilience et leur vulnérabilité aux chocs sanitaires

À la différence de l'IDE, de nature corporative et de grande échelle, les remises migratoires incarnent un flux de capital profondément humain par son échelle et ses mobiles. Définies comme les revenus que les migrants renvoient à leurs familles et communautés dans les pays d'origine, les remises sont un pilier de nombreuses économies en développement. Ces transferts de personne à personne sont généralement motivés par l'altruisme, l'obligation familiale et le souhait de soutenir la consommation, l'éducation et de petits investissements au pays. Leur ampleur est considérable : les remises dépassent régulièrement l'aide publique au développement (APD) et, dans de nombreux pays, rivalisent avec l'IDE comme principale source de financement externe (World Bank (2023)).

Leurs déterminants diffèrent de ceux des autres flux de capitaux. Elles sont moins influencées par les taux de rendement macroéconomiques que par un ensemble de facteurs microéconomiques. Le volume des remises dépend d'abord de la taille et de la réussite économique de la diaspora ; une population migrante plus large employée dans des pays à haut revenu génère naturellement des flux plus importants (Ratha (2003)). Mais la décision d'envoyer des fonds relève aussi de l'altruisme et de l'assurance familiale. Yang and Choi (2007) montrent leur nature contracyclique : elles augmentent souvent en réponse directe aux difficultés économiques, aux catastrophes naturelles ou aux crises personnelles dans le pays d'origine, jouant le rôle d'un filet de sécurité privé.

Au-delà de ces motivations, des facteurs pratiques et macroéconomiques influencent le *timing* et le canal d'envoi. L'efficacité et le coût des services de transfert sont déterminants : des frais élevés découragent les canaux formels et poussent vers des circuits informels moins sûrs (World Bank (2023)). Les conditions économiques dans les pays d'accueil et d'origine comptent également : un affaiblissement de la monnaie domestique peut inciter à envoyer davantage, la valeur locale de la remise augmentant.

La littérature documente de multiples bénéfices à l'échelle des ménages et des pays. Au niveau micro, les remises réduisent la pauvreté et le travail des enfants, et augmentent les dépenses de santé et d'éducation des ménages bénéficiaires (Adams and Page (2005)). Au

niveau macro, elles fournissent des devises stables, aident à financer les déficits courants et renforcent la résilience face aux chocs en soutenant la demande locale même en période de repli (Ratha (2003)). Toutefois, leur stabilité n'est pas garantie : étant liées à l'emploi et au bien-être des travailleurs migrants, elles sont vulnérables aux chocs économiques et sanitaires, de manière parfois complexe et paradoxale.

3.7.3 Risques psychosociaux au travail : comprendre l'environnement professionnel contemporain

Les risques psychosociaux constituent une dimension croissante de la santé et sécurité au travail, englobant des aspects d'organisation, de relations sociales et de conception des emplois susceptibles d'altérer le bien-être psychologique et physique. Selon l'Organisation mondiale de la santé, ils découlent de déficiences dans la conception, l'organisation et la gestion du travail ainsi que d'un contexte social défavorable, susceptibles d'entraîner des conséquences négatives (Leka and Jain (2010)). À la différence des dangers physiques, ils opèrent par des mécanismes psychologiques et sociaux, d'où une évaluation complexe et des réponses exigeantes.

La transition des économies industrielles vers des économies de la connaissance a transformé la nature des risques : si les risques physiques persistent, les exigences cognitives et émotionnelles sont devenues des sources majeures de stress. La numérisation a encore brouillé les frontières vie professionnelle/vie privée et installé la connectivité permanente comme nouvelle norme. Cette évolution appelle une approche globale de la prévention reconnaissant l'importance de la santé psychique aux côtés de la protection physique.

Plusieurs cadres fondateurs ont structuré la compréhension de ces risques. Le *modèle Demande-Contrôle* de Karasek (1979) a établi l'interaction cruciale entre exigences psychologiques et latitude décisionnelle, identifiant la combinaison « fortes exigences / faible contrôle » comme particulièrement délétère. Le *modèle Effort-Récompense* de Siegrist (1996) y ajoute la réciprocité : une récompense insuffisante des efforts constitue une autre voie majeure vers le stress professionnel.

Manifestations et conséquences

Les risques psychosociaux se manifestent par des dimensions interdépendantes : charge excessive, rôles conflictuels, autonomie limitée, soutien insuffisant, violences au travail, injustice organisationnelle. Ces facteurs combinés créent des schémas complexes de stress susceptibles d'évoluer dans le temps et selon les contextes.

Leurs effets sur la santé sont bien établis. Des méta-analyses montrent que le stress chronique lié à ces risques accroît de 40–50 % environ la probabilité de maladie coronarienne, attestant d'effets somatiques au-delà des impacts psychiques (Kivimäki et al. (2012)). Les issues en santé mentale sont tout aussi significatives : dépression, troubles anxieux, épuisement professionnel.

Implications économiques des risques psychosociaux

La charge économique déborde largement l'entreprise pour peser sur l'économie et la société. Les coûts proviennent d'une productivité réduite, de dépenses de santé accrues et de transferts sociaux. Hassard et al. (2018) estiment, pour de nombreux pays industrialisés, des pertes équivalant à 3–4 % du PIB. Elles se matérialisent par des voies directes (soins, médicaments) et indirectes (présentéisme, absentéisme). L'impact est particulièrement prononcé dans les économies intensives en savoir.

Au-delà de ces coûts mesurables, les risques psychosociaux ont des implications sociétales qui affectent la soutenabilité de long terme : sorties précoces du marché du travail (invalidité, retraites anticipées) qui réduisent la participation et pèsent sur les systèmes de protection sociale (OECD (2021) ; Eurofound (2017)). Le stress professionnel peut aussi affecter la stabilité économique des ménages et les trajectoires éducatives des enfants, avec des effets de long terme sur le capital humain (Marmot et al. (2020) ; Schaller and Stevens (2015)). Les analyses coût-bénéfice montrent qu'investir dans la prévention, une meilleure conception des emplois, un soutien managérial, procure des rendements substantiels via une productivité accrue, un turnover réduit et des dépenses de santé moindres (Hamberg-van Reenen et al. (2012) ; McDaid et al. (2019)). La gestion des risques psychosociaux n'est donc pas seulement un impératif éthique ; c'est une nécessité économique.

3.8 Structure de la thèse

La thèse se déploie en trois chapitres, en allant des effets macro *régionaux* (*transfrontaliers, pays adjacents*) vers un panel multi-régions mondial, puis vers des résultats micro, au sein d'une même lentille de vulnérabilité.

Chap. 1 : L'ombre d'Ebola sur les économies africaines, l'IDE et les remises

Ce chapitre traite la crise d'Ebola en Afrique de l'Ouest comme un événement économique *régional* (*transfrontalier, pays adjacents*), et non comme un choc propre à un pays. Il examine comment deux flux externes clés, l'IDE et les remises, ont réagi dans les pays directement touchés et chez leurs voisins. Un panel pays-année est construit pour 28 économies africaines, combinant données macro (WDI) et informations épidémiologiques (OMS, CDC). Une mesure d'exposition sur-mesure identifie l'épicentre et code les voisins proches pour refléter les chaînes d'approvisionnement partagées, le transport, la mobilité du travail et le tourisme. Deux stratégies complémentaires sont utilisées. D'abord, un cadre de projections locales (*local projection*) retrace les réponses de court à moyen terme de l'IDE et des remises autour de l'épisode, de sorte que le creux initial et le retour vers la tendance soient visibles. Ensuite, une spécification GMM en système sert de contrôle de robustesse pour traiter l'endogénéité et valider les relations de plus long terme. Les résultats montrent une baisse marquée de l'IDE dans les économies directement touchées et, dans une moindre mesure mais clairement, chez les voisins, cohérente avec une comouvance régionale quand les contraintes d'exploitation sont partagées. Les remises se comportent différemment : dans les pays affectés, elles augmentent ou restent stables, reflétant le partage de risques des ménages et le rôle stabilisateur du soutien des migrants. Pour les voisins, les résultats ne signalent pas de variation. La lecture conjointe des deux flux aiguise l'interprétation : l'investissement est enclin au report en contexte d'incertitude, tandis que les remises jouent souvent un rôle de coussin. Ces régularités résistent à des vérifications qui modifient le calendrier d'exposition, re-pondèrent l'échantillon et excluent les grands bénéficiaires. Le chapitre établit que l'« exposition des voisins » est

mesurable et pertinente pour l'action publique, et que l'analyse conjointe IDE–remises révèle à la fois résilience sur une marge et repli sur une autre.

Chap. 2 : La santé publique comme amortisseur de l'IDE : le rôle des services de santé

Ce chapitre élargit la focale à plusieurs épidémies et pose deux questions liées : quelle est la *taille de l'impact* d'une flambée sur l'IDE ? Et à quoi ressemble la *trajectoire de retour* ? L'échantillon couvre 98 pays en Afrique, Asie, Amérique latine et Caraïbes, Moyen-Orient et Afrique du Nord ; les résultats sont présentés pour l'ensemble, avec des tests de robustesse par régions du monde. L'analyse porte sur 20 flambées majeures entre 2000 et 2022. Le calendrier et la typologie des maladies proviennent de Torres Munguía et al. (2022), qui harmonise les *WHO Disease Outbreak News* avec le *WHO Coronavirus Dashboard* ; les contrôles macro viennent des *World Development Indicators*. Les informations datées sont reliées aux entrées d'IDE et à leurs déterminants usuels (croissance, ouverture, stabilité politique), et complétées par un proxy praticable des capacités de première ligne : la densité d'infirmier·ère·s et de sages-femmes, observée sur la même échelle. Un modèle à effets fixes bidimensionnels (pays et années) estime les variations moyennes de l'IDE les années d'épidémie, en contrôlant les fondamentaux macroéconomiques. Des projections locales tracent ensuite l'évolution de l'IDE dans les années suivantes, permettant des réponses dynamiques différenciées selon le mode de transmission (p. ex. contact direct, zoonoses). Pour évaluer l'amortissement, l'exposition épidémique est croisée avec la densité d'infirmier·ère·s dans le cadre à effets fixes ; le test porte explicitement sur la profondeur du creux initial. Trois résultats ressortent. Premièrement, en moyenne, l'IDE recule à l'impact quand le risque sanitaire augmente, mais la *reprise* varie selon les contextes : certains cas reviennent vers la tendance en quelques années, d'autres restent dans un creux prolongé. Deuxièmement, les réponses diffèrent par mode de transmission selon des canaux plausibles affectant entreprises et administrations (disponibilité du personnel, fiabilité logistique, continuité administrative). Troisièmement, les pays avec une densité plus élevée d'infirmier·ère·s/sages-femmes subissent des *effets d'impact plus faibles* sur l'IDE pendant les épidémies, en particulier pour les maladies à forte létalité ou à contacts intensifs. L'in-

interprétation est claire : une capacité crédible de première ligne agit comme *amortisseur économique* sur la marge la plus visible pour les investisseurs, la taille de la perturbation initiale.

Chap. 3 : Facteurs de risque psychosociaux, ressources et santé mentale au travail

Ce chapitre se tourne vers le niveau micro et documente la vulnérabilité vécue au travail. Il examine comment les conditions psychosociales, exigences, contrôle, soutien, clarté des rôles, insécurité d'emploi, sont associées à la santé mentale des travailleurs en France. L'analyse utilise SUMER 2017 (Suivi médical des expositions aux risques professionnels), enquête représentative et administrée par des médecins ($n = 20,605$; avril 2016–septembre 2017) couvrant les salariés des régimes généraux et agricole, hôpitaux publics, fonctions publiques d'État/territoriales et grandes entreprises publiques (près de 25 millions de travailleurs). Elle intègre des instruments validés (p. ex. PHQ-9 et Karasek) pour mesurer santé mentale et expositions psychosociales. Les issues incluent symptômes dépressifs, fatigue, difficultés attentionnelles et démotivation. L'analyse n'est pas attachée à une flambée particulière : elle documente les risques et ressources du travail pour eux-mêmes. Des échelles validées ou des indices composites mesurent les risques et les ressources ; des modèles logit estiment les associations, ajustés pour la démographie, le secteur et le type de contrat. Une modélisation par équations structurelles complète l'approche en traitant le bien-être psychique comme construit latent et en cartographiant des voies indirectes à travers les conditions de travail. Deux régularités fortes émergent : (1) les combinaisons « fortes exigences / faible contrôle / faible soutien » sont associées à des issues nettement plus défavorables ; (2) les ressources, autonomie, clarté des rôles, encadrement soutenant, sont protectrices et semblent atténuer l'association entre fortes exigences et mauvaises issues. L'exposition est inégale : les femmes et les travailleurs de la santé, du social et du service public font face à des risques plus élevés et montrent une plus grande vulnérabilité à l'épuisement, la fatigue et la détresse. Les implications économiques sont claires : une santé mentale dégradée s'accompagne d'absentéisme, de présentéisme et de désengagement plus élevés, coûts supportés par les travailleurs, les employeurs et les finances publiques.

3.9 La valeur ajoutée de cette thèse

Cette thèse propose une voie claire pour comprendre comment les chocs sanitaires affectent économies et sociétés en mobilisant une seule lentille, *la vulnérabilité*, appliquée de manière cohérente aux niveaux macro et micro. Sa valeur tient à la transformation d'une idée familière en un cadre opérationnel utilisable dans divers contextes, à la mise en regard d'évidences comparables entre pays et événements, et à l'identification de leviers concrets à la disposition des gouvernements et des organisations. Plutôt que de traiter l'IDE, les remises et les conditions de travail comme des objets séparés, la thèse les lit avec un vocabulaire et une logique communs. Ce faisant, elle déplace le débat des appels génériques à la « résilience » vers des affirmations spécifiques et testables : qui est exposé au-delà des frontières, quelle est l'ampleur et la durée de la perturbation, et quels amortisseurs raccourcissent le retour à la normale.

Sur le plan conceptuel, la thèse clarifie ce que l'on entend par *vulnérabilité* dans l'économie de la santé. La vulnérabilité n'est pas le choc lui-même ; ce sont les conditions qui transforment un choc en perte. La lentille est opérationnelle et mesurable : (i) qui est placé sur la trajectoire du risque par les schémas d'échanges, de transport et de travail ; (ii) avec quelle intensité et quelle persistance les principaux résultats varient lorsque le risque augmente ; et (iii) quelles capacités, dans les systèmes publics et les organisations, limitent les dommages et accélèrent le rétablissement. Utiliser la même lentille aux niveaux macro et micro referme un fossé fréquent dans la littérature, qui sépare souvent les analyses agrégées des flux de capitaux des études de cas sur les ménages et les lieux de travail. Le cadre n'est pas une nouvelle théorie ; sa contribution est pratique : un petit ensemble de quantités estimables de manière transparente, comparables entre pays et reliées à des instruments de politique existants.

Dans les littératures de la finance internationale et du développement, une première contribution consiste à placer au premier plan la *co-mouvance régionale*, ici entre pays voisins. Une grande partie des travaux sur l'IDE en contexte risqué se concentre uniquement sur le pays touché par un choc sanitaire et relègue les voisins à l'arrière-plan,

alors que chaînes d'approvisionnement, marchés du travail, transport et tourisme lient étroitement les économies proches. Ainsi, même avec peu de cas locaux, un choc chez le voisin peut reprogrammer les plans et ralentir l'activité. L'approche proposée rend cette « exposition des voisins » mesurable ; la proximité elle-même, et pas seulement la présence de l'agent pathogène, peut être source de risque économique. Elle trace aussi une ligne claire entre *contagion épidémiologique* et *co-occurrence économique* : des pays peuvent évoluer de concert parce qu'ils font face aux mêmes contraintes et anticipations, même si la maladie ne franchit pas la frontière. Une seconde contribution, liée, est de lire deux flux transfrontaliers ensemble parce qu'ils obéissent à des moteurs différents et s'ajustent sur des marges distinctes. L'IDE est guidé par le profit et planifié sur des horizons pluriannuels ; les remises sont des transferts de ménages façonnés par le partage des risques et les liens sociaux. Pris isolément, chacun ne raconte qu'une partie de l'histoire de la résilience ; mis en regard, ils offrent une image plus nette de ce qui tient et de ce qui cède.

Une troisième contribution est de traiter la *dynamique* comme un objet central, non un détail technique. Nombre d'études empiriques rapportent l'*impact* d'un choc ; bien moins suivent la *reprise*. Or l'effacement ou la persistance des pertes dépend de la durée et de la forme : profondeur et longueur du creux, existence d'un rattrapage, vitesse de retour vers la tendance. L'analyse met donc la reprise sur le même plan que l'impact et demande non seulement « quelle est l'ampleur du choc ? », mais aussi « à quoi ressemble la trajectoire de retour, et pourquoi diffère-t-elle selon les contextes ? ». Dans le même esprit, la thèse intègre le système de santé à la discussion sur le climat d'investissement. Si la littérature relie l'investissement à la capacité de l'État et à la prévisibilité des règles, le rôle de la capacité sanitaire est généralement marginal. Ici, la capacité de première ligne est examinée comme *amortisseur économique* : là où les services essentiels sont crédibles, la perturbation initiale de l'investissement est moindre et les anticipations sont moins déstabilisées lors des épidémies, traitant une part de la dépense de santé comme infrastructure de continuité.

Enfin, la valeur ajoutée est microéconomique autant que macroéconomique. Les travaux en santé au travail et en économie du travail montrent de façon consistante que

les risques psychosociaux, exigences élevées avec faible latitude, faible soutien, insécurité d'emploi, sont associés à une moins bonne santé mentale, tandis que des ressources telles que l'autonomie, la clarté des rôles et un encadrement soutenant amortissent les tensions. En mobilisant la même lentille d'analyse à plusieurs niveaux et des données représentatives au plan national, l'analyse identifie les caractéristiques du travail le plus souvent associées à de moins bons résultats et celles qui semblent les atténuer. Conceptuellement, cela fournit des micro-fondations à un puzzle courant : les indicateurs agrégés peuvent « se redresser » alors que la situation vécue au travail ne s'améliore pas si l'organisation du travail reste fragile.

