

Development Finance for Food and Nutrition Security: Delving Deeper into the Nexus

George MAVROTAS



GEORGE MAVROTAS, Visiting Full Professor, Institute of Development Policy, University of Antwerp, Belgium; Senior Fellow FERDI, Clermont-Ferrand, France; Associate Research Fellow, Centre for Regional Integration Studies of the United Nations University (UNU-CRIS), Bruges, Belgium; Associate Professorial Fellow, International Economics and Development Laboratory (IEDL), Department of Economics, University of Athens, Greece.

Contact: George.Mavrotas@uantwerpen.be

Abstract

This paper examines the evolving relationship between FNS and development finance in the context of deteriorating global FNS trends and the approaching 2030 Agenda deadline. Against a backdrop of widening financing gaps and persistent food insecurity, the paper provides a comprehensive overview of the FNS–development finance nexus, while identifying key research gaps and policy challenges. It focuses on major sources of development finance, namely remittances, foreign direct investment, official development assistance, and food aid, and synthesises insights from the existing empirical literature. ... / ...

.../... A central contribution of the paper is to highlight the importance of development finance heterogeneity in shaping FNS outcomes. Different types of financial flows exert distinct effects, which vary across contexts and institutional environments. In this regard, governance quality emerges as a critical mediating factor that influences both the direction and magnitude of these effects. Evidence suggests that remittances have a positive impact on FNS, with stronger effects in countries characterised by higher governance quality. Similarly, the impact of FDI on FNS is found to be conditional on institutional strength, while food aid outcomes depend significantly on programme design, context, and governance conditions. The paper also underscores that the FNS–development finance nexus remains rather underexplored, particularly in vulnerable regions such as SSA, where food insecurity persists despite decades of development interventions. It further situates these findings within broader debates on development finance, including the role of public versus private actors, structural transformation, and the global financial architecture. Overall, the analysis suggests that integrating development finance heterogeneity with governance quality considerations can provide deeper insights into FNS outcomes and support the design of more effective, targeted policy interventions. The paper concludes by highlighting the need for renewed policy attention to both financing mechanisms and institutional quality in addressing global food security challenges in the coming years.

Keywords: food and nutrition security, development finance, SDG-2, 2030 Agenda, governance quality.

JEL Codes: Q18, F35, O10, O43.

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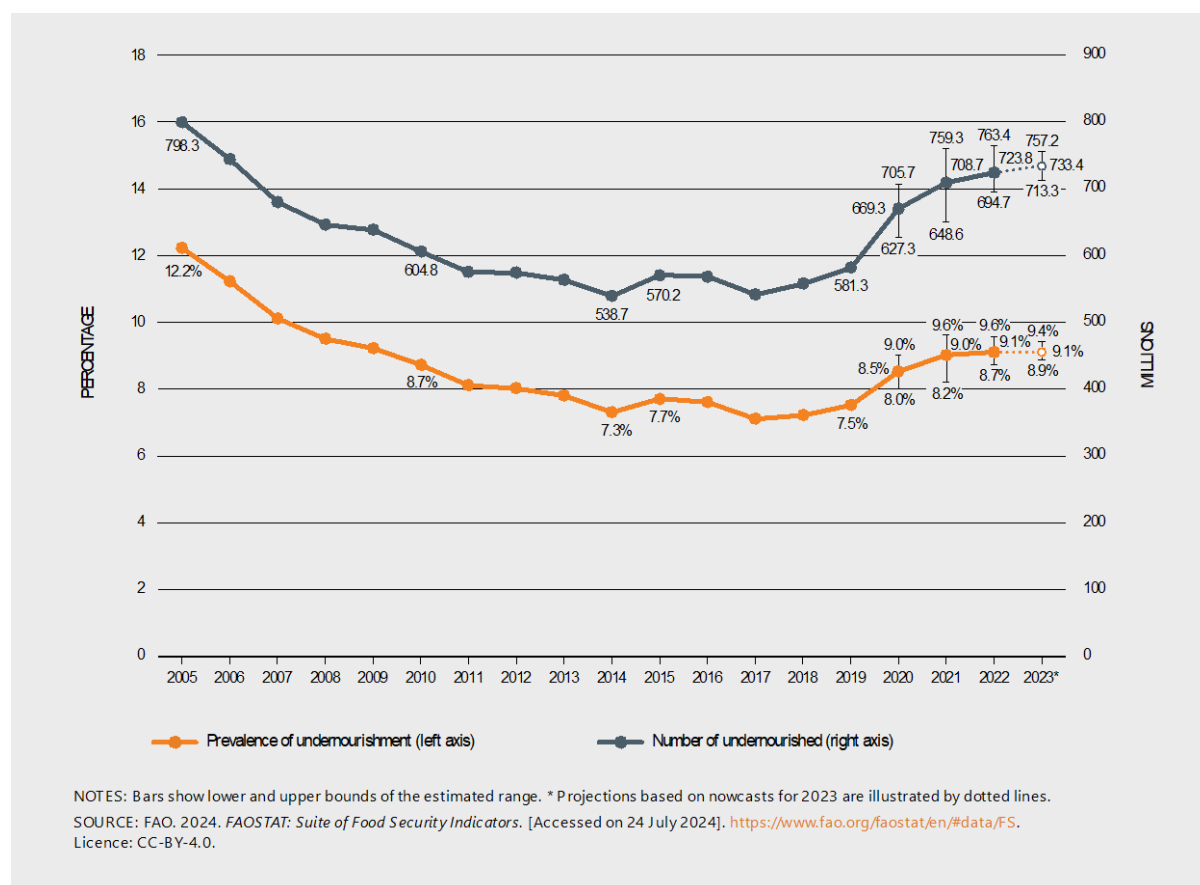
1. INTRODUCTION: FOOD SECURITY AND NUTRITION AS A KEY CHALLENGE IN A TURBULENT WORLD

The current global landscape is characterized by heightened volatility and uncertainty, with significant repercussions for development finance. A combination of factors, including economic shocks, the enduring effects of the COVID-19 pandemic, escalating geopolitical tensions, and shifting political priorities, has exerted considerable strain on the financing for development architecture underpinning global development efforts. Within this context, the recent Fourth Financing for Development Conference, convened in Seville in July 2025, constituted a critical initiative aimed at revitalizing political commitment to reversing the recent deterioration in development financing, particularly in relation to the Sustainable Development Goals (SDGs) and the broader 2030 Agenda. Notwithstanding the ambitious expectations associated with the Seville Conference, its outcomes underscore the imperative for a more pragmatic and results-oriented approach going forward. This need is further accentuated by recent and unprecedented developments in Official Development Assistance (ODA), including the dismantling of USAID and the reorientation of development policy under the current Trump Administration (Klingebiel *et al.*, 2025; Mavrotas, 2025).

One of the areas expected to be affected most is food security and nutrition (FNS) at the global level and in particular in Sub-Saharan Africa (SSA). The United Nations, in its *Handbook on Human Security* (UN, 2016), clearly identifies food security, encompassing hunger, famine, and sudden surges in food prices, as one of the central domains of human security, alongside economic, health, environmental, community, political, and personal security. The interconnection between human security and food security was previously underscored in the UN General Assembly Resolution 66/290 (2012), which emphasized that ensuring access to adequate, safe, and nutritious food is foundational to sustaining human dignity and well-being. Within the framework of the 2030 Agenda for Sustainable Development, SDG 2.1 articulates the goal of ending hunger for all people, while SDG 2.2 expands this ambition to include the elimination of all forms of malnutrition, including chronic undernourishment (Rosa, 2017). However, despite these normative commitments, global trends in recent years have moved in the opposite direction.

In particular, there has been a significant increase in the number of food-insecure and malnourished people worldwide, with SSA experiencing the most pronounced deterioration. According to *The State of Food Security and Nutrition in the World 2024* (FAO *et al.*, 2024), the prevalence of undernourishment has remained stubbornly high, showing little improvement over the past three years following a sharp increase during the COVID-19 pandemic. Specifically, it is estimated that between 713 and 757 million people faced hunger in 2023—equivalent to 1 in 11 people globally, and 1 in 5 in Africa (FAO *et al.*, 2024; see also **Figure 1**). These findings are consistent with evidence from a growing number of country studies that highlight the persistence of food insecurity and malnutrition across SSA (e.g. Fadare *et al.*, 2019a, 2019b; Feyisa *et al.*, 2025, Amare *et al.*, 2021).

Figure 1: The sharp increase of global hunger from 2019 to 2021 persisted at the same level to 2023.

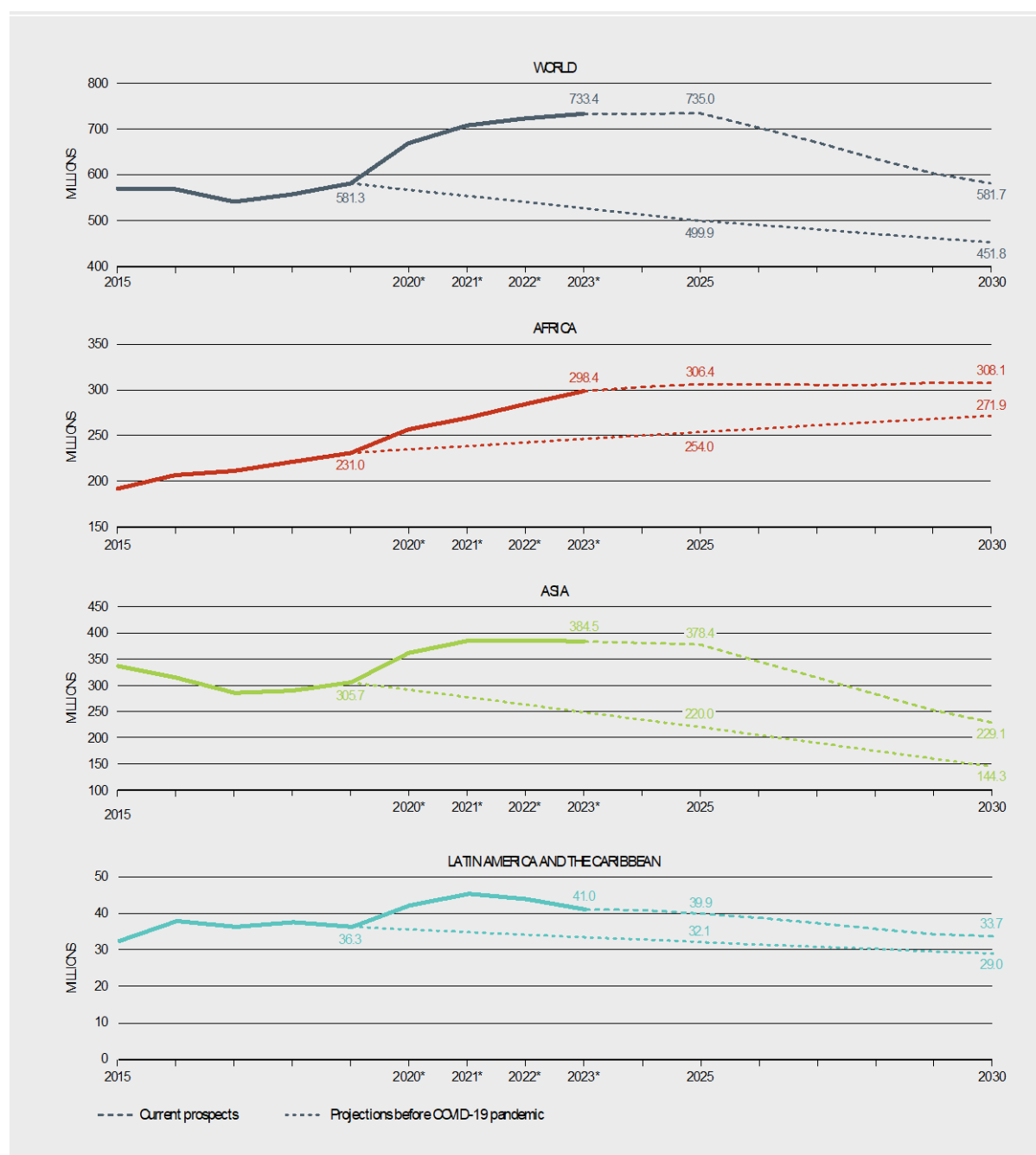


Source: FAO *et al.* (2024), The state of food security and nutrition in the world report 2024

Structural drivers such as non-inclusive economic growth and widening income disparities further exacerbate food insecurity and nutritional inequalities across the region. As Gordon (2022) notes, growth in SSA has often failed to translate into improved food access or social protection for vulnerable populations. Compounding this, poor governance, weak labour protections, and fiscal instability frequently result in months of unpaid salary arrears or inadequate minimum wages, directly undermining household purchasing power and food security (Reeves *et al.*, 2021).

As the Food Security and Nutrition 2024 report argues, “the lack of improvement in food security and the uneven progress in the economic access to healthy diets cast a shadow over the possibility of achieving Zero Hunger in the world, six years away from the 2030 deadline” (p. xvi). The same report also reports projections according to which 582 million people will be chronically undernourished at the end of the decade with more than half of them in Africa (see also **Figure 2**).

Figure 2: Projected numbers of undernourished people-clear indication that the world is far off track to achieve zero hunger Goal 2 by 2030



Source: FAO *et al.* (2024), The state of food security and nutrition in the world report 2024

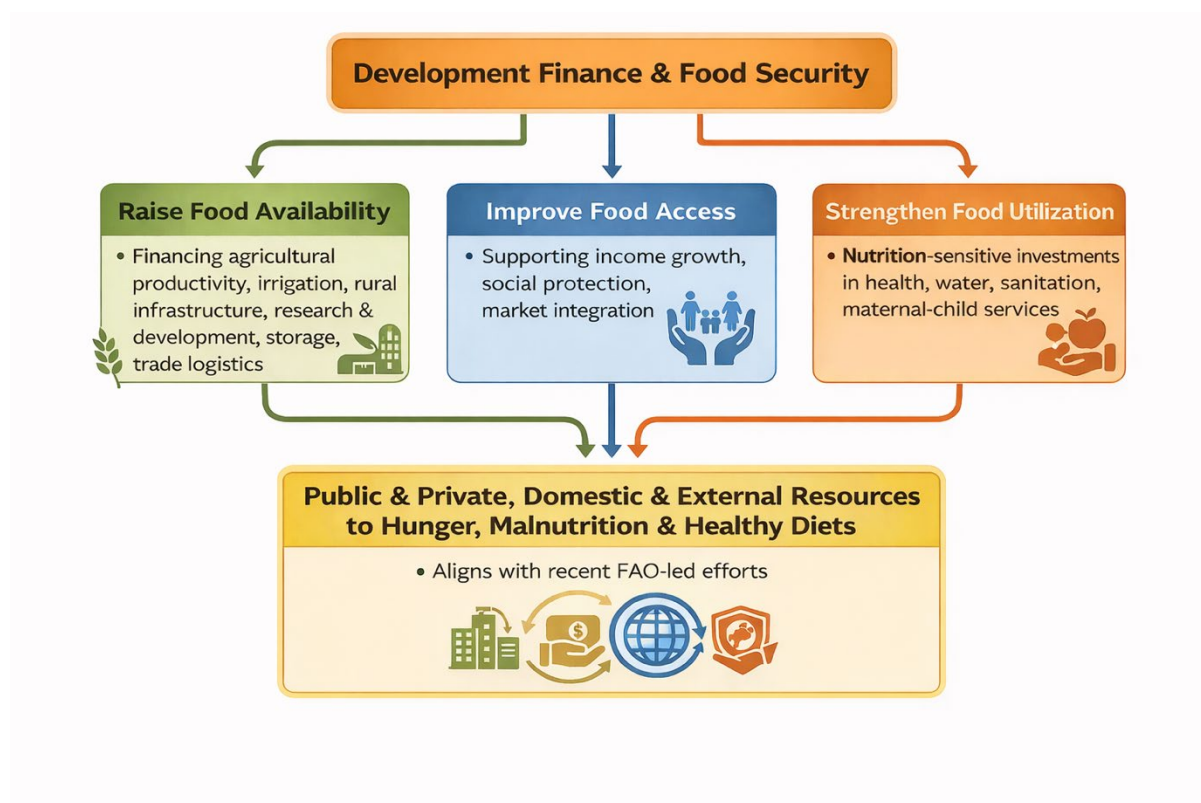
The already adverse outlook for FNS is anticipated to deteriorate further in the post-Seville financing for development context, particularly in light of concurrent global shocks. Among these, the ongoing US–Israel–Iran conflict is expected to have profound and far-reaching implications for the global economy. Recent projections by the World Food Programme (WFP) underscore the severity of these risks, pointing to the potential emergence of a new wave of food insecurity at the global level should the conflict persist. Specifically, in its estimates released on 17 March 2026, the WFP projects that an additional 45 million people could fall into acute food insecurity or worse (Integrated Food Security Phase Classification—IPC Phase

3 or above) if the conflict continues beyond mid-year and if oil prices remain above USD 100 per barrel. This projected increase would compound an already critical situation, adding to the approximately 318 million people worldwide who are currently experiencing food insecurity (WFP announcement, 17 March 2026, Rome).

A relatively underexplored dimension in the FNS literature for many years is the complex nexus between development finance, broadly defined, and FNS, particularly in more vulnerable regions such as SSA. However, in recent years the nexus between development finance and FNS has become a central concern in contemporary development policy because global hunger and food insecurity and malnutrition have remained persistently high despite decades of improvements in foreign aid, agricultural modernization, and various multilateral interventions in this area.

At the conceptual level, development finance may affect FNS through several channels: It can raise food availability by financing agricultural productivity, irrigation, rural infrastructure, research and development, storage, and trade logistics. But it can also improve food access by supporting income growth, social protection, and market integration. Furthermore, it can strengthen food utilization through nutrition-sensitive investments in health, water, sanitation, and maternal-child services, along with enhanced stability by building food systems resilience against climate shocks, conflict, and price volatility. This broader framing aligns also with recent UN-led efforts to define FNS financing as a mix of public and private, domestic and external resources directed toward hunger, malnutrition, and healthy diets (FAO *et al.* 2024) – see also **Figure 3** below.

Figure 3: Channels through which development finance may affect FNS



Source: Author based on literature review.

While considerable attention has been paid to agricultural productivity, dietary quality, and food system resilience, less focus has been given to how different forms of external finance—aid, FDI, remittances, and concessional loans, interact with food security outcomes across diverse governance contexts. Institutional quality and governance play a central role in shaping this nexus (Dhahri & Omri, 2020; Ogunniyi *et al.*, 2020). Weak institutions and poor governance can diminish the effectiveness of development finance by limiting its reach, reducing absorption capacity, and undermining its long-term impact on food systems and household-level nutrition. Conversely, stronger institutions can enhance the allocation, targeting, and oversight of financial flows, increasing their developmental effectiveness in improving food access and nutrition outcomes.

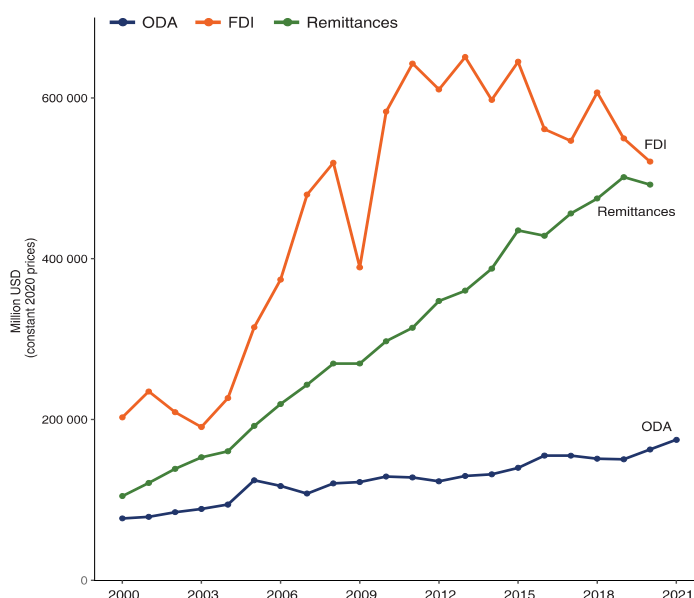
This issue has become especially salient in light of recent global disruptions. Many SSA countries remain highly dependent on imported staple crops and agricultural inputs, rendering them particularly vulnerable to external shocks in global food supply chains. The COVID-19 pandemic, the Russia–Ukraine war, which began in February 2022, and the tragic events in Gaza last year have all contributed to major disruptions in global commodity markets and input supply chains, raising food prices and undermining food security across low-income, import-dependent nations (IFPRI, 2022; Kaiser, 2022).

In light of the above, this paper aims to provide a comprehensive overview of the linkages underpinning the FNS–development finance nexus, while also identifying key research gaps and policy challenges in this important field. The remainder of the paper is structured as follows. Section 2 examines the relationship between FNS and remittances, an increasingly significant source of external finance in recent years. Section 3 explores the nexus between FDI and FNS. Section 4 focuses on the role of ODA, with particular emphasis on food aid. Section 5 analyses the more complex relationship between development finance heterogeneity and FNS, including the role of governance quality in shaping final outcomes. The final section concludes the paper and reflects on the remaining and daunting policy challenges in this crucial area.

2. REMITTANCES AND FOOD SECURITY: WHAT WE KNOW SO FAR

Remittances have received increased attention in recent years in view of their growing importance as compared to other capital flows to developing countries as **Figure 4** below seems to suggest.

Figure 4: ODA, FDI and Remittances for all developing countries, 2000-21



Source: OECD (2023).

As **Figure 4** shows remittances have surpassed in recent years ODA and are quite close in terms of volume to FDI flows, a clear departure from trends in earlier years. At the same time, the effects of remittances on household livelihoods, food security, and economic growth have been extensively examined in the literature, although the findings remain rather inconclusive. Various studies, including Adams and Page (2005), Banga and Sahu (2010), Williams *et al.* (2013), and Lim and Hem (2017), demonstrate that remittances play a significant role in improving the economic well-being of households in low-income economies. These positive effects are particularly pronounced in rural and resource-constrained communities within developing countries (Adams and Page, 2005; Thieme and Wyss, 2005). Furthermore, Ratha (2003) suggests that remittances can stimulate economic growth through an investment multiplier effect. At the household level, Babatunde and Martinetti (2010) find that remittances have a positive and statistically significant effect on calorie intake in Kwara State, Nigeria; however, they report no significant improvement in dietary quality, micronutrient consumption, or child nutritional status. In contrast, other studies, including Ahamada and Coulibaly (2013), Zuniga (2011), and Chami *et al.* (2003), argue that remittances may contribute to inflationary pressures on food prices and reduce labour market participation. Such dynamics may ultimately undermine food affordability, particularly for poorer households and those that do not receive remittances.

Needless to say, the unprecedented COVID-19 pandemic had a major impact on various fronts including remittances, particularly in some countries and regions, thus resulting in potential negative economic and social effects. Van den Bosch and Mavrotas (2022, 2023) examine the influence of COVID-19 on remittances and provide insights into the potential developmental

effects this could have in recipient countries. Preliminary empirical analysis based on limited data available at that time suggests a non-existent or, at best, weak positive relationship between the decline in remittances and food insecurity. Another finding by the same authors was that the pandemic had a stronger impact on female migrants.

When it comes to the particular nexus between remittances and food security various studies (Hildebrandt *et al.*, 2005; Zezza *et al.*, 2011; Davis & Brazil, 2016) have documented a dual, both positive and negative, relationship between remittances and FNS. On the one hand, remittances can generate a direct income effect for recipient households, thereby enhancing their capacity to access critical FNS-related inputs. These may include the adoption of productivity-enhancing agricultural practices, the purchase of improved seeds and fertilizers, and increased consumption of micronutrient-rich foods. Consequently, remittances may improve household welfare by strengthening both food availability and dietary quality. However, the income elasticities of food and nutrition-related expenditures vary considerably across households, and despite the extensive empirical literature on the subject, the evidence remains inconclusive.

On the other hand, some studies (Hamilton *et al.*, 2009; Davis & Brazil, 2016) indicate that migration-induced remittances may also exert adverse effects on FNS through the disruptive consequences experienced by household members left behind. In particular, the migration of productive household members can reduce household labour endowment, which may negatively affect food production and income-generating activities in the long run (McKay, 2007; Schmeer, 2009). Empirical evidence by Waidler and Devereux (2019), examining the effects of both social grants and remittances on food security and nutrition in South Africa, provides further insights into this debate. Using data from the National Income Dynamics Survey, South Africa's first nationally representative longitudinal survey tracking over 28,000 individuals, the authors found that both remittances and the Older Person's Grant significantly improved the dietary diversity index. However, neither remittances nor the Older Person's Grant had significant effects on food expenditure or anthropometric outcomes such as body mass index. In contrast, the Child Support Grant was associated with modest improvements in children's body mass index in the context of the above study.

Another dimension in the above nexus that has been ignored in most of the above literature for many years is about the role of governance quality. Indeed, several studies (Zezza *et al.*, 2011; Ahmed, 2013; Uchendu & Abolarin, 2015; Davis & Brazil, 2016) suggest that the effectiveness of remittances in enhancing FNS may be limited in contexts characterized by weak governance. In many SSA countries in particular, persistent governance challenges, including corruption, government ineffectiveness, political instability, weak regulatory quality, and limited voice and accountability, continue to undermine development outcomes (Aziz, 2001; Uchendu & Abolarin, 2015). Under such conditions, the developmental potential of remittances may be constrained, thereby limiting their capacity to produce sustained improvements in FNS. Consequently, the erosion of governance quality, even in the presence of remittance inflows, may hinder meaningful and long-term reductions in food and nutrition insecurity across SSA in the context of this literature.

The catalytic role of governance quality goes beyond the remittances-FNS nexus to cover also the broad relationship between FNS and development finance. Indeed, the quality of governance is widely regarded as a critical factor in creating an enabling environment for enhancing national FNS and promoting economic growth. According to Rodrik *et al.* (2004), institutional quality plays a fundamental role in economic processes because it determines both

the volume and efficiency of investment within an economy. Despite its importance, much of the existing literature has primarily focused on the impact of government policies directly targeted at improving FNS, while comparatively little attention has been paid to broader governance dimensions such as the rule of law, government effectiveness, and voice and accountability. Some studies have already emphasized the importance of political initiatives that reconnect the demand and supply sides of the food system in order to address food security challenges more effectively (Lang & Barling, 2012; Marsden & Sonnino, 2012). In general, FNS is closely linked to weak institutional structures or the failure of the state to implement strategies that safeguard the legal rights and entitlements of citizens as Amartya Sen has argued long ago (Sen, 1981). But historical evidence further illustrates this particular relationship. For example, financial mismanagement and the neglect of the rule of law by the Malawian government in the sale of the country's strategic grain reserves contributed significantly to the severe famine experienced in Malawi in 1949 (Clover, 2003).

Given the complex interplay of social, economic, cultural, legal, and political factors in developing countries including SSA, the nexus between governance quality, remittances, and FNS becomes therefore particularly important to examine. As already mentioned, most empirical studies have concentrated on the direct contribution of remittances to FNS, often producing inconclusive results. However, these mixed findings may partly reflect differences in financial development and institutional quality across recipient countries (Issahaku *et al.*, 2018). Furthermore, Crush (2013) argues that the mediating role of governance has largely been overlooked in the existing debates on remittances, FNS and economic growth.

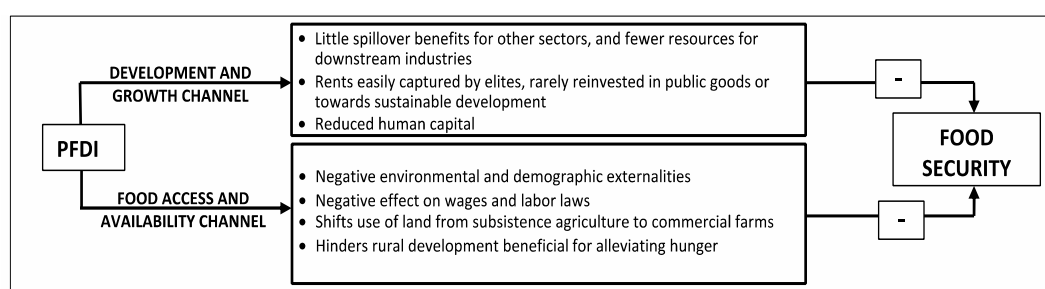
Along the above lines, an important contribution to the above literature trying to fill this particular research gap is the study of Ogunniyi *et al.* (2020) which tried to examine the effect of quality of governance and remittances on FNS in SSA using a balanced panel data of 15 SSA countries covering the period 1996-2015. The study adopts a two-step dynamic empirical model to address issues of unobserved heterogeneity and the potential endogeneity of key explanatory variables. The empirical findings indicate that the composite governance index exerts a statistically significant and positive effect on nutrition security, while no comparable effect is observed for food security. This suggests that the influence of governance quality is more pronounced and nuanced in the context of nutrition outcomes. Notably, among the governance indicators, the control of corruption emerges as a robust and significant determinant of both food and nutrition security. Furthermore, remittances are found to have a positive and statistically significant impact on both food and nutrition security outcomes. Importantly, the interaction between remittances and governance quality yields an even stronger positive effect, highlighting the complementary role of institutional quality in enhancing the developmental benefits of remittance inflows. In addition, secondary school enrolment and the share of agriculture in GDP are positively associated with improvements in food and nutrition security, whereas inflation and rapid population growth exert adverse effects, particularly within the SSA context. Despite the overall positive association between remittances and FNS, the study, consistent with Waidler and Devereux (2019), underscores the inherent volatility and unequal accessibility of remittance flows across households. Moreover, the distinction between food security and nutrition security is emphasized, as improvements in the former do not necessarily translate into gains in the latter. Consequently, the authors advocate for the simultaneous monitoring of both dimensions by policymakers in SSA countries to enable the design of targeted and context-specific interventions.

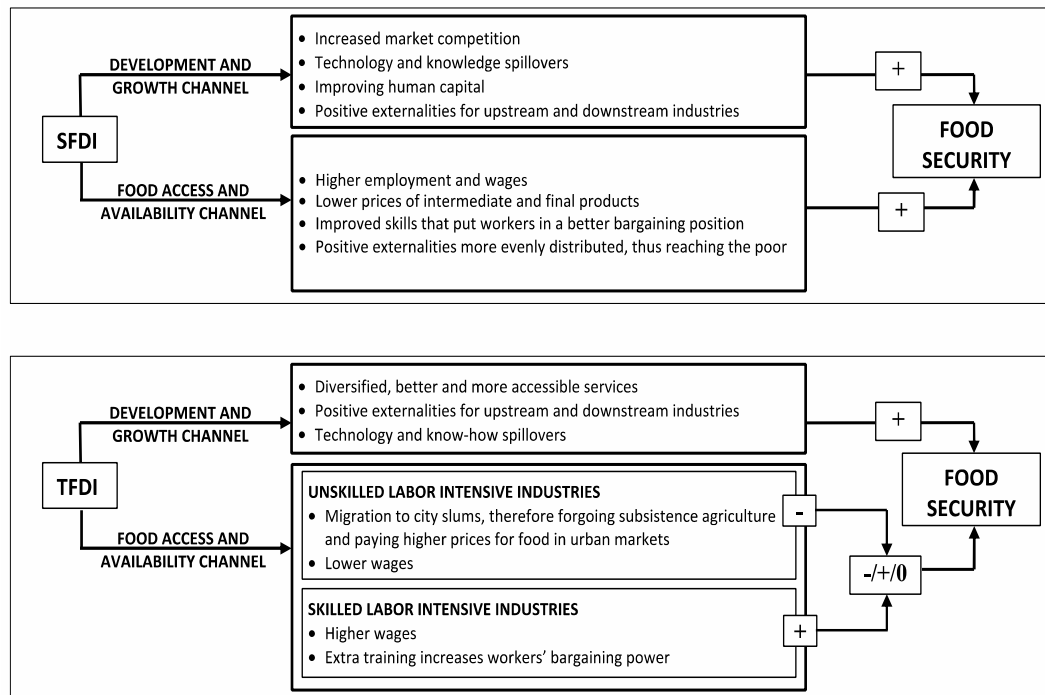
3. THE FNS-FDI NEXUS: A RATHER COMPLEX RELATIONSHIP

FDI has been extensively examined within the broader growth–FDI literature; however, its relationship with FNS in developing countries remains relatively underexplored, with only a limited number of studies providing in-depth analysis. Existing empirical evidence on this relationship is rather mixed. Early studies, such as Wimberley (1991) and Wimberley and Bello (1992), report a predominantly negative association between FDI and food security. In contrast, Jenkins and Scanlan (2001) identify a positive effect of FDI on food security outcomes. More recent contributions, particularly Santangelo (2018), offer a more nuanced perspective by differentiating between types of FDI. Specifically, by distinguishing between land-based FDI originating from developed-country investors and that from developing-country investors, the study finds that the former exerts a positive influence on food security, whereas the latter has a detrimental effect. These findings are based on an analysis of 65 host developing countries over the 2000–2011 period and highlight the importance of considering the heterogeneity of FDI sources when assessing its implications for food security.

Mihalache-O’Keef and Li (2011) contribute to the above literature by delving deeper in the overall dependency and modernization arguments and the broad globalization debate which offer rather contradictory theoretical predictions and produce conflicting evidence according to the authors. The main innovation of the above study is the disaggregation of FDI in various components since according to the authors FDI in distinct economic sectors have disparate attributes, thus producing different welfare consequences for food security – see also **Figure 5** below regarding the various channels through which various FDI types (primary-sector FDI PFDI, manufacturing FDI SFDI, and service-sector or tertiary-sector FDI TFDI) may affect food security. The focus is on food security indicators and not FNS using data on sector-specific FDI inflows to 56 developing and transition economies between 1981 and 2001. The key emerging finding of the study is that manufacturing FDI improves food security, while primary-sector FDI reduces food security and that service-sector FDI has a rather ambiguous but sometimes negative effect.

Figure 5: Channels through which FDI types affect Food Security





Source: Mihalache-O'Keef and Li (2011).

Slimane *et al.* (2015) investigate both the direct and indirect effects of FDI on food security using a panel dataset of 63 developing countries spanning the period 1995–2009. The study employs a composite food security index that integrates the three principal indicators utilized by FAO to assess individual nutritional status. The empirical findings indicate that sectoral FDI does not exert a statistically significant direct effect on food security. However, important indirect effects are observed across sectors. Specifically, FDI in the agricultural and secondary sectors is found to have positive indirect effects on food security, primarily through its contribution to increased agricultural production. In contrast, FDI in the tertiary sector is associated with negative effects, while no significant impact is identified for FDI in the mining sector. These results underscore the importance of disaggregating FDI by sector in order to more accurately capture its heterogeneous effects on food security, consistent with the methodological approach adopted by Mihalache-O'Keef and Li (2011).

In a further contribution to this literature, Haberli and Smith (2014) examine the governance of agricultural FDI (agri-FDI) through the lens of “weak” host states. Their analysis demonstrates that, at both regional and international levels, the governance framework for agri-FDI unevenly allocates obligations and responsibilities among host states, investors, and investors’ home states. This asymmetry tends to result in the overprotection of investors alongside insufficient regulatory oversight of investments. According to the authors, such governance gaps can have detrimental implications for food security in weak host states. The authors define weak states “as states that find it difficult to carry out adequate macroeconomic or fiscal policies that effectively manage, inter alia their natural resources, including land and water, or private enterprise activity carried on within the state” (Haberli and Smith 2014, p.192). Within this context, the study emphasizes that food security constitutes a shared responsibility across states. While governments are expected to safeguard their own national food security, they must also refrain from adopting policies that undermine global food security or displace vulnerable producers in weaker states. Furthermore, when national food security strategies are grounded in human rights frameworks, states are obligated to implement and maintain policies that

uphold fundamental rights, including the right to food and the protection of property rights, in accordance with international and regional human rights law. Consequently, weak host states bear a legally binding responsibility to promote only those agri-FDI activities that are consistent with their human rights commitments and to monitor investor conduct to prevent violations following investment. Overall, the authors rightly highlight the inherently complex relationship between agri-FDI and food security, underscoring that food security should be regarded as a public good. And as such, it necessitates active government intervention, particularly in contexts where market mechanisms fail to ensure its adequate provision.

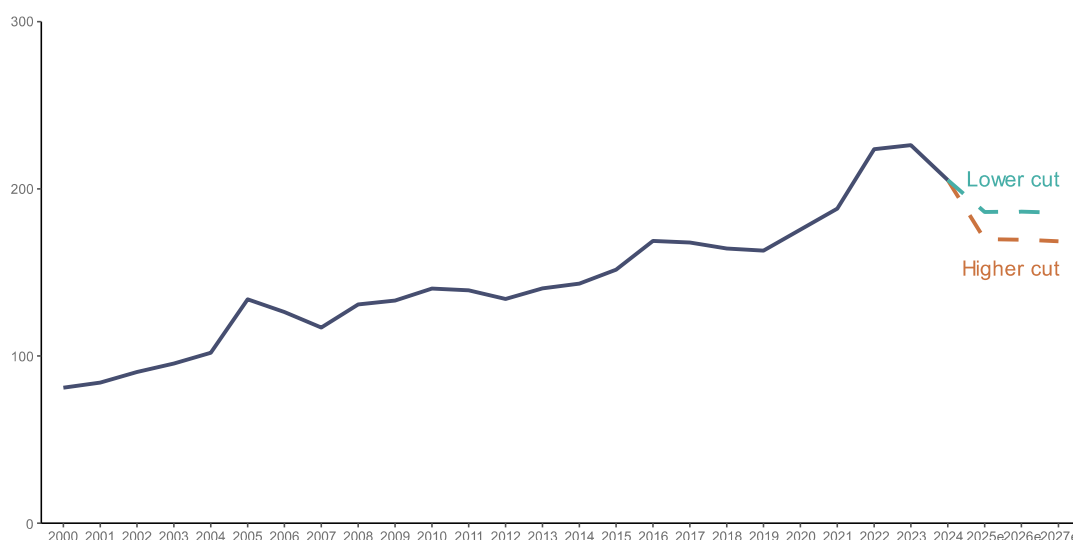
Country-specific analyses provide additional insights into the relationship between FDI and FNS. In this regard, Djokoto (2012) examines the case of Ghana using time-series data spanning the period 1995–2007. The study employs daily energy consumption as a proxy for hunger and finds a statistically significant negative relationship between FDI inflows and food security in both the short and long run. Incorporating measures of democratic governance, the analysis further reveals that daily protein consumption, used as a proxy for nutritional status, is also negatively and significantly associated with FDI. These findings suggest that agricultural FDI inflows may exert adverse effects on both food and nutrition security in Ghana, with democratic governance similarly exhibiting a negative association. In contrast, micro-level evidence from Fleming (2019) presents a more positive perspective. Focusing on employees of an agricultural FDI initiative—the New Horizons Program—in Nampula, Mozambique, the study documents improvements in several behavioural indicators of household food security. The findings indicate that participation in the program is associated with enhanced financial security and notable gains in food security outcomes over time, particularly during the initial years of employment. These contrasting results underscore the context-specific and heterogeneous nature of the FDI–FNS nexus. Finally, Ogunniyi and Igberi (2014) within the context of Nigeria have shown that FDI has no impact on real per capita income, which was used as a proxy for economic access to food in the study.

A notable contribution to this literature is made by Dahri and Omri (2020), who provide a comprehensive analysis of the effects of FDI and foreign aid on food security and poverty reduction using panel data from 50 developing countries over the period 1995–2015. In addition to FDI, the study incorporates multiple categories of foreign aid, reflecting the aid heterogeneity perspective that has become increasingly prominent in the aid-effectiveness literature in recent years (e.g., Mavrotas, 2002, 2005, 2010, 2015; Mavrotas & Nunnenkamp, 2007; Clemens *et al.*, 2012). Specifically, the analysis distinguishes among social infrastructure aid (SIA), investment aid (IA), non-investment aid (NIA), and agriculture, forestry, and fishing aid (AFFA). The findings suggest that FDI has an overall positive impact on both food security and poverty reduction, while SIA and NIA also contribute positively to poverty reduction. By contrast, the effects of IA and AFFA on poverty reduction are found to be insignificant. With respect to food security, SIA, IA, and AFFA are shown to have positive effects. Finally, an important finding emerging from the analysis is that the effects of FDI and the various types of aid on food security and poverty reduction are stronger when they operate jointly, highlighting the importance of complementarity between FDI and foreign aid. This result is also confirmed through the use of the GMM estimator, which accounts for potential endogeneity.

4. ODA, FOOD AID AND FNS: THE DEBATE ABOUT AN EVOLVING RELATIONSHIP

Turning to ODA, it is important to stress that, while ODA reached a reported total of USD 223 billion in 2023, the outlook since then has deteriorated significantly. In particular, the recent dramatic aid cuts by several donor countries, driven in part by shifting geopolitical priorities and domestic pressures, cast serious doubt on the credibility and viability of the Seville Zero Draft's reaffirmation of the 0.7% ODA target (Compromiso de Sevilla for Action, 2025). Recent data from the Organisation for Economic Co-operation and Development (OECD) indicate that ODA is projected to decline by 9 to 17 percent in 2025, following an estimated 9 percent reduction in 2024. This downward trend is primarily attributable to planned budget cuts by four of the largest bilateral donors: France, Germany, the United Kingdom, and the United States. In 2024, these countries simultaneously reduced their ODA allocations for the first time in nearly three decades. If the announced cuts are implemented, it will mark the first occurrence in history of all four major donors decreasing their ODA commitments in two consecutive years. Projections suggest that by 2027, overall ODA levels may revert to those observed in 2020 (OECD, 2025a). See also **Figure 6** below. These reductions are particularly concerning given the rising global demand for development and humanitarian assistance. The anticipated decline is expected to have the greatest impact on low-income countries, where dependence on external aid for essential services such as health, education, and infrastructure remains high. As such, sustained reductions in ODA risk undermining progress toward the SDGs and exacerbating existing inequalities in global development outcomes.

Figure 6: Trends in total ODA from DAC countries, 2000-24 (official data) and 2025-27 (projections), USD billion, constant (2023) prices



Source: OECD (2025a), Cuts in official development assistance: OECD projections for 2025 and the near term, OECD Policy Brief, June.

Of particular relevance to the above recent trends in ODA is the dismantling of the United States Agency for International Development (USAID) in 2025 by the Trump administration, which constitutes a profound and unprecedented shock to the global health and development architecture, with far-reaching implications for health systems, governance, civil society, and broader development outcomes. A recent study published in *The Lancet* (Cavalcanti *et al.*, 2025) provides striking quantitative estimates, suggesting that more than 14 million additional deaths could occur by 2030, including millions of young children, if aid cuts persist. Beyond these mortality projections, the study highlights the risk of systemic deterioration, including the erosion of institutional capacity, weakening of data systems, and loss of donor confidence. Such effects could inflict long-lasting damage on health and development outcomes in many low- and middle-income countries according to the authors and the magnitude of these estimates underscores not only the substantial human cost but also the fragility of development gains achieved over recent decades in countries that remain partially dependent on external support (Cavalcanti *et al.*, 2025).

A recent FERDI study by Boussichas *et al.*, (2025) offers also important insights into the far-reaching implications of the significant cuts to United States ODA, particularly in light of the closure of USAID, a development that marks a fundamental shift in the global aid architecture. According to the authors, three key messages emerge from their analysis, namely that (1) the withdrawal of US support is likely to undermine development progress where it is needed most (2) rather than prompting greater engagement from other donors, the US decision risks creating a negative demonstration effect, potentially discouraging other bilateral and multilateral donors and triggering further reductions in overall ODA flows, and (3) these qualitative shifts are likely to produce quantitative repercussions, particularly regarding aid effectiveness. The final outcome could be an intensified scepticism according to the authors about the legitimacy and utility of development assistance, especially in an era of competing global priorities and fiscal pressures (Boussichas *et al.*, 2025).

The impact of foreign aid on FNS has received considerable attention in the literature (Maxwell and Singer, 1979; Barrett and Maxwell, 2007), particularly with respect to the overall relationship between food aid and FNS outcomes and also as a part of the more substantial discussion and debate over the years regarding the impact of aid in aid-recipient countries.¹ Past food aid interventions, delivered either in cash or in kind, have included the distribution of free food during crises (Tranchant *et al.*, 2019; Gilligan and Hoddinott, 2007), school feeding programs providing meals to pupils (Drake *et al.*, 2020; Petralias *et al.*, 2016), food-for-work schemes in the agricultural sector (Ferrière and Suwa-Eisenmann, 2015), and complementary interventions such as behaviour change communication in nutrition and health (Lentz and

¹ The aid effectiveness literature is voluminous spanning a period of more than six decades and it is certainly beyond the scope of this paper to discuss the aid effectiveness literature in aid-recipient countries. The body of earlier work on the subject (see Cassen 1986; Mosley 1987; Riddell 1987; White 1992; World Bank 1998 among others) is complemented by several more comprehensive assessments in recent years (see Sachs 2005; Easterly 2006, 2007; Riddell 2007; Lahiri 2007; Collier 2007; Guillaumont and Chauvet 2001; Moyo 2008; Doucouliagos and Paldam 2009; Balamoune and Mavrotas 2009; Mavrotas 2010, 2015; Banerjee and Duflo 2011; Ramalingam 2013; and Akame and Mavrotas 2024 among others), and other important parts of the aid effectiveness literature, such as the aid heterogeneity approach, the fiscal response to aid, aid volatility and the allocation of aid in the context of structural vulnerability have received a lot of attention (see Mavrotas 2002, 2005; Ouattara 2006a, 2006b; Mavrotas and Ouattara 2006a, 2006b, 2007; Mavrotas and Nunnenkamp 2007; Amprou *et al.* 2007; Cassimon and Van Campenhout 2007, 2008; Fielding and Mavrotas 2008; Hudson 2015; Clemens *et al.* 2012; Guillaumont 2009, 2010, 2019; Guillaumont *et al.* 2017; Guillaumont and Wagner 2022; and Farooq *et al.* 2025, 2026 among others).

Barrett, 2013). At the same time, the impact of food aid on food security has attracted substantial criticism, reflecting its complex and sometimes ambiguous role (see Schultz, 1960, for an early discussion; and Abdulai *et al.*, 2005, for further analysis). A strand of the literature argues that food aid may generate negative long-term effects, a view supported by several authors (Barrett and Maxwell, 2007; Ferrière and Suwa-Eisenmann, 2015). However, more recent studies challenge this narrative by emphasizing the importance of context, as well as the design and implementation of food aid programs, in shaping their outcomes (see Gautam, 2019; Mary *et al.*, 2018).

Evidence from country studies also indicates that between 2000 and 2018, countries receiving foreign aid to support agricultural inputs, such as seeds and fertilizers, achieved significantly higher yields in cereals (maize and rice), measured in metric tons per harvested hectare, compared to countries without such assistance (Jayne *et al.*, 2021). This finding is consistent with the results of Orji *et al.* (2014), who show that foreign capital inflows in six countries of the West African Monetary Zone over the period 1981–2010 had a positive impact on GDP, with ODA contributing significantly to growth in Sierra Leone and Ghana.

More recently, Sherwen (2025) examines the effects of U.S.-delivered food aid on multiple dimensions of Uganda's domestic food system, with the aim of improving program design and minimizing potential adverse effects. The study places particular emphasis on how food aid interventions influence local supply chains and infrastructure, market dynamics, food production, and recipient behaviour. The findings suggest that food aid programs in Uganda have strengthened supply chains both indirectly, through operational investments in local infrastructure, and directly, through targeted initiatives such as support for agricultural cooperatives and monetization programs. In addition, the study provides evidence that local procurement and livelihood-oriented programs enhance food production and market participation among both Ugandan farmers and refugee populations. Furthermore, food aid consumption patterns are shown to be shaped by several factors, according to the author, including recipient preferences, duration of program participation, and levels of food insecurity. Notably, the sale of in-kind food rations in local markets is often driven by the need for cash rather than surplus consumption. Overall, the author emphasizes the importance of designing more nuanced and sustainable food aid strategies that minimize distortions to domestic food systems while maximizing their developmental impact (Sherwen, 2025).

Another dimension that is often overlooked in the development finance and FNS literature is the role of governance in shaping the effectiveness of foreign aid for FNS². There is also evidence that agricultural productivity growth has important implications for institutional development (Grabowski and Self, 2022), while the reverse relationship also holds, suggesting a mutually reinforcing dynamic between productivity improvements and institutional quality. Furthermore, Mary *et al.* (2018) argue that food aid mismanagement is more prevalent in developing countries characterized by widespread corruption and weak institutional frameworks. In particular, evidence suggests that food aid interventions are highly susceptible to corruption risks, which can undermine their effectiveness in reaching intended beneficiaries (Maxwell, 2012). Moreover, Zúñiga and Mullard (2018) show that the effectiveness of Structural Adjustment Programs (SAPs), implemented in many African countries in the past to improve also FNS in SSA, was constrained by poor governance. Issues such as corruption, political rent-seeking, and inefficiencies, especially in the context of privatization processes, limited the intended benefits of these reforms. Similarly, Callaghy (1986) and Martinez and

² See also the discussion in Section 2 but in connection only with the case of remittances.

Kukutschka (2018) document how government officials in developing countries have, in some cases, diverted foreign aid for personal gain, further weakening its developmental impact. In another study, Gyimah-Brempong and Gentry (2020) find that both aggregate foreign aid and aid directed to the agricultural sector have a positive effect on food security. However, their results also indicate that the interaction between foreign aid and governance has a negative and statistically significant effect on food security, suggesting that the effectiveness of foreign aid depends critically on the quality of governance, with better outcomes observed in countries exhibiting stronger governance structures. Extending the analysis beyond SSA, Petrikova (2015) examines whether the impact of development aid on food security and nutrition is conditioned by governance quality and the composition of aid flows. Using panel data for 85 developing countries and employing both GMM and two-stage least squares estimators, the study finds that foreign aid has a small but positive effect on food security. However, the effectiveness of different types of aid varies: while multilateral aid appears to have a positive impact, the effects of bilateral aid, loans, and agricultural aid are more strongly contingent on the quality of governance.

Against this background, Cassimon *et al.* (2023) examine the joint impact of food aid and governance quality, the latter disaggregated into its key components, on FNS in SSA, using panel data for 25 countries over the period 1996–2018. The authors employ a dynamic panel data approach, which is particularly suitable for capturing the long-term effects of policy interventions. Importantly, this study departs from earlier contributions in several respects. First, it provides macro-level evidence for SSA, thereby complementing the predominantly country-specific analyses in the existing literature. Second, it adopts multiple indicators of FNS outcomes, including the average value of food production (AVFP), average dietary energy supply adequacy (ADESA), and the prevalence of undernourishment. Third, it incorporates both aggregated and disaggregated measures of governance, reflecting the central role of institutional quality in shaping the effectiveness of food aid. Using the dynamic generalized method of moments (GMM) estimator to address potential endogeneity, the study finds a robust relationship between food aid, governance quality, and FNS outcomes. Specifically, food aid is shown to increase AVFP and ADESA, while reducing undernourishment. Among the governance indicators, the control of corruption and political stability are found to have significant effects on these outcomes. However, while the interaction between food aid and the composite governance index has no significant effect on AVFP, it significantly improves ADESA and reduces undernourishment across the empirical specifications.

5. FNS-DEVELOPMENT FINANCE HETEROGENEITY AND THE ROLE OF GOVERNANCE QUALITY

The preceding discussion highlights that the relationship between FNS and development finance cannot be adequately understood without accounting for the role of governance quality. At the same time, the heterogeneity of development finance may offer additional insights into how different financial flows interact with FNS outcomes and how governance conditions shape these interactions. Despite its importance, this more complex nexus has received limited attention in the literature, with notable exceptions being the studies by Cassimon *et al.* (2021, 2022).

In their 2022 study published in *PLOS ONE*, Cassimon *et al.* examine the combined impact of institutional quality and various capital flows on FNS and undernourishment in SSA, using panel data for 25 countries over the period 1996–2018. A key contribution of this study lies in its integrated approach, linking different types of capital flows and governance indicators to multiple FNS outcomes. This represents an advancement over their earlier work (Cassimon *et al.*, 2021), which did not employ a dynamic empirical framework. By adopting a dynamic generalized method of moments (GMM) estimator, the authors were able to account for endogeneity and provide more robust evidence on the relationship between institutional quality, capital flows, and FNS outcomes.

The study employs also three measures of FNS: the average value of food production (AVFP), average dietary energy supply adequacy (ADESA), and the prevalence of undernourishment (PoU). AVFP captures the net value of food production, ADESA reflects the ratio of caloric supply to population requirements, and PoU measures the share of the population experiencing insufficient caloric intake. Together, these indicators provide a comprehensive assessment of food availability, access, and nutritional outcomes, and are consistent with international benchmarks such as Sustainable Development Goal 2 (SDG-2). Another important innovation of the study is the incorporation of multiple dimensions of governance quality alongside disaggregated capital flows. Specifically, the authors consider six governance indicators: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. These dimensions capture key political, economic, and legal aspects of governance. Using Principal Components Analysis, the authors construct a composite governance index. On the financial side, capital flows are disaggregated into foreign direct investment (FDI), portfolio equity (PE), official development assistance (ODA), and remittances, an approach that represents a novel contribution to the empirical literature on development finance and FNS. The analysis also includes relevant control variables and compares the effects of aggregated versus disaggregated capital flows.

The empirical findings reveal that only ODA has a statistically significant effect on food security in the difference-GMM model, a result not captured when using aggregated capital flows, thus highlighting the importance of development finance heterogeneity approach. However, in the system-GMM model, both ODA and aggregate capital flows become significant, with FDI also showing a statistically significant but negative effect. This unexpected negative relationship may reflect the sectoral allocation of FDI, as investments directed toward non-agricultural sectors may have limited or even adverse implications for food security, consistent with earlier findings in the literature (see for instance the previously discussed study of Mihalache-O'Keef and Li, 2011).

With respect to nutrition outcomes, the results indicate that FDI, ODA, governance quality, and their interactions exert a positive and robust effect on nutrition security, particularly in the system-

GMM specifications. The role of governance becomes more pronounced when endogeneity is addressed and cross-country institutional differences are accounted for. Among the governance indicators, political stability, government effectiveness, and control of corruption are positively associated with improved nutrition outcomes, while rule of law exhibits a negative effect. Finally, turning to undernourishment, the results suggest that aggregate capital flows, FDI, ODA, and remittances contribute to reducing the prevalence of undernourishment, with stronger and more consistent effects observed in the system-GMM models.

Overall, these findings underscore the importance of adopting a heterogeneity perspective and reinforce earlier evidence on the critical role of governance in shaping the relationship between external capital flows and FNS outcomes. The results also highlight nuanced interactions: for example, FDI may enhance food security in contexts characterized by strong institutional frameworks, while producing negligible or even adverse effects in environments marked by weak governance and corruption. These insights further suggest that governance should not merely be treated as a control variable but rather as a key mediating factor in the development finance–FNS nexus. This has important implications for both policy and research. In particular, aligning development finance strategies with institutional conditions may be essential for achieving meaningful and sustainable improvements in FNS in SSA and other developing regions (Cassimon *et al.*, 2022).

6. CONCLUDING REMARKS AND EMERGING POLICY CHALLENGES FOR FNS FINANCING

The alarming deterioration of FNS trends in recent years, coupled with increasingly bleak prospects for improvement as the 2030 deadline approaches, have reignited debate on the FNS–development finance nexus. This includes renewed attention to the substantial financing and policy challenges facing the international development community in achieving the goals of the 2030 Agenda. Against this backdrop, this paper has provided a comprehensive overview of the linkages underpinning the FNS–development finance nexus, while also identifying key research gaps emerging from the empirical literature and the associated policy challenges. In particular, the analysis has focused on major sources of development finance, namely remittances, FDI, ODA, and food aid—and their relationship with FNS outcomes, as documented in the existing empirical literature. A key insight emerging from this discussion is that recognising development finance heterogeneity allows for a more nuanced understanding of how different types of financial flows affect FNS. Another important finding concerns the role of governance quality and the channels through which it shapes outcomes within this nexus, a dimension that has, until recently, received limited attention in the literature. Overall, the paper emphasizes that combining the analysis of development finance heterogeneity with measures of governance quality can provide deeper insights into the FNS–development finance nexus, with important implications for the design of more effective and targeted policy responses.

The paper also stressed that a relatively underexplored dimension in the FNS literature has been the complex nexus between development finance, broadly defined, and FNS, particularly in vulnerable regions such as SSA. In recent years, however, this nexus has emerged as a central concern in development policy, as global hunger, food insecurity, and malnutrition have remained persistently high despite decades of progress in foreign aid, agricultural modernisation, and multilateral interventions in the SSA region. At the same time, the emerging empirical literature has begun to provide valuable insights into the mechanisms through which

the development finance–FNS nexus operates in SSA, shedding light on both its potential and its limitations.

With regard to the relationship between remittances and FNS, recent evidence suggests that governance quality plays a critical role in shaping outcomes. In the context of SSA, remittances are found to exert a positive and statistically significant impact on both food and nutrition security indicators. More importantly, the interaction between remittances and governance quality generates an even stronger positive effect, underscoring the complementary role of institutional quality in enhancing the developmental impact of remittance inflows.

Turning to the complex relationship between FDI and FNS, the empirical evidence remains mixed, particularly at the country level, although panel data analyses tend to provide more robust insights. An important lesson emerging from this literature is that disaggregating FDI into its various forms allows for a more nuanced understanding of its differential impacts on FNS outcomes. More recent findings (Cassimon *et al.*, 2022) underscore the importance of adopting a heterogeneity perspective and reinforce earlier evidence on the critical role of governance in shaping the relationship between external capital flows and FNS. The results also highlight important nuances: for instance, FDI may enhance food security in contexts characterised by strong institutional frameworks, while producing negligible or even adverse effects in environments marked by weak governance and corruption. More importantly, these findings suggest that governance should not be treated merely as a control variable, but rather as a key mediating factor in the development finance–FNS nexus, with significant implications for both policy design and future research.

The impact of food aid on FNS has long been a subject of debate, with no clear consensus emerging in the literature. While a substantial body of work has raised concerns about its effectiveness, highlighting the potential for adverse long-term effects, more recent studies offer a more nuanced perspective. In particular, they emphasise the importance of context, as well as the design and implementation of food aid programmes, in shaping outcomes. Recent empirical evidence, especially from panel data analyses in SSA, further underscores the relevance of governance quality in this relationship. In the context of this recent evidence it has been stressed that food aid can contribute positively to both food and nutrition security while at the same time reducing undernourishment. Moreover, specific dimensions of governance, most notably control of corruption and political stability, are shown to exert significant influence on these outcomes.

Notwithstanding the above, significant policy questions and challenges regarding the financing of FNS still remain, particularly in the context of an increasingly uncertain global environment. An important issue recently is about the re-emerging debate in the post-Seville context whether the international development community should continue prioritising the closure of increasingly widening financing gaps through enhanced resource mobilisation to achieve the SDGs, or whether greater emphasis should instead be placed on reshaping global structural transformation by unlocking the full potential of development finance through innovative public-private partnerships (Mazzucato 2025; Cassimon and Mavrotas 2025a; Mavrotas 2025). Particularly relevant in this regard is the growing emphasis in recent years on the role of the public sector not merely as a “fixer” of market failures, but as a “doer” and shaper of markets, in line with the concept of the “entrepreneurial state” and the associated “mission-oriented” approach (Mazzucato 2013, 2021). This perspective is also highly relevant to food security as a global public good.

This call for a re-defined role of the public sector also reflects the disappointing performance of the private sector, contrary to earlier expectations, in mobilising the financing required to advance the SDGs and the broader 2030 Agenda, including financing to strengthen FNS at the global level. Indeed, Mazzucato (2025) argues that several key factors shape the effectiveness of blended finance as a potential source of SDG financing, as summarised in **Table 1** below. In this context, a new and evolving public-private sector partnership, embedded within a more holistic and mission-oriented approach, may prove crucial for addressing the FNS challenge in the years ahead.

Table 1: The various factors affecting blended finance

Volume	The blended finance market averages \$15 billion annually compared to the \$5–7 trillion needed annually to close the SDG financing gap
Mobilisation ratio	The average mobilisation ratio (share of private finance mobilised per unit of public finance) in blended climate finance deals between 2018 and 2023 has remained low, at 1:0.16
Additionality	The absence of agreed metrics makes it difficult to assess additionality of blended finance projects.
Leverage	LICs mobilised only US\$0.37 per dollar of public financing invested, compared to \$1.06 in LMICs.
Equity	70 per cent of blended climate finance currently goes to international corporations.
Type of financing	60 per cent of total climate finance was allocated to lower-risk mitigation efforts compared to 27 per cent for adaptation
Debt risks	Blended public-private partnerships can lead to the accumulation of contingent liabilities and fiscal risks in LMICs , further reducing fiscal space.

Source: Mazzucato (2025), p.5.

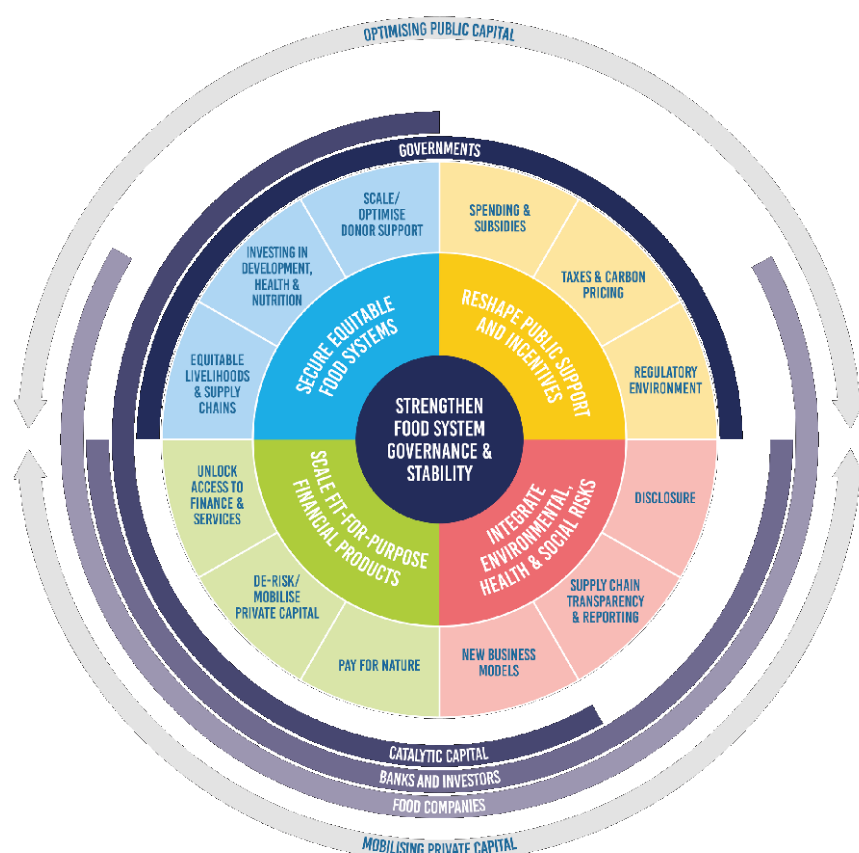
Furthermore, earlier work by the World Bank *et al.* (2021), undertaken in the context of the severe disruptions caused by the COVID-19 pandemic to the global food finance architecture, identified five key imperatives for optimising public expenditure and mobilising private capital in support of a transformative global food system:

- ❖ **Reshape public support and incentives** using subsidies and market mechanisms to redirect capital out of unhealthy, destructive assets to support public goods;
- ❖ **Integrate health, environmental and social risks into financial decision-making**, future-proofing portfolios by measuring & disclosing food system risks and redirecting investment into new business models to mitigate exposure;
- ❖ **Scale fit-for-purpose financial products and business models**, mobilising private capital by de-risking and mainstreaming innovative financial instruments & regenerative assets

while improving access to finance & services for primary producers through new supply chain partnerships;

- ❖ **Secure equitable food systems** by rebalancing bargaining power, investing in rural infrastructure to drive sustainable production & development and implementing fair prices and living wages to ensure access to affordable, healthy diets; and
- ❖ **Strengthen food governance and stability** as the underpinning foundation of the entire food system to build physical and financial resilience to shocks (World Bank *et al.*, 2021, p.3)³. See also **Figure 7** below.

Figure 7: Food finance architecture for optimizing public-private capital partnership via 5 core imperatives



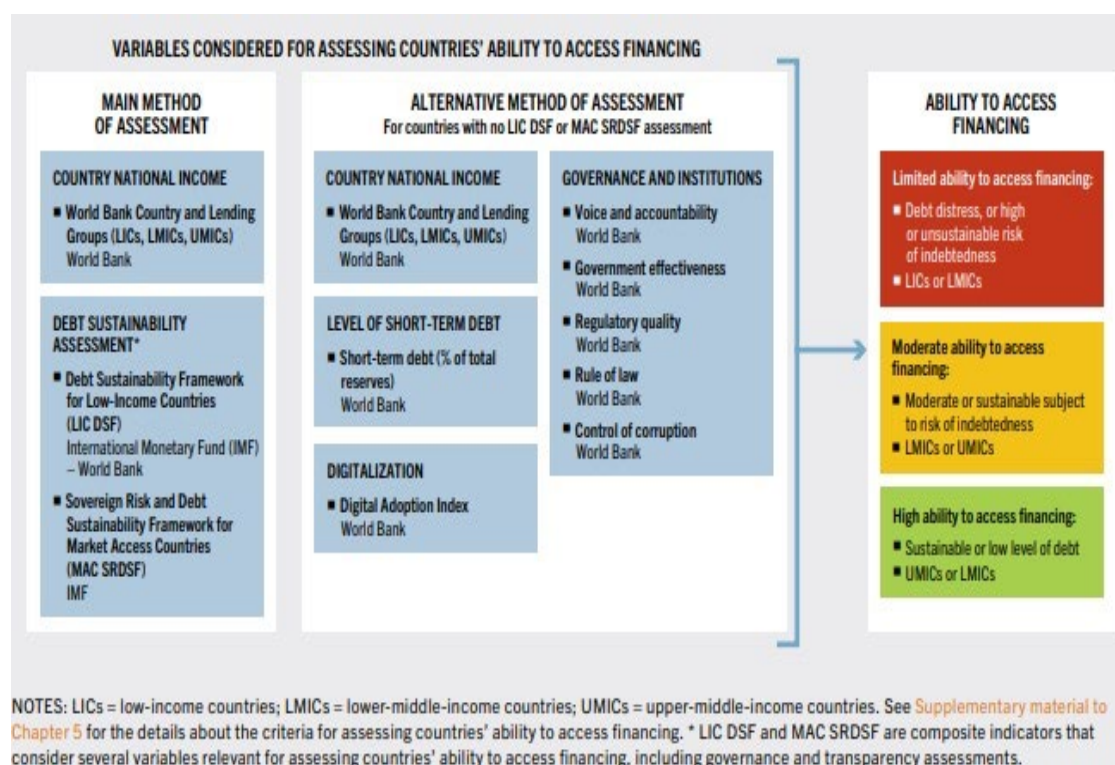
Source: World Bank *et al.* (2021), p. 13.

Of equal importance is the need to account for differences in recipient countries' capacity to access SDG financing, particularly in relation to the varying levels of risk associated with such access, including financing for FNS (FAO *et al.*, 2024; Cassimon and Mavrotas 2026). This issue is further illustrated in **Figure 8** below (FAO *et al.*, 2024). Finally, FAO *et al.* (2024) classify recipient countries into three main groups according to their level of financial risk in accessing external financing: countries with limited, moderate, and high access to financing⁴.

³ See World Bank *et al.* (2021) and more recently Cassimon and Mavrotas (2026) for further discussion.

⁴ See FAO *et al.* (2024) and Cassimon and Mavrotas (2026) for a detailed discussion.

Figure 8: Recipient countries' ability to access food system-related financing



Source: FAO *et al.* (2024, Figure 30, p.107).

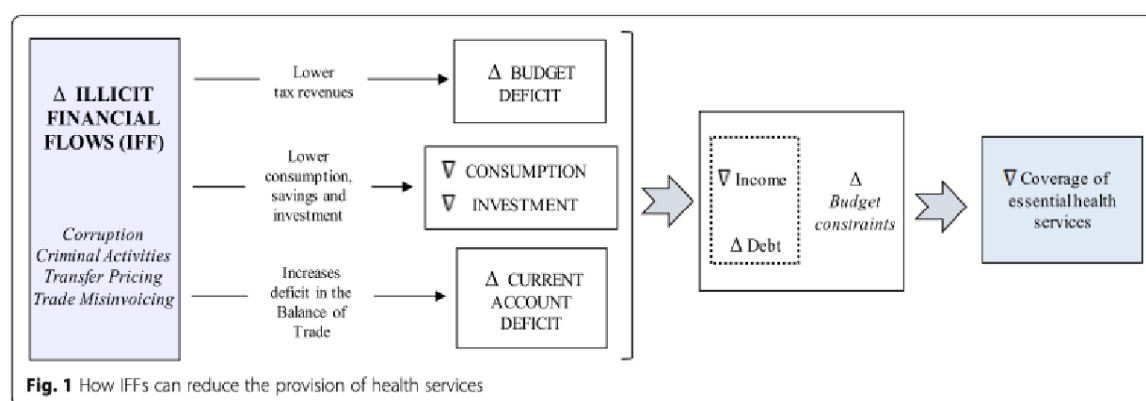
In addition to the above discussion on the financing challenges associated with FNS, it is important to emphasise that any meaningful assessment of the current state of development finance must also engage with broader structural issues. These include the architecture of the development finance system (OECD, 2025b), the allocation and utilisation of Special Drawing Rights (SDRs) (Oxfam, 2024; Zattler, 2024), the evolving role of multilateral development banks (MDBs) and the need for their reform (Walle, 2025; Lee and Matthews, 2024; Bartzokas, 2023), as well as emerging challenges in the governance of ODA.

Finally, in a context of increasing uncertainty surrounding aid budgets, and in light of the broader challenges associated with financing FNS food and resilient food systems, the role of Illicit Financial Flows (IFFs) should not be overlooked. Addressing IFFs holds significant potential for mobilising additional domestic resources by curbing the loss of financial capital from developing economies. Indeed, reducing IFFs is central to the implementation of the 2030 Agenda, particularly in relation to SDG target 16.4. In recent years, IFFs have also attracted significant attention from high-level international forums such as the G7 and the G20 (Musselli & Bürgi-Bonanomi, 2020; Addison *et al.*, 2018; Reuter, 2017; Brandt, 2020; Johannesen *et al.*, 2020). This agenda includes strengthening Anti-Money Laundering compliance to mitigate the impact of IFFs within the global financial system (Naheem, 2018). The issue is particularly acute in Africa, where various estimates suggest that the continent lost approximately \$35.4 billion annually between 2010 and 2019 due to IFFs, with some estimates placing the figure as high as \$50 billion per year (GFI, 2021).

Recent evidence regarding the impact of IFFs on SDGs-related outcomes with particular emphasis on health services by Ortega *et al.* (2020) has discussed the multiple transmission

channels in place, summarized also in **Figure 9** below. Finally, the relationship between IFFs and FNS is complex and largely indirect, operating through multiple interconnected channels. Reduced government revenues resulting from tax evasion and trade mispricing constrain public budgets, thereby limiting investment in agriculture, research, and extension services. This, in turn, undermines agricultural productivity, rural livelihoods, and food availability. Moreover, IFFs tend to exacerbate income inequality, as the benefits of such illicit activities accrue disproportionately to wealthier groups. As income disparities widen, vulnerable populations face increasing barriers to accessing nutritious food, leading to higher levels of food insecurity and malnutrition (Cassimon and Mavrotas, 2025b).⁵ Recent evidence by Ortega *et al.* (2020) on the impact of IFFs on SDG-related outcomes, with particular emphasis on health services, highlights the existence of multiple transmission channels, as summarised in **Figure 9** below.

Figure 9: The transmission mechanism of IFFs and SDGs-related outcomes with emphasis on health services.



Source: Ortega *et al.* (2020), p.4.

Finally, the relationship between IFFs and FNS is complex and largely indirect, operating through several interconnected pathways. Reduced government revenues resulting from tax evasion and trade mispricing constrain public budgets, thereby limiting investment in agriculture, research, and extension services. This, in turn, undermines agricultural productivity, rural livelihoods, and food availability. Moreover, IFFs tend to exacerbate income inequality, as the gains from such illicit activities accrue disproportionately to wealthier groups. And as income disparities widen, vulnerable populations face increasing barriers to accessing nutritious food, leading to higher levels of food insecurity and malnutrition (Cassimon and Mavrotas, 2025b).⁵

⁵ See also Cassimon and Mavrotas (2025b) and Ortega *et al.* (2020) for further discussion.

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Contact

www.ferdi.fr

contact@ferdi.fr

+33 (0)4 43 97 64 60