

THÈSE

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Trois essais sur la migration et la sécurité alimentaire dans les pays d'Afrique Sub-Saharienne

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Dédicace

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Liste des sigles et abréviations

BCEAO	Banque Centrale des Etats de l’Afrique de l’Ouest
CSI	Coping Strategies Index
ECVM/A	Enquête nationale sur les Conditions de Vie des Ménages et l’Agriculture
ESS	Ethiopian Socioeconomic Survey
FAO	Food and Agriculture Organization of the United Nations
FCS	Food Consumption Score
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IFPRI	International Food Policy Research Institute
ILO	International Labour Organisation
IOM	International Organization for Migration
ODA	Official Direct Assistance
SADC	Southern African Development Community
WAEMU	West African Economic and Monetary Union
WFP	World Food Program
WHO	World Health Organization

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Introduction générale

0.1 Contexte général

En 2000, les dirigeants de plusieurs pays adoptaient, au sein des Nations Unies, huit objectifs principaux afin de mettre fin à l'extrême pauvreté dans le monde. Ces objectifs, connus sous le nom des OMD (Objectifs du Millénaire pour le Développement), ont permis de réaliser des avancées notables en matière de réduction de la pauvreté et de la faim, de scolarisation des enfants, d'autonomisation des femmes, de réduction de la mortalité infantile, Selon l'ONU, le nombre de personnes vivants dans une extrême pauvreté a baissé de 1,9 milliard en 1990 à 836 millions en 2015. Aussi, la proportion de personne sous-alimentées dans les pays en développement est passée de 23,3 % en 1992 à 12,9 % en 2014. Des chiffres qui n'épargnent ni les enfants ni les populations vulnérables, puisqu'en 2017 presque 22 % des enfants de moins de 5 ans souffraient de problèmes de croissance (PNUD). Cependant, on note de grandes disparités régionales. En Afrique Sub-Saharienne par exemple, la prévalence de la sous-alimentation en 2014 était de 20 %, tandis qu'en Asie du Sud elle avoisinait 17 %. Si la proportion de personnes sous-alimentées a continué à baisser dans différentes régions en voie de développement, on note même une légère augmentation en Afrique sub-saharienne : de 20 % en 2014, elle est passée à 23.2 % en 2016. Autrement dit, presque une personne sur quatre était sous-alimentée dans la région en 2016.

Ces chiffres montrent qu'en dépit des progrès notables soient réalisés, la fin des OMD en 2016 reste marquée par une persistance de la sous-alimentation combinée à un taux élevé de malnutrition des enfants dans le monde. Cette situation a conduit les Nations Unies à mettre en place, à partir de 2017, 17 nouveaux objectifs portant le nom d'ODD (Objectifs de Développement Durable). L'objectif 2 des ODD, dénommé « Faim Zéro », consiste à « éliminer la faim, assurer la sécurité alimentaire, améliorer la nutrition et promouvoir l'agriculture durable ». Cet objectif vise à mettre un terme à la faim et à la malnutrition, en faisant en sorte que toutes les personnes aient accès à une alimentation suffisante en quantité et en qualité. Pour atteindre cet objectif, le PNUD stipule qu'il faut encourager les pratiques agricoles durables, améliorer les moyens d'existence et les capacités des petits paysans, permettre une égalité d'accès à la terre, aux technologies et aux marchés. Aussi, l'atteinte de l'objectif 2 passe par celle de l'objectif 1, dont l'ambition est d'éradiquer la pauvreté dans le monde. Cependant, suffit-il de réduire la pauvreté et de promouvoir l'agriculture pour assurer une sécurité alimentaire aux individus ? Existe-t-il d'autres facteurs pouvant contribuer à

l'amélioration de la sécurité alimentaire dans les pays en développement ?

Parallèlement aux niveaux élevés de sous-alimentation et de malnutrition, on constate également un accroissement des flux migratoires d'un pays à un autre, et d'une région à une autre (migrations internes). En 2013, plus de 247 millions de personnes avaient migré vers d'autres régions du monde, ce qui représentait 3,4 %¹ de la population mondiale. Ce chiffre a progressé en 2018, passant à plus de 266 millions de personnes, soit 3,6 % de la population mondiale. Face à la croissance de ce flux de personnes, existe la croissance d'un flux financier, celui des transferts monétaires des migrants vers leur localité d'origine. Selon la Banque mondiale, en 2017, les transferts des migrants vers les pays en développement ont atteint 466 milliards USD, soit un accroissement de 9,4 % par rapport à 2013. En Afrique Sub-Saharienne, les transferts reçus de la part des migrants en 2017 étaient estimés à 42,7 milliards USD, avoisinant ainsi les aides publiques au développement qui étaient estimés à 49,3 milliards USD.

Ces statistiques soulèvent ainsi plusieurs questions : La migration contribuerait-elle à la réduction de la proportion de personnes sous-alimentées dans les pays en développement, notamment les pays de l'Afrique Sub-Saharienne ? Pourrait-elle donc jouer un rôle dans l'objectif « Faim zéro » des ODD dans les pays de l'Afrique Sub-Saharienne ? Si oui, dans quelle mesure et par quels mécanismes la migration contribuerait-elle à l'atteinte de cet objectif dans ces pays ?

0.2 Fondements théoriques de la relation entre la migration et la sécurité alimentaire

0.2.1 Sous-alimentation, famine et *Entitlement*: Sen (1981)

Sen (1981) distingue clairement la famine de la sous-alimentation, et la sous-alimentation de la pauvreté. La famine implique la sous-alimentation, et non l'inverse. De la même manière, la sous-alimentation entraîne la pauvreté, tandis que l'inverse n'est pas vérifié. Autrement dit, une personne pauvre n'est pas nécessairement sous-alimentée, et une personne sous-alimentée ne souffre pas nécessairement de famine.

La théorie de l'*Entitlement* (« Droit à la nutrition ») se focalise sur la capacité des individus à se

¹Statistique calculée à partir des données de la Banque mondiale

procurer de la nourriture par les moyens légaux disponibles dans la société, y compris l'utilisation des possibilités de production, les opportunités commerciales, les droits vis-à-vis de l'État, et d'autres méthodes d'acquisition de la nourriture. Elle prend en compte également les moyens de contrôle de la nourriture qui sont légitimés par le système juridique en vigueur dans une société, et n'inclut pas tous les facteurs possibles qui peuvent en principe causer la famine, notamment les transferts illégaux, tels que les pillages, et les échecs de choix dus à des habitudes alimentaires inflexibles.

Pour Sen (1981), la sous-alimentation et la famine sont influencées par le fonctionnement de l'ensemble de l'économie et de la société, et non pas seulement par la production agricole. Il faut donc davantage s'intéresser à la capacité des personnes à se procurer de la nourriture, et non à la seule production alimentaire. La nourriture n'étant pas gratuite, elle doit être acquise par l'*Entitlement* dont dispose chaque personne. Ainsi, les individus souffrent de sous-alimentation lorsque leur *Entitlement* est en dessous du niveau requis pour se procurer des aliments.

Sen (1981) distingue trois facteurs fondamentaux qui déterminent l'*Entitlement* d'un individu ou d'une famille. Le premier facteur est la *dotation*, constituée de la propriété des ressources reproductives et de toute richesse qui a un prix sur le marché. Dans l'économie contemporaine, la dotation principale pour la plupart des individus est la force de travail. A cela s'ajoute la terre et d'autres ressources qui forment ensemble un panier de biens. En effet, la terre et la force de travail peuvent être directement utilisées pour produire des denrées alimentaires, comme c'est le cas dans l'agriculture. Alternativement, la force de travail peut s'échanger sur le marché du travail contre un salaire, permettant à l'offreur de travail de se procurer des produits alimentaires sur le marché des biens et services. Par conséquent, la dotation sous la forme de force de travail ou de propriété d'une terre garantit aux individus ou aux familles le droit à la nutrition.

Le deuxième facteur qui détermine l'*Entitlement* des familles ou des individus est constitué des *capacités de production et de leur utilisation* dans l'économie, lesquelles dépendent de la technologie. En effet, la disponibilité de la technologie détermine les possibilités de production qui, à leur tour, sont influencées par la disponibilité de la connaissance et la capacité des individus à mettre en pratique cette connaissance. Ce deuxième facteur déterminant l'*Entitlement* est lié au premier dans la mesure où l'échange du travail contre un salaire dépend des opportunités d'emplois dans l'économie et des salaires en vigueur, lesquels dépendent aussi des possibilités de

production dans l'agriculture, l'industrie et autres branches. Cette interdépendance montre ainsi que les individus peuvent perdre leur capacité à se procurer des produits alimentaires, non pas en raison de la baisse de la production agricole, mais à cause à des difficultés liées à la production des biens non agricoles dans les autres branches.

Les deux précédents facteurs déterminant l'*Entitlement* des familles ou des individus dépendent aussi des *conditions d'échange*, qui représente le troisième facteur. En effet, même si les individus disposent d'une dotation échangeable et qu'il existe des possibilités de production adéquates, il reste que celles-ci sont conditionnées par les capacités d'achat et de vente de ces individus dans l'économie. L'autre condition d'échange à prendre également en compte est la détermination des prix relatifs de différents biens. Par exemple, un artisan arrive-t-il à vendre ses produits sur le marché ? Si oui, parvient-il à les vendre au prix relatif lui permettant d'acquérir des denrées alimentaires ? Concernant la force de travail qui représente la dotation principale des individus, s'offre-t-elle à un salaire adéquat ?

0.2.2 La migration de travail comme stratégie des familles pour améliorer leur *Entitlement*

L'une des causes de la migration des travailleurs théorisées dans la littérature économique est la défaillance du marché du travail domestique. Le chômage et la perte de revenu créent un effet répulsif qui conduit les individus à migrer vers les régions où le chômage est moins élevé. [Gordon and Vickerman \(1982\)](#) distinguent deux types de migration : la migration spéculative et la migration contractée. La migration spéculative consiste pour les individus à se déplacer en espérant trouver un emploi ; à contrario, dans la migration contractée, ils se déplacent en sachant déjà qu'ils ont un emploi dans la région de destination. L'effet répulsif, ou « Push effect » tend à induire les migrations spéculatives. Les migrations contractées résultent quant à elles d'un effet d'attraction « Pull effect » des régions d'accueil. En effet, les postes vacants dans les régions où le chômage est moins élevé exercent un effet d'attraction sur les individus résidents dans les zones où le chômage est élevé.

Pour [Harris and Todaro \(1970\)](#), les migrations de travail dépendent des différences de salaires entre les régions et de la probabilité d'obtention d'emploi par un potentiel migrant. En effet,

la décision de migrer dépend de la rentabilité de la migration, laquelle est basée sur un calcul coûts-bénéfices. Les individus comparent leur salaire dans leur région d'origine à l'espérance de la rémunération dans la région de destination, laquelle est fonction des salaires en vigueur dans cette région et de la probabilité de trouver un emploi. Il y a donc migration vers une région lorsque le salaire espéré dans celle-ci est supérieur au salaire dans la région d'origine du migrant.

Toutes ces théories montrent que l'incapacité d'échanger leur dotation sur le marché domestique peut contraindre les individus à la migration. Aussi, la migration peut intervenir lorsqu'il y a une défaillance des conditions d'échange sur le marché local. Lorsque cela se produit, la force de travail, principale dotation des individus, s'exporte sur une région qui présente des meilleures conditions d'échange. Par exemple, un artisan qui ne parvient pas à vendre ses produits sur le marché local à un prix relatif suffisant pour acheter des aliments peut soit les exporter, avec un coût supplémentaire, soit se déplacer vers une région où la demande est forte et où les conditions d'échange sont satisfaisantes. De la même manière, un travailleur qui perçoit un salaire ne lui permettant pas de se procurer suffisamment de denrées alimentaires, peut effectuer un calcul coûts-bénéfices de la migration et décider finalement de migrer. De cette manière, la migration intervient comme une alternative pour pallier la défaillance de l'*Entitlement* des individus. Cependant, qu'en est-il de l'*Entitlement* de la famille ?

Contrairement aux théories traditionnelles qui mettent l'individu au cœur de la décision de migration, la nouvelle économie des migrations du travail, développée par [Stark and Bloom \(1985\)](#), stipule que cette décision est prise conjointement par le migrant et les non-migrants. En effet, comme le soulignait [Sjaastad \(1962\)](#), la migration représente un investissement qui implique des coûts (les coûts monétaires, les coûts d'opportunité, les coûts psychiques) et des retombées dont le principal est le transfert des migrants. Ces coûts et retombées sont partagés entre le migrant et les non-migrants (famille, amis, ...) selon un accord implicite entre les deux parties. La nouvelle économie des migrations du travail fait ainsi passer la théorie de la migration de l'indépendance individuelle à l'interdépendance mutuelle. Autrement dit, elle considère la migration comme une "stratégie calculée" et non comme un acte de désespoir ou d'optimisme sans bornes. La migration est ici une stratégie adoptée par la famille pour minimiser les risques sur le marché local. En effet, en l'absence de migration, le partage des risques entre les membres de la famille peut être limité par sa petite taille, « effet d'échelle ». Cependant, des économies d'échelle pourraient être réalisées

grâce à la migration d'un ou de plusieurs membres de la famille vers un secteur où les revenus sont soit corrélés négativement, soit statiquement indépendants, soit peu corrélés positivement aux revenus du secteur d'origine. Il en résulte que le migrant et sa famille non-migrante sont mieux lotis puisqu'un échange d'engagements de partage des revenus leur fournit une coassurance (Gubert, 2002).

La nouvelle théorie des migrations du travail montre donc que la migration est une stratégie adoptée par le migrant et sa famille pour renforcer leur *Entitlement*. En effet, la défaillance du marché de travail local conduit la famille à exporter la dotation en travail d'un de ses membres vers une localité présentant de meilleures conditions d'échange. Par la suite, le membre de la famille ayant migré effectue des transferts matériels et immatériels à cette dernière, compte tenu de l'engagement implicite qui les lie. Les transferts matériels, qui peuvent être sous forme monétaire ou non monétaire, sont ainsi échangés contre des produits alimentaires sur le marché des biens et services. Quant aux transferts immatériels, ils peuvent prendre la forme d'un transfert de technologie permettant d'améliorer les possibilités de production sur le marché local. Autrement dit, les connaissances développées par le migrant dans la localité de destination peuvent être transférées à ses proches (familles, amis, ...) dans le but d'améliorer leur production agricole, artisanale ou industrielle. Théoriquement donc, la migration d'un membre de la famille permet à celle-ci d'améliorer globalement ses conditions d'accès à l'alimentation, et donc son *Entitlement*. Toutefois, les envois monétaires et les envois de produits alimentaires par le migrant produisent un effet plus important que celui des autres types de transferts. En effet, les produits alimentaires envoyés par le migrant peuvent être directement consommés par la famille. De même, les transferts monétaires peuvent être directement échangés par la famille du migrant contre des denrées alimentaires². A contrario, la production supplémentaire engendrée par le transfert de technologie nécessiterait d'être d'abord échangée contre un revenu, lequel sera utilisé dans l'achat des denrées alimentaires. Or, dans la théorie de Sen (1981), l'échange de la production, permettant d'atteindre l'*Entitlement* adéquat, dépend des conditions du marché, telles que la présence d'une demande sur le marché des biens et services, et la fixation adéquate des prix relatifs des produits sur ce marché.

²Même si la production agricole locale est insuffisante, il est possible de recourir au marché international pour se procurer des produits alimentaires.

0.2.3 Les transferts monétaires des migrants : vecteur d'une meilleure nutrition ?

La théorie de l'*Entitlement* de [Sen \(1981\)](#) présente une vision plus large de l'accès à la nourriture. Les transferts des migrants, tels que décrits dans la nouvelle théorie des migrations du travail, s'inscrivent dans cette vision dans la mesure où ils peuvent être échangés contre des denrées alimentaires. Cependant, peut-on confirmer théoriquement qu'ils jouent un rôle significatif dans l'amélioration de la situation alimentaire des familles qui les reçoivent ?

Considérons la théorie des salaires efficients basés sur la consommation alimentaire des travailleurs. Selon [Leibenstein \(1986\)](#), la baisse des salaires rend les travailleurs moins productifs, ce qui engendre un coût élevé de l'efficacité du travail. En effet, la baisse des salaires entraîne une baisse de la nutrition, et par conséquent une baisse de la productivité des travailleurs. Par contre, une hausse des salaires induit un investissement dans la nutrition, une hausse de la productivité et du profit de l'entreprise. Cependant, comme nous le verrons dans la section suivante, il existe un seuil de nutrition en dessous duquel les individus sont moins productifs, et disposent de peu de chance d'obtenir un emploi ([Dasgupta and Ray, 1986](#)). Ce seuil permet de distinguer deux types de nutrition : la nutrition destinée à satisfaire les besoins vitaux de l'organisme et celle nécessaire pour exercer des travaux à forte intensité physique. La théorie des salaires efficients s'intéresse uniquement à la dernière et elle stipule que, pour améliorer cette nutrition, il faut accroître les salaires des travailleurs, et donc leur revenu.

Cette théorie peut être appliquée aux transferts de fonds des migrants dans la mesure où il n'existe aucune raison de penser que l'utilisation des transferts soit différente de celle des autres revenus, notamment le salaire ([Mckenzie and Sasin, 2007](#)). Elle permet de supposer que les membres de la famille du migrant restés dans la localité d'origine investiront les transferts dans la consommation alimentaire dans l'optique d'améliorer leur productivité et leur compétitivité sur le marché du travail local. Toutefois, cela n'est vrai que s'ils présentent l'intérêt d'offrir leur force de travail bien que recevant les transferts. En effet, la théorie néoclassique souligne que l'accroissement du salaire de réserve peut décourager l'offre de travail au profit de la demande de loisir. Il est donc possible que les transferts des migrants accroissent le salaire de réserve de leurs familles restées dans la localité d'origine, leur décourageant ainsi d'offrir du travail sur le

marché domestique ([Azam and Gubert, 2005](#)). La nutrition, pour être productif et compétitif sur le marché du travail, devient dès lors sans intérêt pour les membres de la famille qui reçoivent les transferts des migrants. Cependant, qu'en est-il de la nutrition pour satisfaire aux besoins vitaux ?

Pour expliquer la relation entre le revenu et la nutrition, [Deaton \(2010b\)](#) formule un modèle dans lequel il distingue la consommation de calories à des fins de besoins vitaux et celle exigée par les travaux à forte intensité physique. Dans ce modèle, la productivité des travailleurs dépend de leur force physique qui, elle-même, est fonction de leur consommation de calories. Ainsi, les travailleurs qui exercent une activité à forte intensité physique utilisent plus de calories et gagnent plus d'argent. Selon [Deaton \(2010b\)](#), il arrivera que sur un marché du travail unique avec un salaire commun, l'impact de la force physique sur le revenu, via le travail et la consommation de calories, induira une relation positive entre le revenu et la consommation de calories. Autrement dit, si les individus n'ont pas la possibilité de substitution entre les employeurs, et que la seule contrainte de travail est la force physique, alors ils n'auront pas d'autres choix que d'investir dans leur nutrition productive pour être mieux rémunéré. Cela confirmerait l'hypothèse de la théorie des salaires efficients. Toutefois, à mesure que les salaires réels augmentent, que ce soit dans l'espace ou dans le temps, le travail physique diminuera et la consommation de calories pour le travail diminuera aussi. Avec le temps, plus les individus s'enrichissent, plus le travail manuel n'exigera qu'un minimum de nutriments. A long terme, l'augmentation des revenus sera donc associée principalement à une consommation de calories pour l'amélioration de l'état nutritionnel.

En se référant à cette théorie de [Deaton \(2010b\)](#), les transferts des migrants, en décourageant l'offre du travail des membres de la famille restés dans la localité d'origine, entraîneraient une baisse de leur consommation de calorie à des fins de travaux physiques. Cependant, ils continueront d'augmenter leur consommation de calorie destinée à la satisfaction des besoins vitaux. On peut donc distinguer deux phases : une première dans laquelle les transferts entraînent une baisse de la consommation totale des calories (subsistance et travail), et une deuxième phase dans laquelle ils provoqueront une hausse de cette consommation.

0.2.4 La migration de travail comme solution pour sortir les enfants du piège de pauvreté de la nutrition ?

La question de savoir si les individus sont piégés ou pas dans la pauvreté est l'un des sujets qui opposent les économistes du développement. Pour [Sachs \(2005\)](#), plusieurs personnes dans les pays en développement sont piégées dans la pauvreté du fait de facteurs tels que leur position géographique, ou simplement une mauvaise chance. Cet argument s'oppose à celui de [Easterly \(2006\)](#) qui affirme que plusieurs pays qui étaient auparavant pauvres sont aujourd'hui riches, ce qui ne serait pas le cas s'ils étaient réellement piégés dans la pauvreté. Cependant, ces arguments, bien qu'opposés, portent sur une dimension large du piège de pauvreté. Si l'on restreint l'analyse et qu'on s'intéresse uniquement à la nutrition, peut-on supposer qu'il existe des individus piégés dans la pauvreté à cause d'une sous-alimentation ?

Cette question a été traitée par [Dasgupta and Ray \(1986\)](#) dans un modèle d'équilibre général. Leur modèle stipule que les agents les plus riches sont ceux qui ont plus de chance de trouver un emploi, la raison étant que ces derniers investissent plus dans la nutrition par rapport aux plus pauvres. Il existe, selon ces auteurs, un seuil minimum de revenu en dessous duquel un individu a peu de chance de trouver un emploi, compte tenu de sa nutrition et de sa productivité. En d'autres termes, il existe un niveau de revenu en dessous duquel les individus sont piégés dans la pauvreté (Figure 1). En effet, du fait que le corps humain ait besoin d'un certain nombre de nutriments pour survivre, les individus pauvres n'auront pas d'autres choix que de consacrer le peu de ressources dont ils disposent à la nutrition de base. Cependant, cette nutrition reste insuffisante pour être productif sur un marché de travail à forte intensité physique (par exemple les emplois agricoles). Plus les individus deviennent riches, plus ils vont acheter des aliments, ce qui leur procura non seulement une survie, mais aussi une meilleure productivité de travail.

Si cette thèse paraît solide, [Banerjee and Duflo \(2011\)](#) montrent que, dans les faits, la plupart des personnes, y compris les plus pauvres, sont situées hors de la zone du piège de pauvreté dû à la sous-alimentation. Autrement dit, la plupart des individus dispose du revenu nécessaire pour assurer à la fois la nutrition de subsistance, et celle pour être productive. Toutefois, ces auteurs ne rejettent pas l'idée selon laquelle il existe un piège de pauvreté dû à la nutrition (Figure 1). Considérant la dimension qualitative de la nutrition (utilisation et diversification alimentaire), ils

montrent que les personnes susceptibles de tomber dans le piège sont celles n'ayant pas le pouvoir de décision sur leur nutrition : le fœtus et les enfants. La malnutrition de la mère et de l'enfant peut avoir des conséquences négatives sur la productivité future des enfants, et leur insertion sur le marché du travail. En effet, selon la théorie de [Barker \(1997\)](#), les conditions dans l'utérus ont un impact de long terme sur les capacités cognitives des enfants.

Le piège de pauvreté, selon [Banerjee and Duflo \(2011\)](#), est donc longitudinal car il s'observe durant le cycle de vie d'un individu (de l'enfance à l'âge adulte). Par conséquent, pour éviter que les enfants ne tombent plus tard dans le piège de pauvreté, il convient de leur assurer une bonne nutrition dès leur bas âge. Cela peut se faire via des conseils et des dons d'aliments dotés de bons éléments nutritifs aux femmes enceintes et aux parents ayant des enfants ([Banerjee and Duflo, 2011](#)). Si ceux-ci peuvent provenir des gouvernements et des institutions internationales, ils peuvent également être fournis par un membre de la famille ayant migré vers d'autres localité. En effet, comme expliqué dans la section précédente, la migration est un engagement contractuel implicite entre le migrant et sa famille résidant dans la région d'origine qui oblige le migrant, une fois installé dans le pays de destination, à effectuer des transferts matériels ou immatériels (retour d'expérience, conseils sur les bonnes pratiques alimentaires ...) à cette dernière. Si ceux-ci permettent d'améliorer l'*Entitlement* de ces familles, ils peuvent également contribuer à la réduction de la malnutrition des enfants présents dans celles-ci. En effet, usant de leur expérience dans leur nouveau lieu d'habitation, les migrants peuvent inciter leurs familles restées dans les régions d'origine à adopter de bonnes pratiques alimentaires vis-à-vis des enfants. Les envois de denrées alimentaires riches en composantes nutritives peuvent également contribuer à l'amélioration de la nutrition des enfants dans la famille du migrant.

0.3 Objectifs

Avant de présenter les objectifs de cette thèse, nous commençons d'abord par adopter une définition générale du concept de *sécurité alimentaire*.

La définition de la sécurité alimentaire retenue dans notre analyse est celle de l'organisation des Nations Unies pour l'alimentation et l'agriculture (FAO, 1996) qui stipule que « la sécurité alimentaire est atteinte aux niveaux individuel, familial, national, régional et mondial lorsque tous

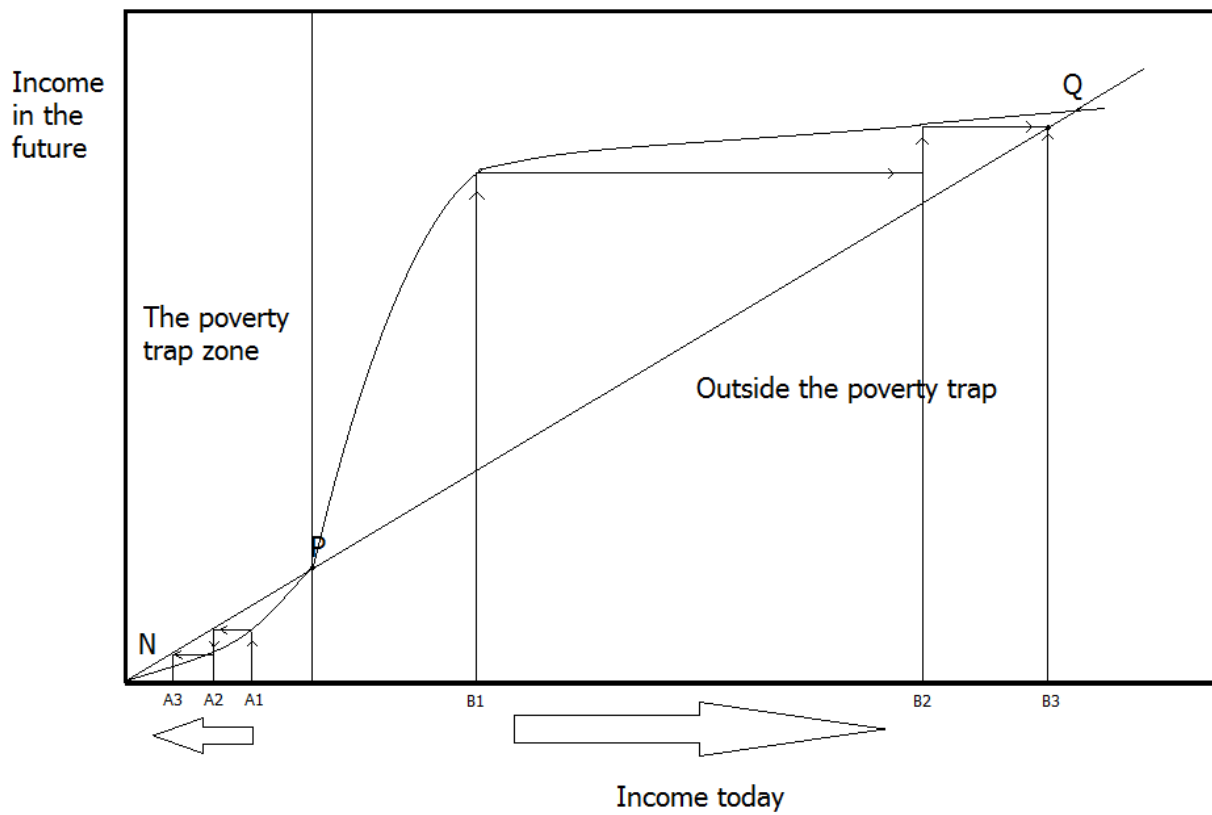


Figure 1: The S-Shape Curve and the Poverty Trap

Source: Banerjee and Duflo, 2011

les individus, à tout moment, ont un accès physique et économique à une nourriture suffisante, saine et nutritive pour satisfaire leurs besoins diététiques et leurs préférences alimentaires pour une vie saine et active ». Cette définition prend en compte trois principales dimensions de la sécurité alimentaire, à savoir : la disponibilité, l'accès et l'utilisation de la nourriture. A ces trois dimensions, s'ajoute une quatrième dimension qui est la stabilité d'accès, de disponibilité, et d'utilisation de la nourriture.

La figure 1 (Zezza et al., 2011) présente une synthèse des potentielles relations entre la migration et chacune des dimensions de la sécurité alimentaire. Elle illustre cinq canaux possibles par lesquels la migration peut impact à court terme les différentes dimensions de la sécurité alimentaire des ménages. Il s'agit notamment de l'effet sur les conditions d'accès (*Entitlement*); de l'effet sur la composition du ménage; de l'effet d'assurance; de l'effet sur les pratiques sanitaires ; et enfin des effets sur l'allocation du temps dans le ménage. En effet, les transferts monétaires et non monétaires effectués par le migrant permettent de baisser le niveau de pauvreté du ménage; ce qui améliore son accès aux produits alimentaires. La migration, en elle-même, se traduit par une baisse de la taille du ménage, qui implique une meilleure répartition de la nourriture dans la famille. Cependant, la perte d'une force de travail dans le ménage, due à la migration, peut se traduire à court terme par une baisse de sa production et donc de la disponibilité des denrées alimentaires, notamment lorsque l'activité est dans l'agriculture. La migration peut aussi garantir une stabilité dans l'accès à la nourriture puisqu'en cas de déficit alimentaire, le ménage peut solliciter l'aide des transferts de fonds du migrant pour se procurer des denrées sur le marché. Elle peut donc être une assurance contre tout choc pouvant provoquer un manque de denrées alimentaires dans le ménage. La migration, à travers les transferts immatériels, prenant la forme des conseils sur les bonnes pratiques alimentaires, peut également favoriser une meilleure utilisation des produits alimentaires. Le migrant peut, par exemple, inciter son ménage à utiliser de l'eau potable et à recourir aux services de santé lorsque les enfants présentent des carences. Enfin, à court terme les charges domestiques des autres membres du ménage peuvent s'accroître du fait du départ du migrant. Par exemple, lorsque le mari émigre, sa compagne peut se retrouver seule à prendre en charge les tâches domestiques et les soins des enfants. La santé et la nutrition de ces enfants peuvent être ainsi négativement affectées.

L'objectif principal de cette thèse est d'analyser empiriquement les différents effets de la mi-

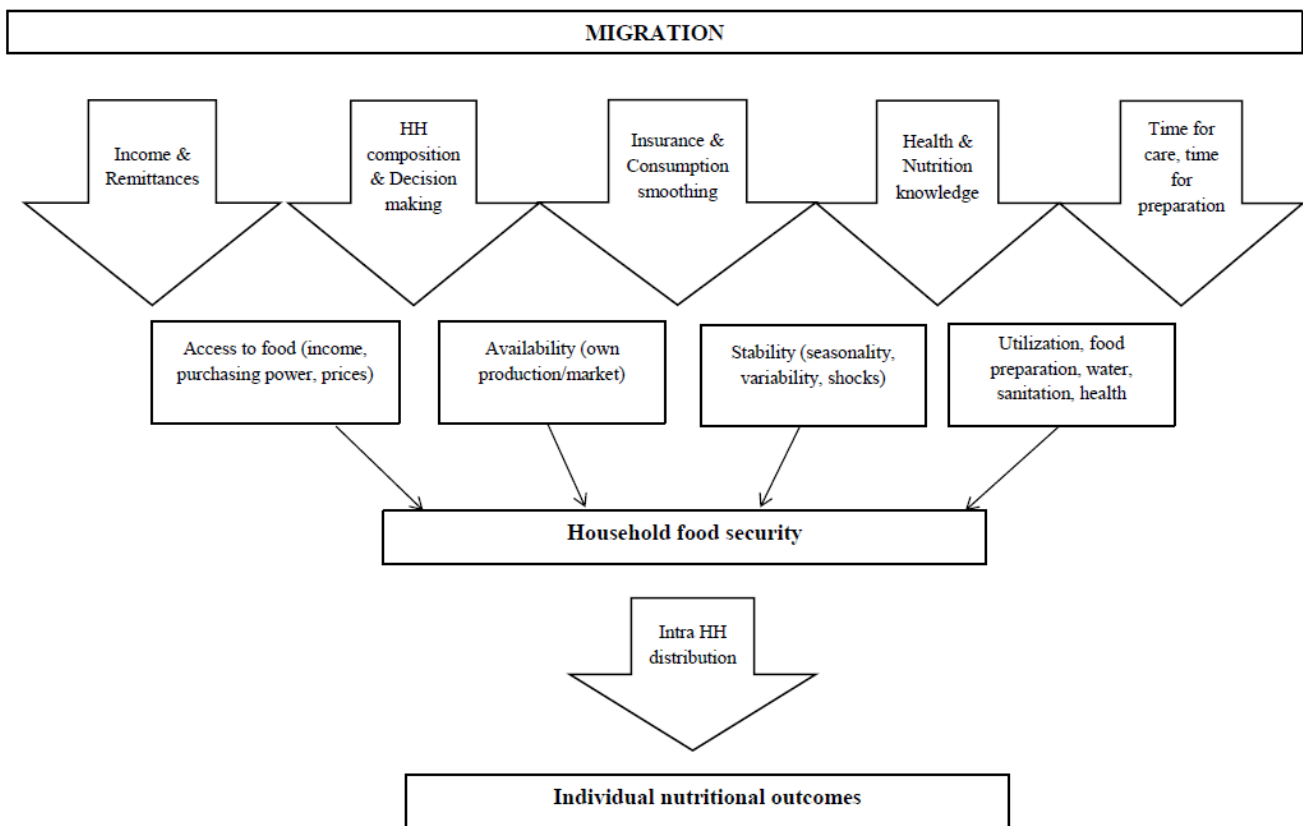


Figure 1: Migration and food security: a simple conceptual framework
 Source: [Zeza et al. \(2011\)](#)

gration sur la sécurité alimentaire des familles restées dans les localités d'origine. Le cas étudié est celui des pays d'Afrique Sub-Saharienne, région qui présente actuellement la prévalence de sous-alimentation la plus élevée. Nous nous focalisons uniquement sur les trois dernières dimensions de la sécurité alimentaire, à savoir l'accessibilité, l'utilisation et la stabilité dans l'accès. En effet, comme expliqué dans la théorie de l'*Entitlement*, l'insécurité alimentaire est plus due à une défaillance dans les conditions d'accès aux produits alimentaires qu'à une indisponibilité de ces produits sur le marché des biens et services. [Banerjee and Duflo \(2011\)](#) argumentent que, de nos jours, la production agricole mondiale est capable de nourrir chaque individu vivant sur la planète. Cela se justifie principalement par de nombreuses innovations technologiques, réalisées dans le secteur agricole, ayant permis l'accroissement de la production des denrées alimentaires. Outre les conditions d'accès, la prise en compte de la dimension « utilisation » (diversification alimentaire) se justifie par la nécessité d'étudier également l'aspect qualitatif de la sécurité alimentaire des individus.

Cet objectif se décline en plusieurs sous objectifs traités dans trois chapitres distincts. Chaque chapitre a été rédigé sous la forme d'un article destiné à une publication dans une revue scientifique en économie. Le premier chapitre a déjà été publié dans le numéro 47-2018 de la revue « *Région et Développement* ». Quant aux deux derniers chapitres, ils seront prochainement soumis pour une publication dans d'autres revues d'économie.

Chapitre 1 : « Comprendre l'effet des transferts internationaux des migrants sur la sous-alimentation dans les pays de l'Afrique Sub-Saharienne »

L'objectif de ce chapitre est d'étudier l'impact des transferts de fonds des migrants sur la prévalence de sous-alimentation pour un panel de 35 pays d'Afrique Sub-Saharienne. Il a pour but de fournir une première réponse sur le rôle que jouent les transferts internationaux des migrants dans le renforcement de l'*Entitlement* en Afrique Sub-Saharienne. Autrement dit, les transferts internationaux de fonds des migrants en direction de ces pays jouent-ils un rôle dans la réduction de la part de la population sous-nourrie ? Si oui, cela est-il valable pour les 35 pays considérés ? Dans le cas contraire, dans quelles conditions les transferts internationaux de fonds des migrants contribuent-ils à la baisse de la proportion des personnes sous-nourries ? Pour répondre à cette dernière question, les 35 pays ont été répartis dans 10 déciles de revenu par habitant, les déciles

inférieurs désignant les groupes de pays à faible revenu par habitant, et les déciles supérieurs désignant ceux à revenu par habitant élevés. L'objectif n'étant pas de refaire la classification selon le revenu de la Banque mondiale mais de vérifier si, selon leur niveau de revenu par habitant, les pays réagissent différemment face aux transferts internationaux reçus de la part des migrants.

Pour déterminer la part d'individus souffrant de sous-alimentation dans chaque pays, nous nous référons à l'indicateur de prévalence de la sous-alimentation de la FAO. Cet indicateur est défini comme la probabilité qu'une personne, choisie au hasard dans la population de référence, consomme moins que le minimum de calories nécessaires pour mener une vie saine et active. Son calcul repose sur la quantité d'énergie nutritive consommée dans un pays au cours d'une année. Cette quantité est estimée à partir des données sur la production alimentaire, les importations nettes et l'utilisation des produits alimentaires.

Chapitre 2 : « Migration, changement de la composition du ménage et sécurité alimentaire : Cas de l'Éthiopie et du Niger »

L'objectif de ce chapitre est d'analyser en profondeur, à partir des données d'enquêtes, l'impact des migrations interne et internationale sur la sécurité alimentaire des ménages restés dans les localités d'origine. Il est principalement question d'étudier l'effet de la migration sur l'accès, la stabilité dans l'accès, et la diversification alimentaire de ces ménages; l'hypothèse émise étant que la migration entraîne une baisse de leur dotation de travail, et donc de leur *Entitlement*, en l'absence des transferts des migrants. Cependant, lorsque ces ménages reçoivent des transferts, leurs conditions d'accès aux denrées alimentaires s'améliorent, ce qui contribuerait à renforcer leur *Entitlement* et de leur sécurité alimentaire. La deuxième hypothèse est que la migration, à travers les transferts immatériels, sous la forme de conseils sur les bonnes pratiques alimentaires, contribue à une amélioration de la diversification alimentaire dans les ménages ayant un migrant. Ce chapitre prend également en compte les changements de la composition du ménage qui interviennent après le processus de migration. En effet, la migration étant un investissement, son financement peut provenir aussi des personnes n'appartenant pas au ménage d'origine du migrant. Celles-ci peuvent rejoindre les ménages concernés dans l'optique de bénéficier des transferts qu'effectue le migrant (Bertoli and Murard, 2019). Aussi, compte tenu du fait que le départ du migrant engendre des tâches domestiques supplémentaires (soin des enfants, travaux ménagers,...) pour les autres

membres, le ménage peut également faire appel à d'autres personnes pour le rejoindre afin de s'occuper de ces tâches. Les nouveaux membres peuvent également être des migrants de retour, ce qui constitue une dotation supplémentaire pour le ménage. Cette dotation, si elle est échangée sur le marché du travail, peut compenser la perte de revenu due au départ du migrant. Ce chapitre vient donc compléter le chapitre 1, plus global, dans la mesure où il prend en compte plusieurs mécanismes qui lient la migration et la sécurité alimentaire des ménages comptant un migrant.

Notre analyse porte sur l'Éthiopie et le Niger, pour lesquels des données d'enquêtes sont disponibles sur le site de la Banque Mondiale. En choisissant, l'Éthiopie et le Niger, dans lesquels l'impact des transferts internationaux des migrants est moins prononcé (Voir chapitre 1), notre objectif est d'étudier également le rôle que pourrait jouer les transferts internes dans l'amélioration de la sécurité alimentaire des ménages. Le choix de ces deux pays est aussi motivé, d'une part, par le fait que les résultats obtenus peuvent être étendus à d'autres pays d'Afrique Sub-Saharienne avec qui, ils partagent les mêmes caractéristiques. En effet, plusieurs pays d'Afrique Sub-Saharienne, tout comme l'Éthiopie et le Niger, consacrent plus de la moitié des fonds reçus des migrants à la consommation courante ([Sambo, 2018](#)). L'Éthiopie présente aussi des similitudes avec d'autres pays d'Afrique de l'Est, où prédomine la migration interne, comme le Kenya et l'Ouganda, pour lesquels en 2010, les proportions de migrants internes étaient respectivement de 60 % et 71 % ([African Migration Project, 2010](#)). Les résultats de l'Éthiopie peuvent donc, dans une certaine mesure, être étendus à ces deux pays. Le choix du Niger est aussi justifié par le caractère 'panel' des données d'enquêtes disponibles, qui permet d'observer le processus de migration et les changements dans la composition des ménages entre deux périodes. Autrement dit, il était possible d'identifier, entre deux périodes, les ménages ayant enregistré un départ et ceux pour lesquels aucun membre n'a migré. D'autre part, il convient de rappeler que le Niger et l'Éthiopie, comme d'autres pays du Sahel et de la Corne de l'Afrique, comptent une longue histoire de crises alimentaires ayant rendu les populations vulnérables au cours du temps, et ayant entraîné des flux migratoires internes et intra-africains.

Les études précédentes qui ont analysé l'impact de la migration et des transferts des migrants sur le niveau de pauvreté (conditions d'accès) ont abouti au consensus selon lequel la migration contribue significativement à une baisse du niveau de pauvreté des ménages comptant un migrant ([Adams and Page, 2003](#); [Yang and Martinez, 2006](#); [Acosta et al., 2008](#); [Gubert et al., 2010](#); [Imai](#)

et al., 2014; Margolis et al., 2015; Bang et al., 2016). Si ce consensus montre que la migration permet d'améliorer les conditions d'accès aux denrées alimentaires des ménages, il ne permet pas de conclure que cette amélioration est suivie d'une amélioration de la diversification alimentaire au sein de ces ménages.

Les travaux ayant traité l'effet de la migration sur la diversification alimentaire des ménages comptant un migrant ont, jusqu'à présent, abouti à des résultats opposés. Dans leur étude sur le Ghana, Karamba et al. (2011) montrent que, dans l'ensemble, la migration n'affecte pas de manière substantielle les dépenses alimentaires totales par habitant des ménages et qu'elle n'a qu'un effet minime sur la structure des dépenses alimentaires. Ils trouvent également que la migration n'augmente les dépenses alimentaires globales que dans les seules régions à fort taux de migration ; cela entraîne un déplacement vers la consommation de catégories d'aliments potentiellement moins nutritifs, comme le sucre, les boissons et les repas déjà préparés. L'étude de Karamba et al. (2011), (2011) conclut donc à un effet négatif de la migration sur la diversification alimentaire. A l'opposé, les résultats obtenus par Nguyen and Winters (2011) indiquent que la migration de court terme a un effet positif sur les dépenses alimentaires globales par habitant, la consommation calorifique par habitant et la diversification alimentaire. Ils montrent également que la migration de long terme est liée positivement à la consommation, mais son impact est souvent non significatif et d'une ampleur moindre que celle de la migration de court terme.

L'insuffisance majeure de ces deux études réside dans le fait qu'elles se basent sur la structure des dépenses alimentaires du ménage, et non sur la structure des fréquences de consommation de catégories d'aliments. En effet, généralement dans les enquêtes socio-économiques, il est demandé aux ménages de reporter leurs dépenses alimentaires durant les 7 derniers jours. Or, certains ménages peuvent effectuer des dépenses groupées afin d'étaler leur consommation sur l'ensemble du mois. Les dépenses alimentaires sur une semaine peuvent donc ne pas refléter la consommation réelle des ménages du produit acheté durant cette semaine. Cela est d'autant plus vrai pour les denrées de base (riz, pâtes, ...) et les légumineuses. De même, un ménage disposant déjà d'un produit en stock peut décider de ne pas en acheter durant la semaine où il a été interviewé. Cela crée donc un biais dans l'utilisation de la structure des dépenses alimentaires comme mesure de la consommation et de la diversification alimentaire.

Contrairement aux études précédentes, nous utilisons les fréquences de consommation de différentes

catégories d'aliments pour mesurer la consommation réelle et la diversification alimentaire des ménages. Ainsi, nous construisons, à partir de ces fréquences, le score de consommation alimentaire (Food Consumption Score, FCS), qui est l'indicateur phare du Programme Alimentaire Mondiale (PAM). Pour analyser la stabilité dans l'accès aux denrées alimentaires durant les chocs (sécheresse, inondation, . . .), nous utilisons un indice des stratégies de survie³ en temps de pénurie alimentaire. Cet indice a été mis en place par Maxwell (1996) dans le but d'identifier les localités vulnérables durant les crises, et d'améliorer l'intervention des organisations internationales. Notre étude a également l'avantage de distinguer les effets de différents types de migration, à savoir : la migration de travail, la migration pour les études, les rapatriements familiaux, les migrations forcées, . . .

Chapitre 3 : « Migration, transferts des migrants et statut nutritionnel des enfants »

Comme montré dans la section précédente, la malnutrition des enfants peut les entraîner vers un piège de pauvreté plus tard dans leur vie active. Elle est aussi un bon indicateur pour mesurer l'utilisation de la nourriture au sein du ménage. En effet, comme les enfants n'ont pas de pouvoir de décision sur leur consommation alimentaire, leur statut nutritionnel dépendra d'une bonne utilisation de la nourriture par les adultes dans le ménage.

Ce chapitre vise à étudier, dans quelle mesure la migration, via les transferts des migrants, peut prévenir ces enfants de ce piège de pauvreté. Il analyse principalement l'impact des transferts des migrants sur la malnutrition des enfants dans les ménages comptant un migrant. Le cas étudié est celui du Burkina-Faso. Le choix de ce pays est motivé, d'une part, par sa longue tradition de migration vers la Côte d'Ivoire, un pays voisin, et vers d'autres pays d'Afrique. Cette longue tradition de migration s'est traduite aujourd'hui par un stock élevé de migrants burkinabés en Côte d'Ivoire, permettant d'identifier l'échelle du réseau de migration des burkinabés et de prédire les flux futurs. D'autre part, parmi les données d'enquête disponibles sur le site de la Banque mondiale, ce sont celles du Burkina-Faso qui permettent une meilleure analyse de l'impact de la migration sur la nutrition des enfants dans les familles comptant un migrant. Notons également

³Les stratégies de survies potentielles pendant une pénurie alimentaire sont les suivantes : (1) Limiter la variété des aliments consommés ; (2) Limiter les portions à l'heure des repas ; (3) Réduire le nombre de repas consommés dans une journée ; (4) Restreindre la consommation des adultes pour que les enfants puissent manger ; (5) Emprunter de la nourriture ou compter sur l'aide d'un ami ou d'un parent ; (6) Ne pas avoir de nourriture d'aucune sorte dans votre ménage ; (7) Passez toute une journée et toute une nuit sans rien manger.

que le taux de malnutrition chronique dans ce pays fait partie des plus élevés en Afrique Sub-Saharienne. L'enquête nationale sur la nutrition en 2014 estimait à 29.1 % la proportion d'enfants souffrant d'une malnutrition chronique au Burkina-Faso.

Pour mener notre analyse, nous utilisons trois mesures anthropométriques du statut nutritionnel des enfants : le z-score du poids par rapport à la taille (WHZ), le z-score du poids par rapport à l'âge (WAZ) et le z-score de la taille par rapport à l'âge (HAZ). Chacun de ces scores est associé à des types spécifiques de malnutrition. Le rapport poids/taille et le rapport poids/taille d'âge indiquent une mauvaise santé due à la malnutrition aiguë actuelle, tandis que le faible rapport poids/taille d'âge indique une malnutrition (chronique) de longue durée. Ce dernier indicateur mesure également la croissance de l'enfant dans le temps. Dans notre analyse, l'échantillon d'âge considéré est celui des enfants de moins de 5 ans. Ils sont considérés comme dépourvus de pouvoir de décision sur leur nutrition, laquelle dépend étroitement de leurs parents. Dans ce chapitre, nous prenons également en compte les caractéristiques socio-économiques de la mère, qui représentent un déterminant fondamental de la nutrition des enfants. L'accent est particulièrement mis sur son niveau d'éducation.

0.4 Résultats et principales contributions

Notre analyse a débouché sur plusieurs résultats, validant les hypothèses théoriques et permettant de comprendre, en économie, les relations entre la migration et la nutrition.

Les transferts internationaux des migrants vers leurs pays d'origine contribuent à la réduction de la proportion de personnes sous-alimentées.

Le premier résultat et la première contribution de cette thèse est de montrer que les transferts internationaux des migrants jouent un rôle positif dans la baisse de la prévalence de sous-alimentation dans les pays d'origine des migrants. Cet impact, bien que faible, dépasse celui du PIB par habitant, démontrant ainsi que les transferts internationaux profitent plus à la couche sociale défavorisée que le PIB par habitant, peu inclusif. En effet, l'élasticité de la sous-alimentation aux transferts internationaux des migrants est deux fois plus élevée que celle du PIB par habitant. Les transferts internationaux des migrants permettent ainsi, au niveau macroéconomique, un meilleur accès aux

denrées alimentaires dans les pays récipiendaires.

L'analyse montre également que les transferts internationaux permettent de réduire l'effet négatif des inondations sur la prévalence de sous-alimentation. Ils constituent de ce fait une assurance contre les chocs alimentaires dans les pays d'Afrique Sub-Saharienne considérés dans notre analyse. Ce résultat permet de confirmer, sous l'angle de la nutrition, la fonction d'assurance des transferts internationaux déjà observée par [Clarke and Wallsten \(2003\)](#).

La décomposition des pays par déciles de revenu par habitant montre que l'impact des transferts internationaux des migrants est plus prononcé dans un pays lorsque son PIB annuel par habitant est compris entre 420 USD et 518 USD, soit le quatrième décile de revenu. Entre 2006 et 2007, les pays ayant appartenu à ce décile étaient : le Burkina-Faso, la Gambie, la Guinée, le Mozambique, la Sierra-Léone, le Malawi, et Madagascar. Dans les pays à revenu annuel par habitant inférieur à 420 USD (Exemple en 2011: l'Ethiopie, la Guinée, le Libéria et le Niger), on observe un impact plus faible des transferts internationaux des migrants sur la prévalence de sous-alimentation. Ce faible impact s'explique par le fait que, pour ces pays, la probabilité pour les ménages les plus pauvres d'avoir des migrants internationaux est faible, compte tenu du coût élevé de la migration internationale. Dans ces pays les plus pauvres, ce ne sont pas les ménages les plus pauvres qui bénéficient des transferts internationaux, ce sont plutôt les ménages les plus aisés qui ont pu envoyer un migrant. De même, on observe un impact modéré des transferts internationaux des migrants dans les pays dont le revenu annuel par habitant est supérieur à 518 USD (Exemple: l'Uganda en 2008 et 2010, et le Kenya en 2010). Cet impact modéré des transferts internationaux des migrants se justifie par le fait que, dans ces pays, les ménages récipiendaires des fonds les consacrent plus à l'éducation, à la santé, et à l'investissement privé.

La seule migration sans contrepartie a un effet négatif sur l'accès et la diversification alimentaire des ménages. Toutefois, cet effet négatif est compensé par la réception des transferts effectués par le migrant, et par l'arrivée d'un nouveau membre dans le ménage.

Nos résultats montrent que, dans le cas de l'Éthiopie, la seule migration sans transfert a un effet négatif sur l'accès et la diversification alimentaire des ménages. L'une des contributions originales de notre étude est de préciser le type de migration qui induit cet effet négatif. Il s'agit des

migrations qui ne produisent pas (ou produisent peu) de transferts aux ménages notamment les rapatriements familiaux, les migrations forcées, les migrations pour les études, . . . Par contre, les migrations de travail, engendrant des transferts des migrants (matériels et immatériels), entraînent une amélioration de l'accès et de la diversification alimentaire des ménages. Lorsque le ménage dispose à la fois d'un migrant de travail et d'autres types de migrants, l'effet négatif de l'ensemble de la migration en son sein est compensé par la réception des transferts de la part du migrant de travail. Autrement dit, les transferts permettent de compenser la perte de la dotation de travail, et donc du revenu, due au départ du migrant. Quant au Niger, nous obtenons un effet non significatif de la migration sur la diversification alimentaire des ménages sur la période 2011-2014. L'expérience de la migration étudiée limitée à trois ans, contrairement à l'Éthiopie où elle était d'au minimum huit ans, peut expliquer ce résultat.

Nous montrons aussi que l'arrivée d'un nouveau membre dans le ménage, non seulement affecte positivement son accès et sa diversification alimentaire, et compense l'effet négatif du départ du migrant en Éthiopie. Ce n'est pas le cas au Niger, où les nouveaux membres sont pour la plupart des nouveau-nés. Autrement dit, l'arrivée de nouveaux membres dans les ménages n'agit significativement sur leur accès et leur diversification alimentaire que si ceux-ci compensent la perte de la dotation de travail due au départ du migrant. Cela se fait à travers la prise en charge des tâches domestiques qui incombait au migrant, ou par une participation au marché du travail qui va générer des revenus supplémentaires au ménage.

La migration assure une stabilité d'accès aux denrées alimentaires lorsqu'un déficit alimentaire survient dans le ménage.

L'analyse sur les stratégies de survie, en temps de pénurie alimentaire en Éthiopie, montre que les ménages éthiopiens ayant un migrant auraient adopté des stratégies de survie plus sévères (passer par exemple toute une journée sans manger) s'il n'avait pas eu de migrant. Le migrant constitue donc une assurance pour ces ménages lorsque ceux-ci font face à une pénurie alimentaire, due à une forte détérioration de leur *Entitlement*. Cet effet de la migration s'explique parce que les ménages comptant un migrant sollicitent l'aide de ce dernier lorsqu'ils ont des difficultés pour se procurer de la nourriture. Le migrant effectue donc des transferts à son ménage d'origine pour l'aider à faire face à la pénurie alimentaire. Toutefois, notons que les transferts des migrants éthiopiens

proviennent essentiellement de la migration interne. Ainsi, cet effet significatif de la migration, observé en Éthiopie, est celle de la migration interne. La migration internationale, comptant moins de 5 % de la population de migrants dans les données de l'ESS3⁴, n'a aucun impact significatif sur la stabilité d'accès aux denrées alimentaires par les ménages. Ce résultat confirme le faible impact des transferts internationaux des migrants, obtenu dans le chapitre 1, dans les pays à faible revenu par habitant dont faisait partie l'Éthiopie. La migration procure donc à ces ménages une stabilité dans l'accès aux denrées alimentaires.

A l'inverse, si l'arrivée d'un nouveau membre dans le ménage, venant remplacer le migrant, s'avère être bénéfique pour l'accès et la diversification alimentaire des ménages dotés d'un migrant, elle représente un fardeau pour ceux-ci en temps de crise. En effet, l'arrivée de ce nouveau membre vient augmenter la taille du ménage, ce qui implique une répartition supplémentaire de la nourriture. Dès lors, les stratégies de survie en temps de pénurie alimentaire deviennent plus sévères. Par exemple, le ménage ayant reçu un nouveau membre peut passer, en temps de crise, d'une limitation de la variété des aliments consommés à une réduction du nombre de repas consommés dans une journée. Par conséquent, l'arrivée d'un nouveau membre dans le ménage réduit l'effet d'assurance de la migration dans les ménages ayant un migrant.

La migration, à travers les transferts matériels et immatériels des migrants (conseils sur les pratiques alimentaires), permet d'améliorer la nutrition des enfants dans les ménages d'origine du migrant.

Plusieurs études ont déjà tenté d'étudier l'impact de la migration sur la santé et le statut nutritionnel des enfants dans les ménages d'origine du migrant. Si la plupart de ces études concluent à un effet positif de la migration sur la santé et la nutrition de ces enfants (Ssengonzi et al., 2002; Hildebrandt et al., 2005; Adams and Cuecuecha, 2010; Antón, 2010; Frankel, 2011; Carletto et al., 2011; Ponce et al., 2011), d'autres observent plutôt l'effet inverse (Gibson et al., 2011; De Brauw and Mu, 2011). Il n'existe donc pas dans la littérature un consensus sur l'impact de la migration sur la nutrition des enfants.

Notre analyse sur le Burkina-Faso montre que la migration a un effet positif sur la nutrition des enfants présents dans les ménages d'origine du migrant. En effet, les transferts effectués par les

⁴Third Ethiopian Socioeconomic Survey

migrants permettent d'améliorer le statut nutritionnel de ces enfants, en contribuant notamment à une baisse de leur malnutrition aiguë et de leur malnutrition chronique (frein à leur croissance). La migration favorise donc une meilleure utilisation de la nourriture dans les familles ayant un migrant. Si les transferts des migrants comprennent à la fois les transferts matériels (argents, nourriture, . . .) et les transferts immatériels (correspondant aux conseils sur les bonnes pratiques alimentaires), seuls les premiers étaient observables dans les données.

L'effet positif de la migration sur le statut nutritionnel des enfants dans les ménages dotés d'un migrant nous permet de supposer que celle-ci peut contribuer à prévenir ces enfants d'un futur piège de pauvreté dû à la malnutrition de base. Cependant, la vérification de cette hypothèse est limitée par l'indisponibilité des données longitudinales permettant de suivre les individus ayant bénéficié des transferts de fonds durant leur enfance.

**Understanding the effect of international
remittances on undernourishment in
Sub-Saharan Africa: A spatial model approach**

1.1 Introduction

For years, the relationship between income and nutrition has yielded a debate among researchers in development economics. According to the Engel curve, a rise of household incomes leads to a substitution of food quantity for food quality, which implies an increase in demand for calories. Therefore, the elasticity of calorie consumption to income is greater than zero (Subramanian and Deaton, 1996a). However, different studies have found that this elasticity is close to zero (Behrman and Deolalikar, 1987; Bouis and Haddad, 1992), meaning that an increase of income doesn't lead to a significant increase in calorie consumption. More recently, based on facts in India, Deaton and Drèze (2009) have found that in spite of a high growth rate of per capita income and per capita consumption, per calorie consumption has been falling for a quarter of the century. One explanation given by the authors is that an increase of per capita income has probably led to a move out of the agricultural sector into modern industry, resulting in a fall of calorie consumption needed in support of heavy physical labor which in turn reduce the total calorie consumption. Indeed, considering that people use calories for two purposes, own nutrition and heavy physical labor, Deaton and Drèze (2009) argue that in a single labor market with a common wage, the relationship from strength to income through work and calorie consumption will induce a positive relationship between income and calorie consumption. However, a rise of real wages will induce a decline in physical labor leading to a fall in calorie consumption even as the calorie consumption for improving nutritional status is increasing albeit at a smaller pace. However, this analysis does not take into account the preferences of individuals for other aspects of food, namely taste, appearance, odor, status value or cultural preference. When these preferences are taken in account, it is likely that additional incomes do not induce a significant improvement in calorie intake even though there is a rise in food consumption (Behrman and Deolalikar, 1987). This is because a part of the money is spent to get more calories and the other to get tasty foods which are more expensive. More recently, Banerjee and Duflo (2011) have provided a detailed analysis of the food consumption behavior of poor households. They argue that people eat little not because they are too poor to buy foods but because it is not clear that the additional productivity translates into higher earnings if employers do not know that a well-nourished worker is more productive. Indeed, if employers pay the same wage to all workers, then there would be no reason to eat more

and get stronger. People also do not know that their good nutrition leads to a better health for their children. Therefore, the poor typically choose their foods not for their nutritional values, but for how good they taste. From this perspective, it is not surprising that, with additional income, the poor choose to consume tasty foods rather than nutritious foods. [Banerjee and Duflo \(2011\)](#) also pointed out that there are other things more important in the lives of the poor than food due to social pressures or social contexts, especially in developing countries. These things include weddings, dowries, and christenings. Given those many additional pressures and desires competing with food, it is then likely to see that the poor do not eat any more or any better when their income goes up.

In recent years, migrant remittances have experienced strong growth in developing countries, outpacing public development aid. Since these transfers are directly sent to individuals and act in the form of supplementary income, the question arises whether, given the relationship between income and calorie consumption, such transfers have an effect on calorie consumption in developing countries. According to the *new economics of labor migration*, the migration decision is made among households in order to minimize their risks and overcome limitations occurred as a consequence of the failures of the national markets ([Stark, 1991](#)). In turn, families abroad send remittances which have a positive impact on the economics of poor. The effect of remittances on poverty is well-documented in the economic literature. Researchers agree that remittances contribute to the reduction of poverty in receiving countries ([Imai et al., 2014](#); [Margolis et al., 2015](#); [Bang et al., 2016](#)). However, as described above, the reduction of poverty does not necessarily lead to additional calorie consumption. In addition, most of these studies have focused on monetary poverty instead of looking at a more broadly defined multidimensional poverty, which includes to some extent the outcomes of good nutrition. Other studies have analyzed the effect of remittances on food consumption. [Adams and Cuecuecha \(2013\)](#) have found in their study in Ghana that food consumption increase with the receipt of remittances. However, households receiving remittances spend less at the margin on food. Remittances have also been found to dampen the impact of the positive food price shock and food price instability on household consumption in vulnerable countries the majority of which are in Sub-Saharan Africa ([Combes and Ebeke, 2011](#); [Combes et al., 2014](#)). But these studies do not make it possible to know the real impact of remittances on the calorie consumption. Existing studies on the relationship between remittances and nutrition

are more often directed towards nutritional or health status of children ([Hildebrandt et al., 2005](#); [Antón, 2010](#)) rather than global undernourishment.

This paper attempts to fill the gap in the literature by investigating the impact of remittances on undernourishment in Sub-Saharan Africa, a region which contains a large number of developing and impoverished countries. Indeed, despite the continuous decrease of undernourishment in Sub-Saharan Africa, the region is the one with the largest proportion of undernourished in the world. According to FAO (2015), between 2014 and 2016, 23.2% of the population was estimated to be undernourished in Sub-Saharan Africa, compared to 12.1% in Asia and 5.5% in Latin America and the Caribbean (LAC). At the same time, remittances received in Sub-Saharan Africa were estimated at 34.8 billion USD in 2015 (World Bank).

Our analysis is conducted with a panel of 35 Sub-Saharan African countries. To estimate the impact of remittances on undernourishment, we use the generalized moments estimator for autoregressive spatial panel developed by [Kapoor et al. \(2007\)](#). The reason behind this choice was the possibility of accounting for random shocks (price spikes, droughts, floods,...) which are usually spatially autocorrelated. Indeed, when spatial units are spatially autocorrelated, usual panel regression models produce an inconsistent estimate of the parameters ([Gallo, 2007](#)). Our findings suggest that the reception of remittances results in a decrease of the proportion of undernourished in Sub-Saharan Africa. This result is explained by the fact that most of the households receiving remittances in Sub-Saharan Africa dedicate them to consumption. However, the elasticity of nutrition to remittances is very small even though exceeding that to GDP per capita. Remittances were also found to be a hedge against flood shocks in Sub-Saharan Africa. We also find that GDP per capita, domestic credit, and private investment contribute to a reduction of the proportion of undernourished in the region. In addition, having a greater share of agricultural land also leads to a significant reduction of the proportion of undernourished in Sub-Saharan Africa. Grouping countries by decile of per capita GDP, we found that the impact of remittances on undernourishment is low in both the top and the bottom GDP per capita deciles. However, the impact is much higher in decile 4 for which the per capita GDP is between 420 USD and 518 USD. This result can be explained by the fact that people in bottom deciles countries compared to those in decile 4 cannot afford international migration costs leading to less migration and fewer remittances in bottom deciles. In addition, the countries in the bottom deciles are those suffering the most from undernourishment.

In top deciles countries, the money received from migrants is more devoted to education, health-care and investment rather than consumption. This explains the smaller effect of remittances in the top decile countries.

The paper is structured as follows, Section 2 describes the trend of four income flows and that of the prevalence of undernourishment from 1990 to 2015, and Section 3 provides an understanding of the use of remittances in Sub-Saharan Africa. A description of the data and the methodology is presented in Section 5. In Section 6, we outline the main results and conclude in Section 7.

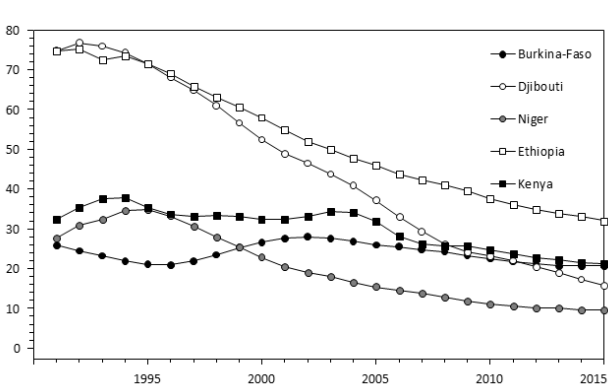
1.2 Income flows and undernourishment in five selecting countries from 1990-2015

In this section, we analyze the trends of four income flows and that of undernourishment¹ in five sub-Saharan African countries from 1990 to 2015. We focus on two types of income flows: external flows which include official development assistance, foreign direct investment and remittances; and one internal income flow, a country's per capita GDP. Figure 1.1 shows that, compared to Burkina Faso and Kenya, where undernourishment has not declined significantly from its 1990 level, in Djibouti, Niger, and Ethiopia, there has been a sharp drop from 1994 onwards. All five countries, however, have experienced considerable growth in per capita GDP since 2000. Per capita GDP growth, therefore, does not explain the decline in undernourishment observed from 1994. However, it cannot be denied that it contributed to the decline in the level of undernourishment from 2000 onwards in some countries. For example, Ethiopia, the country with the highest per capita GDP growth over the period, is also the country that has seen its level of undernourishment shrink considerably, catching up and even falling below the level of undernourishment in Burkina Faso and Kenya. However, despite Kenya's strong per capita GDP growth, nutrition has not improved significantly in the country. Moreover, Niger, which saw its level of undernourishment decline significantly from 1994 onwards, experienced only a small increase in its per capita GDP. Theories supporting the notion that the income elasticity of calorie consumption is close to zero are verified for Kenya (Behrman and Deolalikar, 1987; Bouis and Haddad, 1992) while those in favor of zero

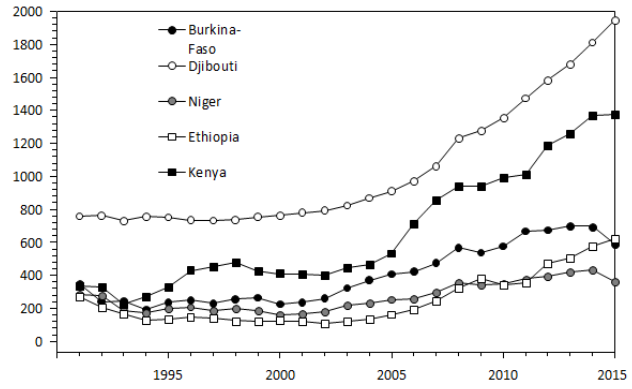
¹Undernourishment is measured by the FAO prevalence of undernourishment index which is defined as the probability that a randomly selected individuals from the reference population is found to consume less than 1,800 calories a day, a minimum requirement for an active and healthy life

elasticity can be confirmed for Ethiopia ([Subramanian and Deaton, 1996a](#)). If the per capita GDP has a controversial effect on undernourishment in the five countries, what about migrant's transfers?

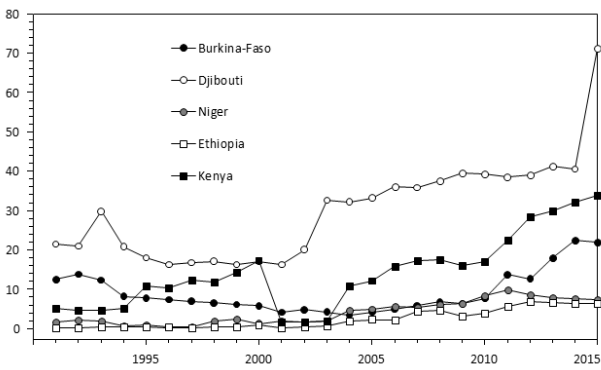
Figure 1.1 shows a strong correlation between migrant remittances and per capita GDP, with the growth phases of GDP per capita coinciding with those of migrants' remittances. In addition, countries with high growth rates are also those with high remittances. Since the trend in long-distance transfers is the same as that of GDP per capita for all countries, the same conclusions can be drawn as above. This is justifiable because remittances operate in the form of supplementary income to the households, although the uses may be different. The literature also shows that migrant remittances have a positive impact on economic growth ([Pradhan et al., 2008](#); [Nsiah and Fayissa, 2013](#); [Driffield and Jones, 2013](#); [Zghidi et al., 2016](#)).



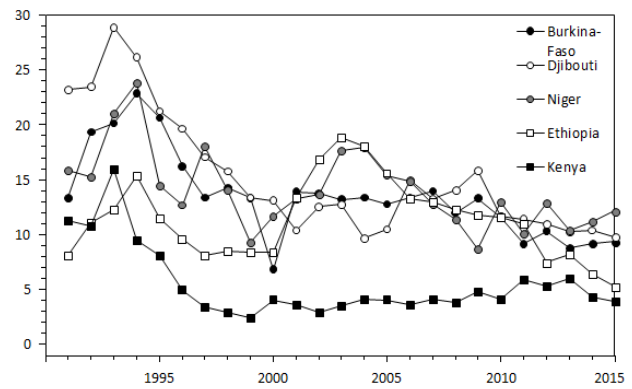
(a) Prevalence of undernourishment



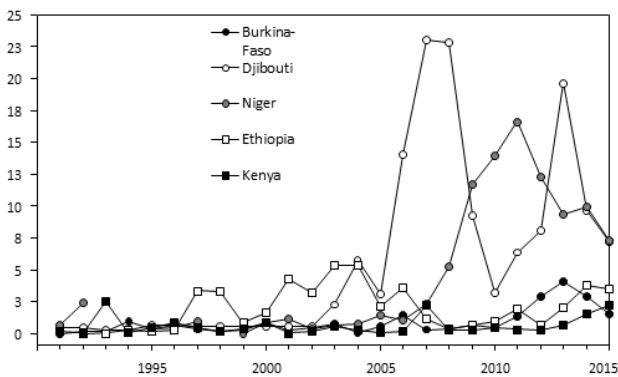
(b) GDP per capita



(c) Remittances per capita



(d) Official development assistance



(e) Foreign direct investments

Source: Author

Figure 1.1: Trend of undernourishment and four income flows in a selecting countries

While migrant remittances and per capita GDP have contributed to the decline in undernourishment in some countries from 2000 onwards, it does not explain the decline in undernourishment observed

in 1994 in Djibouti, Niger, and Ethiopia. What then explains this decline in 1994? One possible explanation would be that, following the increase in undernourishment in 1990, aid has increased to save countries from a probable famine (very high undernourishment), which explains why the decline in 1994 coincides with the decline in development aid (Figure 1.1). If we assume that development aid played a role in reducing undernourishment in 1994, what about foreign direct investment (FDI)?

The inspection of Figure 5 shows that it is difficult to establish a link between FDI and undernourishment in the five countries. The only countries where FDI has grown considerably are Niger and Djibouti, starting later in 2005 after the onset of the decline in undernourishment. Moreover, the decline in FDI in Ethiopia, after the financial crisis of 2007, did not lead to an increase in undernourishment.

Although this analysis cannot be generalized to all sub-Saharan African countries, it provides an initial idea of the impact of these different income streams on undernourishment.

1.3 The uses of remittances in Sub-Saharan Africa

As argued by Deaton (2010a), learning about development requires the investigation of mechanisms. Understanding how the money sent by migrants are spent in Sub-Saharan may help to respond to the question on whether remittances contribute to the reduction of undernourishment in the region. In this section, we investigate the uses of remittances, basing on surveys that were conducted in most Sub-Saharan Africa countries.

In order to understand the development impact of remittances, in 2006, the Southern Africa Migration Project (SAMP) devised a migration-remittances survey in 5 SADC² countries: Botswana, Lesotho, Mozambique, Swaziland, and Zimbabwe (Pendleton et al., 2006). The survey reveals that across the five countries, remittances are mostly used for food purchases, following school fees, clothing and transportation (Table 1.1). Indeed, 82% of households used received money to buy food while 52%, 52%, and 34% devoted money respectively to school fees, clothing, and transportation. However, while food remains the main item that remittances are used for, there is little change in the rank of other uses of money for different countries. In Botswana, Lesotho,

²Southern African Development Community

and Zimbabwe, clothing is the second largest category which remittances are mostly devoted to (63% of households in Botswana, 76.1% in Lesotho and 57%). Regarding, Mozambique and Swaziland, school fees are the second largest item that remittances are spent on (49% of households in Mozambique and 55% in Swaziland). It is important to note that households claiming to spend their remittances on food may also use them for other purposes. Therefore, the sum of the share of household using remittances for different expenditures is not expected to be equal to 100%.

In 2008, a survey on remittances in Uganda was also conducted by the Bank of Uganda and the Uganda Bureau of Statistics. In contrast to SADC countries, it was found from this survey that remittances are mostly used for spending on education in Uganda (27.4% of the total amount of received cash) (Table 1.2). Nevertheless, there is less difference with the share of cash used in household expenditure (food, clothing,...) which counts for 22.7% of total received remittances. Work on buildings is also one major item to which remittances-received households devote an important share of the money they received from migrants (21.2% of the total amount of received cash). Land purchase, business and saving was ranked respectively fourth, first and sixth use of remittances.

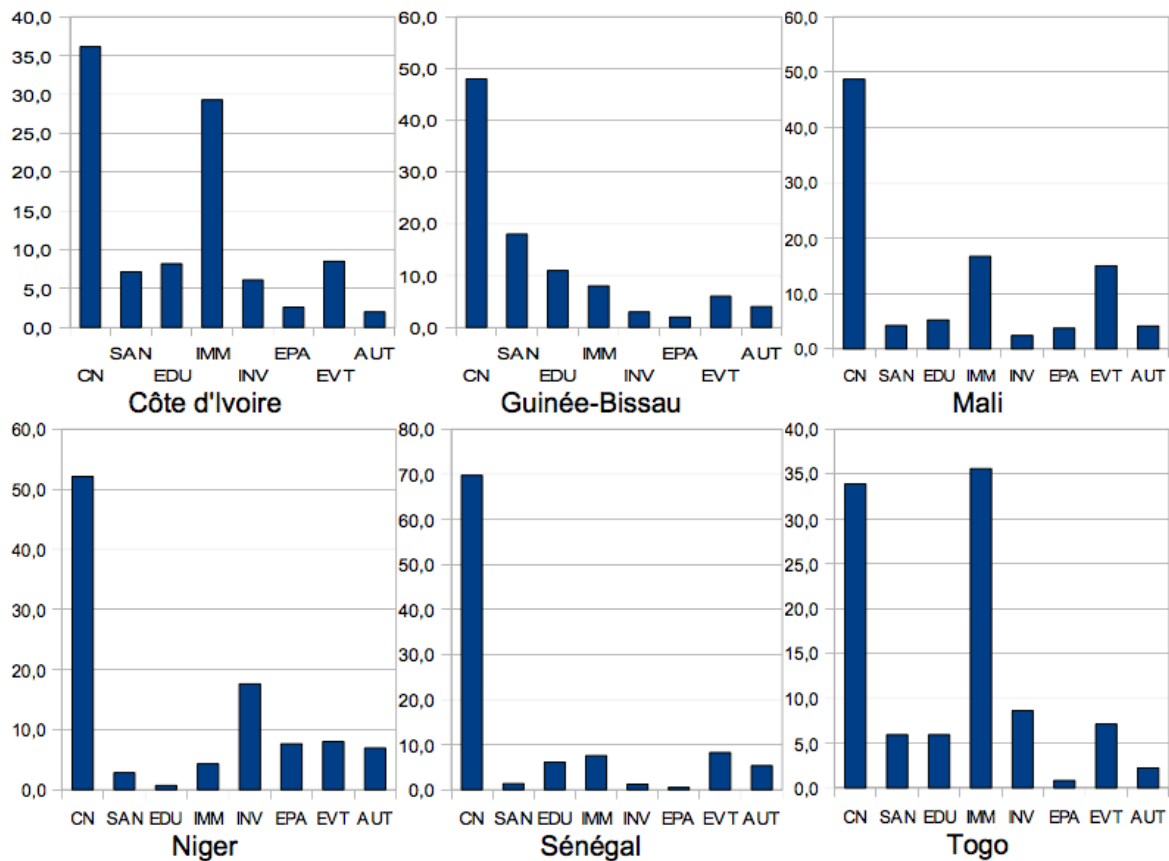
Following the survey in Uganda, the World Bank conducted a survey in three East African countries including Uganda through a Future of African Remittances Team in 2010. The two other countries in which the survey was conducted are Ethiopia and Kenya. In contrast to the above survey, the World Bank survey of 2010 reveals that remittances are mostly spent in small business (35% of total remittances), followed by education (25% of total remittances) and daily expenses (24% of total remittances) in Uganda. However, both World Bank and Bank of Uganda's surveys show that consumption is not the first use of remittances in Uganda. The World Bank survey also showed that, in Kenya, the money received from migrants is mostly devoted to migrant physical investment (27% of total remittances), followed by new house building (18% of total remittances) and land purchase (15% of total remittances). Food purchases count only for 2% of total remittances received in Kenya. However, in Ethiopia, more than a half of total amount of remittances is devoted to daily expenses. Education and small business count respectively for 29% and 9% of the total money received from migrants in the country.

In 2010, BCEAO ³ have also performed a survey on remittances in the countries of the union:

³Central Bank of West African Economic and Monetary Union (WAEMU)

Benin, Niger, Burkina-Faso, Senegal, Togo, Mali, Guinea-Bissau and Côte d'Ivoire (BCEAO, 2013). The survey indicates that household receiving remittances spend more than a half of the received money on consumption in the region. Indeed, 54.6% of the money received is spent on consumption while 21.3% is spent on investment and 3.4% and 6.4% respectively on health-care and education. However, heterogeneity in the use of remittances occurs within the countries of the Union. In Benin, 29.6% of remittances are devoted to consumption, 23% to property investments and 28.1% to other investments. Burkina-Faso and Côte d'Ivoire follow the same pattern in the use of money received from migrants. Indeed, remittance-receiving households in Burkina-Faso spend 37.3% of remittances on consumption, 25.7% on property investments, 16.3% on other investments and 15% on education, while those of Côte d'Ivoire spend 36.2% of remittances on consumption and 29.3% on property investments. The WAEMU's country with the largest share of remittances spent on consumption is Senegal, with 70% of received money spent in consumption and only 7.6% in property purchase and 7.4% in education and health-care. Senegal is followed by Niger, Mali and, Guinea-Bissau in which consumption expenditures hold respectively 52.1%, 48.7% and 48% of total remittances received by each country. In Niger, only 2.8% and 0.7% of remittances are used respectively in health-care and education. In Mali, 5.2% of the money received is devoted to education while 4.2% is devoted to health-care. In Guinea-Bissau, education expenditures and health-care expenditure count respectively for 11% and 18% of total remittances. In contrast to the rest of WAEMU's countries, remittance-receiving households in Togo spend more on property investments (35.6% of the total money received). However, there is less difference with a share of money used for consumption which counts for 33% of remittances.

Although remittances are mostly spent on consumption, it is still not enough to conclude that they lead to a significant calorie consumption and thus a reduction of the proportion of undernourished in the Sub-Saharan region. Indeed, as underlined above, rising food consumption may not necessarily provoke a significant improvement in calorie consumption which depends on the nutrients intake.



Notes : CN : consommation ; SAN : santé ; EDU : éducation ; IMM : investissement immobilier ; INV : autres investissements ; EPA : épargne ; EVT : événements familiaux/religieux ; AUT : autres.

Source : BCEAO

Figure 1.2: The uses of remittances in WAEMU's countries (2010)

Table 1.1: Use of remittances in southern Africa (2006)

	Botswana		Lesotho		Mozambique		Swaziland		Zimbabwe		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
School fees	264	42.9	572	56.0	336	49.1	549	54.9	385	54.6	2106	52.3
Food	538	87.5	912	89.3	479	69.9	834	83.4	534	75.7	3297	81.9
Clothing	387	62.9	777	76.1	298	43.5	240	24.0	399	56.6	2101	52.2
Seed	15	2.4	249	24.4	180	26.3	444	44.4	80	11.3	968	24.0
Fertiliser	7	1.1	189	18.5	9	1.3	342	34.2	66	9.4	613	15.2
Tractor	9	1.5	128	12.5	6	.9	397	39.7	9	1.3	549	13.6
Oxen for ploughing	3	.5	26	2.5	36	5.3	21	2.1	11	1.6	97	2.4
Labour	31	5.0	52	5.1	67	9.8	41	4.1	30	4.3	221	5.5
Cattle purchase	128	20.8	14	1.4	15	2.2	16	1.6	14	2.0	187	4.6
Small stock purchase	82	13.3	11	1.1	46	6.7	2	.2	5	.7	146	3.6
Poultry purchase	1	.2	8	.8	62	9.1	13	1.3	8	1.1	92	2.3
Dipping and veterinary costs	64	10.4	27	2.6	4	.6	3	.3	8	1.1	106	2.6
Vehicle and transport costs	3	.5	6	.6	26	3.8	18	1.8	20	2.8	73	1.8
Equipment	2	.3	3	.3	17	2.5	6	.6	11	1.6	39	1.0
Other farm input	0	.0	4	.4	9	1.3	7	.7	3	.4	23	.6
Fares	166	27.0	510	50.0	170	24.8	292	29.2	223	31.6	1361	33.8
Fuel	22	3.6	101	9.9	42	6.1	20	2.0	55	7.8	240	6.0
Vehicle purchase and maintenance	21	3.4	8	.8	8	1.2	1	.1	60	8.5	98	2.4
Other transport expenses	0	.0	0	.0	16	2.3	0	.0	1	.1	17	.4
Purchase goods for sale (stock)	7	1.1	11	1.1	25	3.6	8	.8	96	13.6	147	3.7
Repay loans	42	6.8	19	1.9	40	5.8	42	4.2	25	3.5	168	4.2
Labour costs	3	.5	3	.3	9	1.3	1	.1	24	3.4	40	1.0
Machinery and equipment	0	.0	1	.1	0	.0	2	.2	15	2.1	18	.4
Other business expenses	1	.2	0	.0	9	1.3	2	.2	12	1.7	24	.6
Roofing	133	21.6	37	3.6	49	7.2	35	3.5	47	6.7	301	7.5
Walls	100	16.3	7	.7	3	.4	7	.7	25	3.5	142	3.5
Cement	164	26.7	53	5.2	102	14.9	72	7.2	57	8.1	448	11.1
Bricks	125	20.3	46	4.5	34	5.0	27	2.7	47	6.7	279	6.9
Wood	14	2.3	13	1.3	36	5.3	12	1.2	14	2.0	89	2.2
Paint	46	7.5	20	2.0	13	1.9	4	.4	25	3.5	108	2.7
Doors and windows	135	22.0	39	3.8	45	6.6	36	3.6	29	4.1	284	7.1
Other building material	51	8.3	0	.0	45	6.6	16	1.6	9	1.3	121	3.0
Savings	53	8.6	191	18.7	75	10.9	47	4.7	137	19.4	503	12.5
Insurance policies	3	.5	46	4.5	1	.1	2	.2	35	5.0	87	2.2
Funeral and burial policies	27	4.4	293	28.7	4	.6	3	.3	66	9.4	393	9.8
Other personal investment	0	.0	0	.0	8	1.2	0	.0	17	2.4	25	.6
Marriage	103	16.7	11	1.1	12	1.8	9	.9	15	2.1	150	3.7
Funeral	116	18.9	166	16.3	38	5.5	50	5.0	64	9.1	434	10.8
Feast	8	1.3	73	7.1	43	6.3	1	.1	14	2.0	139	3.5
Other special events	2	.3	22	2.2	11	1.6	5	.5	5	.7	45	1.1
Other expenditure item First item	17	2.8	248	24.3	73	10.7	24	2.4	16	2.3	378	9.4
Other expenditure item Second item	0	.0	111	10.9	29	4.2	1	.1	0	.0	141	3.5
Other expenditure item Third item	0	.0	46	4.5	6	.9	0	.0	0	.0	52	1.3
Don't know	2	.3	1	.1	26	3.8	4	.4	9	1.3	42	1.0
Refused to answer	1	.2	0	.0	7	1.0	0	.0	35	5.0	43	1.1

Source: Pendleton et al. (2006)

Table 1.2: Use of remittances in Uganda 2008 (Value in USD)

Use	Amount	Percent
Consumption	347,655,600	52.2
Education	182,728,564	27.4
Household expenses	146,868,761	22.0
Health	18,058,275	2.7
Savings and Investment	273,622,795	41.1
Building works	141,558,423	21.2
Land purchase	45,713,587	6.9
Business	43,658,853	6.6
Savings	33,361,147	5.0
Farming	5,521,858	0.8
Vehicle purchase	3,786,837	0.6
Livestock	22,09	0.0
Other personal and community services	32,383,213	4.9
Ceremony	26,699,802	4.0
Church	5,399,398	0.8
Visa fees	284,013	0.0
Remittance to other Household	9,859,503	1.5
Rural household	6,531,820	1.0
Urban household	3,327,683	0.5
Other (Un specified)	2,805,415	0.4
Total	666,326,526	100.0

Source: Bank of Uganda and the Uganda Bureau of Statistics. National Workers' Remittances surveys (2008)

1.4 Methodology and data

1.4.1 Model and estimation

The analysis of the impact of remittances on undernourishment using panel data requires a careful specification of the model to be used. In this study, the indicator employed to measure undernourishment relies on the total food supplied in the country, including food imports. Therefore, a fall of foods in country i may affect the undernourishment of countries j with which i has food trade relationship. Undernourishment caused by a fall in food production in country i may then affect undernourishment in countries j . To simplify, we assume that i trades food with its neighbor countries j . Under this assumption, usual panel data models yield inconsistent estimate of the parameters of the model (Gallo, 2007; Schaffar, 2014).

In order to take into account spatial correlation between countries, we use the specification in

Elhorst (2014). The model is then written as follow:

$$PoU_{it} = \lambda \sum_{j=1}^N w_{ij} PoU_{jt} + \phi + \beta_1 Remit_{it} + \beta_2 X_{it} + c_i + \alpha_t + v_{it} \quad (1.1)$$

where PoU_{it} is the prevalence of undernourishment for country i at time t ($i = 1, \dots, N$ and $t = 1, \dots, T$), $Remit_{it}$ refers to the per capita remittances of country i at time t , and ϕ is the constant term parameter. The variable $\sum_{j=1}^N w_{ij} PoU_{jt}$ denotes the interaction effect of undernourishment in country i with the undernourishment in neighboring countries, w_{ij} is the i, j th element of a $N \times N$ spatial weights matrix W . X_{it} is a $1 \times (K - 1)$ vector of exogenous control variables with K denoting the number of explanatory variables. v_{it} is an i.i.d error term for i and t with zero mean and variance σ^2 , while c_i denotes spatial specific effects and α_t the time-period specific effects. Including spatial specific effects allows for the control of space-specific time-invariant variables whose omission could bias our results. In the same manner, time-period specific effects allow the control of all time specific effects.

The correlation between countries may also come from interaction effects in error term. This is consistent with a situation in which random shocks are spatially correlated. As random shocks pass through the error term, we rewrite v_{it} as follow: $v_{it} = \rho \sum_{j=1}^N w_{ij} v_{jt} + u_{it}$. Model 1 becomes :

$$PoU_{it} = \lambda \sum_{j=1}^N w_{ij} PoU_{jt} + \phi + \beta_1 Remit_{it} + \beta_2 X_{it} + c_i + \alpha_t + \rho \sum_{j=1}^N w_{ij} v_{jt} + u_{it} \quad (1.2)$$

To test whether this model is more appropriate to describe the data than a model without any spatial interaction effects, we use the generalized and the robust Lagrange Multiplier (LM) test proposed by [Burrige \(1980\)](#), [Anselin \(1988\)](#) and [Anselin et al. \(1996\)](#). The result (Table 1.3) indicates that only spatial error correlation have to be accepted, meaning that $\lambda = 0$ but $\rho \neq 0$ at 5 % significance level. This suggests that the countries considered in this study share common random shocks with the neighbors. This can be illustrated with the 2006-2011's Horn of Africa food crisis and the 2010-2011's Sahel food crisis which affect respectively most of Horn of Africa countries and most of Sahel countries located in the same area. Therefore, the model to be estimated is then :

$$PoU_{it} = \phi + \beta_1 Remit_{it} + \beta_2 X_{it} + c_i + \alpha_t + \rho \sum_{j=1}^N w_{ij} v_{jt} + u_{it} \quad (1.3)$$

Different approaches have been proposed to estimate the parameters of this model. [Kapoor et al. \(2007\)](#) proposed a generalization of the generalized moments estimators suggested in [Kelejian and Prucha \(1998\)](#) while [Fingleton \(2008\)](#) extend their work to develop GM estimators for spatial moving average panel data model. We used the generalized moments estimators of [Kapoor et al. \(2007\)](#), because this approach allows the disturbance terms to be both spatially and time-wise correlated as well as heteroscedastic.

The variables included in X_{it} were chosen in line with the existing literature. They include GDP per capita, Foreign Direct Investments (FDI), Official Development Assistance (ODA), public expenditures in agriculture, domestic credits, political stability, private investments, domestic food prices, food price volatility and the share of agricultural land. Indeed, although the impact of income on undernourishment is controversial ([Subramanian and Deaton, 1996a](#); [Behrman and Deolalikar, 1987](#); [Deaton and Drèze, 2009](#); [Banerjee and Duflo, 2011](#)), there are studies showing that GDP per capita contributes to the reduction of undernourishment ([Klasen, 2008](#)). Regarding official development assistance, the literature is also controversial on their impact in developing countries. At one extreme, there are theories arguing that people are trapped in poverty in developing countries and foreign aid is the key to help them to invest in the area that will lift them out poverty-trap ([Sachs, 2005](#)). At the other extremes are theories by [Easterly \(2006\)](#) and [Moyo \(2009\)](#) arguing that foreign aids corrupt and undermine the local institution. These bad outcomes of foreign aids could lead to an increase of undernourishment since having the good institutions is one of the conditions for the reduction of undernourishment in the [Sen \(1981\)](#) entitlement theory. According to this theory, in an economy with private ownership and exchange in form of trade and production, the entitlement set for a given person depends on the endowment of the person and the exchange mapping. People can use their endowment to produce food or sell their labor power to get wage and buy food. The role of foreign direct investment in the reduction of undernourishment can be through the later. Indeed, foreign direct investment, especially greenfield investment, lead to a demand for workers which can be absorbed by those who want to sell their labor power to buy food. Food price, as well as food price volatility, are also the determinant of undernourishment

usually cited in the literature. High food prices can lead to an increase of undernourishment (less consumption of calories) (Anríquez et al., 2013). However, Banerjee and Duflo (2011) have stated that food price has had no significant impact on calorie consumption in India from 2005. Indeed, food prices have declined in the country between 1980 and 2005, and in spite of an increase of food price in 2005, the decline in calorie consumption happened when the price of food was going down.

In order to count for the possible role of remittances in mitigating shocks, such as drought and floods, we include two dummies variables, for droughts and floods, among explanatory variables and generate the interaction terms of remittances with these dummies. The addition of interaction term is motivated by the study of Combes and Ebeke (2011) who found that remittances are a hedge against natural disasters, agricultural shocks, discretionary fiscal policy, financial and systemic banking crises, and exchange rate instability. The dummies variables on the level of income in a country were also added in the explanatory variables. They were calculated basing on the decile of per capita GDP. The thresholds, as well as the mean of per capita income, are indicated in Table 1.4.

Estimation of equation 1.3 involves the specification of the $N \times N$ spatial weights matrix W . The choice of spatial weights matrix is a difficult task in the spatial analysis as the results may change with alternative specifications. The literature on spatial weights matrix is classified into exogenous weight matrix and parametrized weight matrix. The exogenous matrix includes binary contiguity matrix, inverse distance matrix, and k-nearest neighbors matrix. Binary contiguity matrix based on boundaries could not be used in this study since it lets islands such as Madagascar, Cabo Verde with no interaction partners. Therefore, to estimate equation 1.3, we use an exponential distance weights matrix which is based on a negative exponential function of distances. An exponential distance weights matrix assumes that the impact of random shocks in country i on neighboring countries j diminishes when the distance between i and j becomes higher. Let d_{ij} (d is a Euclidean distance based on longitude and latitude of centroid) denote centroid distances from each country i to all countries $j \neq i$:

$$w_{ij} = \exp(-2d_{ij}) \tag{1.4}$$

Table 1.3: Spatial correlation tests

Ho: Error has No Spatial AutoCorrelation		
Ha: Error has Spatial AutoCorrelation		
	Statistic	P-value
LM error (Burridge)	5.9011	0.0151
LM error (Robust)	6.1813	0.0129
Ho: Spatial Lagged Dependent Variable has No Spatial AutoCorrelation		
Ha: Spatial Lagged Dependent Variable has Spatial AutoCorrelation		
	Statistic	P-value
LM error (Anselin)	0.0000	1.000
LM error (Robust)	0.2802	0.5966

Table 1.4: Descriptive statistics on GDP per capita by decile

Decile	Mean	st dev	min	max
1	221.2387	47.24972	116.7956	275.7769
2	317.9721	26.06084	278.2105	359.1549
3	391.6511	16.81975	360.8283	417.1546
4	467.8627	31.31757	420.0534	518.3311
5	582.4032	46.40058	523.9092	671.6339
6	798.001	76.09828	676.7354	911.7183
7	1051.187	88.07473	927.173	1195.445
8	1624.384	378.1721	1197.471	2395.621
9	3403.899	569.9144	2541.343	4327.645
10	6482.726	1597.249	4390.256	10893.48

1.4.2 Data and description

We use data from 35 Sub-Saharan African countries, spanning the years 2001-2011. Data were collected from different sources. Undernourishment is measured by the FAO⁴ prevalence of undernourishment index. The index is defined as the probability that a randomly selected individual from the reference population is found to consume less than a minimum calories requirement for an active and healthy life. It relies on the Dietary Energy Consumption (DEC) which is difficult to compute due to the lack of suitable survey regularly conducted in most countries. Thus, the available DEC for human consumption in a country for one year is estimated through data on production, trade, and utilization of food commodities. The index ranges from 0 to 100, with 100 indicating a high level of undernourishment in the country. Regarding remittances, we use the

⁴Food and Agriculture Organization of the United Nations

World Bank's remittances data. Remittances comprise *personal transfers*, transfers in cash or in kind received by resident households from nonresident households, and *Compensation of employees* referring to the income of border, seasonal, and other short-term workers who are employed in an economy where they are not resident and of residents employed by nonresident entities. The data don't allow the understanding of which category of people (rural or urban population, rich or poor,...) remittances are sent for. Thus, remittances per capita were computed by dividing the total amount of remittances received in country i by the population of this country. Data on political stability, domestic credits and those of official development assistance (ODA) were also collected from the World Bank database (World Development Indicators). Political stability and absence of violence are captured by an index which measures the perceptions of the likelihood of political instability and/or politically- motivated violence, including terrorism. The index is running from approximately -2.5 to 2.5, with higher values corresponding to better stability. Domestic credits, measured as a percentage of GDP, refer to the credits provided by the financial sector. They include all credits to various sectors on a gross basis, with the exception of credit to the central government, which is net. The financial sector includes monetary authorities and deposit money banks, as well as other financial corporations where data are available (including corporations that do not accept transferable deposits but do incur such liabilities as time and savings deposits).

Regarding data on macroeconomic variables such as GDP per capita and the net inflow of foreign direct investment, we used the World Economic Outlook and the IMF's balance of payment database.

As for undernourishment, data on the domestic food price and the food prices volatility index were drawn from FAO's database. Domestic food price index is an indicator of the relative price of food in a country. Its computation is based on the 2011's International Comparison Program (ICP) from the World Bank and the consumer price index from the International Labour Organisation (ILO). We also use the FAO's data on agricultural land area and total land area to compute the share of agricultural land in a country. The agricultural land area is the sum area under arable land, permanent crops, and permanent pastures.

The IFPRI's⁵ datasets on government expenditure in different sectors were used to draw data on the percentage of agriculture expenditure in total GDP of country i .

⁵International Food Policy Research Institute

The binary dummy variables for droughts and floods were collected from the International Disaster Database (EM-DAT), Centre for Research on the Epidemiology of Disasters (CRED).

Although most of our variables have full data, missing values were observed in domestic price index and government expenditure in agriculture. In order to extract a maximum of information from our data and avoid listwise deletion, we use the recent imputation method for time-series cross-section developed by [Honaker and King \(2010\)](#) to impute missing values of these variables. The purpose is not to re-create the individual missing values as close as possible to the true ones but to handle missing data in a way resulting in the valid statistical inference. The advantage of using Honacker and King's method is that, in contrast to standard methods of imputation applying to survey data, it allows for taking into account the tendency of variables which can move smoothly over time, jump sharply between some cross-sectional units like countries, jump less or be similar between some countries in close proximity, and for time-series patterns to differ across many countries. In addition, the method is based on multiple imputations which, compared to single regression (linear interpolation, unconditional mean imputation,...), reflects uncertainty in the imputed values. Missing values are imputed through a bootstrapped Expected Maximum (EM) algorithm.

Table [1.5](#) reports the descriptive statistics of the data. It shows that on average, almost one in four people suffer from undernourishment in Sub-Saharan Africa during the years 2001-2011.

1.5 Results

Table [1.6](#) reports the results of the estimation of remittances impact on undernourishment in Sub-Saharan Africa with a spatial error model. It is composed of three columns, with columns 1 and 2 indicating the results of the estimation without natural disasters, and column 2 taking into account natural disasters, namely droughts and floods.

Inspection of table [1.6](#) indicates that the impact of remittances on undernourishment is statistically significant in Sub-Saharan Africa. However, nutrition responds merely to an increase of remittances. Indeed, a 10 percent increase in remittances per individual leads to a decrease by only 1.17 percent of the proportion of undernourished in the region. As described in Section 3, in most Sub-Saharan African countries, remittances are greatly devoted to consumption, especially to food purchase.

Table 1.5: Descriptive statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Prevalence of undernourishment	overall	23.345	12.652	5	54.8	N = 385
	between		12.203	5	50.036	n = 35
	within		3.8803	9.809	39.809	T = 11
total remittances	overall	521.11	2442.53	0.55367	20616.89	N = 385
	between		2028.49	2.510	12111.78	n = 35
	within		1399.409	-10530.66	9026.231	T = 11
Remittances per capita	overall	38.888	71.083	0.0605	360.02	N = 385
	between		69.643	1.080	298.6538	n = 35
	within		18.137	-51.285	133.373	T = 11
Share of agricultural land	overall	50.668	17.87529	18.114	80.920	N = 385
	between		18.0356	18.836	80.200	n = 35
	within		1.647	41.246	57.711	T = 11
Domestic credit (% of GDP)	overall	29.035	40.720	-70.377	227.783	N = 385
	between		39.104	-12.770	175.677	n = 35
	within		12.993	-89.079	106.7897	T = 11
ODA	overall	10.590	12.090	-.2319435	115.405	N = 385
	between		9.7965	0.324	48.540	n = 35
	within		7.259	-31.682	77.455	T = 11
GDP per capita	overall	1528.885	1951.586	116.7956	10893.48	N = 385
	between		1828.928	235.17	7269.031	n = 35
	within		742.1735	-1676.179	5153.33	T = 11
Private investment (% of GDP)	overall	22.32942	9.161	4.4038	76.12	N = 385
	between		7.399	7.009	48.854	n = 35
	within		5.531	4.011	49.594	T = 11
Domestic food price	overall	6.493	1.776	2.12	11.69	N = 385
	between		1.7315	2.474	10.890	n = 35
	within		0.4865	4.941	8.2717	T = 11
Political stability	overall	-0.3255	.8194	-2.375	1.185	N = 385
	between		0.763	-1.805	0.946	n = 35
	within		0.323	-1.756	0.595	T = 11
Public spending in agriculture	overall	1.348	1.119	-1.406	5.858	N = 385
	between		0.9687	0.1476	4.334	n = 35
	within		0.5824	-0.802	4.015	T = 11
Food price volatility	overall	13.087	9.231	-0.0599	84.5	N = 385
	between		5.040	5.218	26.481	n = 35
	within		7.776	-2.130	78.233	T = 11
FDI	overall	5.0303	7.1146	-4.6180	72.841	N = 385
	between		4.622	0.4877	21.915	n = 35
	within		5.459	-16.442	55.956	T = 11

However, increasing food consumption does not systematically lead to a huge improvement of nutrition which depends on the calorie of the consumed foods. This is because food consumption depends on many factors such as taste, appearance, odor, status value or cultural preference (Behrman and Deolalikar, 1987; Banerjee and Duflo, 2011). As argued by Banerjee and Duflo (2011), due to ignorance of the real added value of good nutrition, the poorest who are the ones who suffer the most from undernourishment sometimes choose to consume tasty foods rather than nutrient-rich foods.

Like remittances, the effect of per capita GDP on undernourishment is statistically significant in Sub-Saharan Africa. However, the elasticity is very close to zero. Indeed, a 10 percent increase in GDP per capita leads to a 0.62 percent decrease of undernourishment. This finding supports

the literature which underlines that the elasticity of calorie consumption to income is closed to zero (Behrman and Deolalikar, 1987; Bouis and Haddad, 1992). As described in Section 1, there have been countries that have started to reduce their level of undernourishment well before the growth of their per capita GDP. In addition, countries such as Djibouti, which have had high per capita GDP between 1980 and 2015, have remained for a long time one of the countries with a high level of undernourishment (Figure 1.1). One important finding in this study is that the elasticity of calorie consumption to remittances is higher than that of GDP (Table 1.6). This finding can be explained by the fact that remittances are directly received by families in the home country while the reception of GDP per capita depends on how well income is distributed.

As expected, a high share of agricultural land is significantly associated with a reduction of undernourishment in Sub-Saharan Africa. Indeed, the more is agricultural land, the more is food supply and the less are undernourishment. Credits, as well as private investments, were found to contribute significantly to the reduction of undernourishment in Sub-Saharan Africa. When the share of domestic credits to GDP increase by 10 percent, the proportion of undernourished in the region decreases by 0.65 percent. This result emphasizes the role played by domestic credit (Obilor, 2013) in helping farmers to afford agriculture inputs (fertilizers, tractors,...) and improve agricultural production. With respect to private investment, results in Table 1.6 show that a 10% increase in private investment induces a 0.58% decrease in the proportion of undernourished in Sub-Saharan Africa.

The first column of table 1.6 shows that official development assistance (ODA) is positively and significantly related to undernourishment in Sub-Saharan Africa. Since this finding might due to a reverse causality between official development assistance and undernourishment, we lagged ODA by one period with the intuition behind it being that current undernourishment can't cause past ODA. Column 2 shows that ODA has no significant effect on undernourishment when it is lagged by one period. This result raises the question of the effectiveness of aids in fighting undernourishment. According to the literature, there are two theories on the effectiveness of foreign aid: the public interest theory which argues that foreign aids are necessary to fill a financing or investment gap, which in turn will lift countries out of a poverty trap (Sachs, 2005), and a public choice theory which argues that foreign aids are ineffective and possibly damaging to recipient countries (Easterly, 2006; Moyo, 2009). Aid allocation may encourage impoverishing policies since

misery resulting from damaging policies leads donors more likely to grant more aid to try and alleviate the impoverished conditions ([Williamson, 2010](#)).

Like official development assistance, foreign direct investments (FDI) have no significant impact on undernourishment in Sub-Saharan Africa. Food prices, as well as food price volatility, were also found to have no significant effect on undernourishment in Sub-Saharan Africa. Likewise, political stability, government expenditure in agriculture, droughts, and floods have no significant impact on undernourishment. The insignificance effect of floods and droughts on undernourishment in Sub-Saharan Africa is not surprising. All the countries in [Figure 1.1](#) have experienced either a drought or a flood during the period 2000 to 2015. However, only the level of undernourishment in Kenya was affected by these catastrophes.

While droughts and floods have no significant effect on undernourishment in Sub-Saharan Africa, [table 1.6](#) shows that remittances play a significant role during a period of floods as shown the significant and negative coefficient of the interaction term between remittances per capita and a dummy of floods. This result supports the finding of [Combes and Ebeke \(2011\)](#).

Inspection of interaction between per capita remittances and income group dummies in [table 1.7](#) indicates that the impact of remittances is statistically different in the income decile 4 and 10. Moreover, remittances have less effect on calorie consumption in decile 10 than decile 4. This result can be explained by the fact that, over a certain level of income, household receiving remittances may prefer to devote a high share of the money to others uses, namely education, health, investment, rather than consumption since they have sufficient resources to afford food. For instance, in Niger and Ethiopia, the countries in which the income per individual is low, households receiving remittances spend more than 50% of received money on consumption while those of Kenya and Côte d'Ivoire, two of the countries with high per capita GDP, devote less than 40% of received money on consumption ([Section 2](#)). The effect of remittances on undernourishment is also low in countries with very low GDP per capita, decile 1-3, comparing to countries in decile 4. The possible explanation for this finding is that counting the high costs of international migration, individuals in low-GDP countries are less able to migrate and send money thereafter. As shown in [table 1.8](#), the countries in deciles 1-3 are the most affected by undernourishment and, at the same time, they are the smallest receivers of remittances.

Table 1.6: Explaining the impact of remittances on undernourishment in Sub-Saharan Africa

Dependant variable: Prevalence of undernourishment ($N=35, T=11$)						
	(1)		(2)		(3)	
	β	Elasticities	β	Elasticities	β	Elasticities
Remittances per capita	-0.0697*** (0.0084)	-0.1161	-0.0711*** (0.0084)	-0.1184	-0.0656*** (0.0087)	-0.1093
Share of agricultural land	-0.0866*** (0.0324)	-0.1879	-0.0921*** (0.0325)	-0.2000	-0.0913*** (0.0319)	-0.1981
Domestic credit (% of GDP)	-0.0503*** (0.0147)	-0.0626	-0.0461*** (0.0147)	-0.0573	-0.0456*** (0.0144)	-0.0568
ODA (% of GDP)	0.126** (0.0504)	0.0579				
ODA (t-1)			0.0754 (0.0493)	0.0316	0.0635 (0.0474)	0.0266
GDP per capita	-0.0009** (0.0003)	-0.0580	-0.0010*** (0.0004)	-0.0654	-0.0010*** (0.0003)	-0.0667
Private investment (% of GDP)	-0.1382* (0.0691)	-0.1321	-0.1236* (0.0691)	-0.1183	-0.1224* (0.0672)	-0.1171
Domestic food price	0.0682 (0.3538)	0.0192	0.1085 (0.3566)	0.0302	0.1072 (0.3445)	0.0298
Political stability	0.11 (0.7763)	-0.0015	0.1145 (0.7734)	-0.0016	0.1292 (0.7522)	-0.0018
Public spending in agriculture	-0.6419 (0.5434)	-0.0371	-0.7282 (0.5144)	-0.0383	-0.5469 (0.5328)	-0.0316
Food price volatility	-0.0660 (0.0560)	-0.0370	-0.0498 (0.0562)	-0.0279	-0.0560 (0.0552)	-0.0314
FDI (% of GDP)	0.0097 (0.0805)	0.0021	0.0322 (0.0801)	0.0070	0.0251 (0.0785)	0.0054
Drought	1.6088 (1.5096)	0.0091	1.6725 (1.5224)	0.0095	1.9707 (1.5989)	0.0112
Flood	0.3484 (1.1121)	0.0043	0.3433 (1.1185)	0.0042	1.3985 (1.1851)	0.0173
Remittances x Drought					-0.0085 (0.0191)	-0.0018
Remittances x Flood					-0.0375* (0.0195)	-0.0121
Constant	35.7468***		35.865***		35.630***	
Rho	0.556		0.5533		0.5599	
LM Test ($H_o : Rho = 0$)	9.658		9.6898		9.8897	
R2	0.2371		0.2296		0.2276	
Ajusted R2	0.1307		0.1222		0.1147	
Raw R2	0.8256		0.8237		0.8230	
Ajusted Raw R2	0.8013		0.7991		0.7971	

Note: (): Robust standards errors, ***: Significant at 1 % level, **: Significant at 5 % level, *: Significant at 10 % level, ODA: Net Official Development Assistance as % of GDP, FDI: Net Foreign Direct Investment as % of GDP., W: Exponential distance weights matrix, LM Tests are calculated basing on [Baltagi et al. \(2007\)](#)

Table 1.7: Explaining the impact of remittances on undernourishment by income group in Sub-Saharan Africa

Variables	Dependant variable: Prevalence of undernourishment ($N=35$, $T=11$)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Remittances per capita	-0.0637*** (0.0082)	-0.0687*** (0.0082)	-0.0695*** (0.0082)	-0.0701*** (0.0083)	-0.0702*** (0.0084)	-0.0717*** (0.0088)	-0.0701*** (0.0083)	-0.0676*** (0.0085)	-0.0725*** (0.0089)	-0.0748*** (0.0087)
Share of agricultural land	-0.0579* (0.0318)	-0.0906*** (0.0314)	-0.0883*** (0.0316)	-0.0888*** (0.0317)	-0.0897*** (0.0317)	-0.0918*** (0.0318)	-0.0883*** (0.0316)	-0.0878*** (0.0315)	-0.0876*** (0.0321)	-0.0964*** (0.0324)
Domestic credit (% of GDP)	-0.0634*** (0.0149)	-0.0447*** (0.0142)	-0.0459*** (0.0143)	-0.0452*** (0.0142)	-0.0467*** (0.0143)	-0.0459*** (0.0145)	-0.0446*** (0.0142)	-0.0458*** (0.0142)	-0.0461*** (0.0144)	-0.0544*** (0.0150)
ODA (t-1)	0.0859* (0.0465)	0.0491 (0.0474)	0.0693 (0.0473)	0.0666 (0.0473)	0.0681 (0.0473)	0.0595 (0.0473)	0.0619 (0.0473)	0.0636 (0.0469)	0.0710 (0.0478)	0.0667 (0.0485)
GDP per capita	-0.0008** (0.0003)	-0.0010*** (0.0003)	-0.0010*** (0.0003)	-0.0011*** (0.0003)	-0.0011*** (0.0003)	-0.0011*** (0.0003)	-0.0011*** (0.0003)	-0.0010*** (0.0003)	-0.0010*** (0.0003)	-0.0015*** (0.0004)
Private investment (% of GDP)	-0.1014 (0.0660)	-0.1066 (0.0663)	-0.1268* (0.0667)	-0.1231* (0.0669)	-0.1219* (0.0667)	-0.1124* (0.0669)	-0.1069 (0.0670)	-0.1158* (0.0662)	-0.1233* (0.0679)	-0.1295* (0.0691)
Domestic food price	0.0939 (0.3345)	0.1338 (0.3369)	0.0731 (0.3391)	0.1057 (0.3410)	0.0833 (0.3401)	0.1567 (0.3442)	0.1746 (0.3407)	0.1386 (0.3368)	0.0887 (0.3474)	0.0602 (0.3602)
Political stability	0.5859 (0.7387)	0.0841 (0.7311)	0.0624 (0.7387)	0.1479 (0.7439)	0.0346 (0.7401)	-0.1239 (0.7425)	-0.0169 (0.7426)	-0.0506 (0.7334)	0.0579 (0.7515)	0.0269 (0.7762)
Public spending in agriculture	-0.6929 (0.5204)	-0.5657 (0.5238)	-0.5088 (0.5275)	-0.5634 (0.5286)	-0.5106 (0.5286)	-0.5051 (0.5308)	-0.5648 (0.5279)	-0.5923 (0.5251)	-0.5103 (0.5338)	-0.6019 (0.5440)
Food price volatility	-0.0734 (0.0539)	-0.0551 (0.0544)	-0.0569 (0.0549)	-0.0549 (0.0549)	-0.0535 (0.0549)	-0.0597 (0.0549)	-0.0540 (0.0561)	-0.0610 (0.0546)	-0.0557 (0.0557)	-0.0642 (0.0559)
FDI (% of GDP)	0.0497 (0.0773)	0.0293 (0.0771)	0.0269 (0.0778)	0.0269 (0.0780)	0.0229 (0.0778)	0.0239 (0.0776)	0.0264 (0.0779)	0.0217 (0.0776)	0.0231 (0.0787)	0.0282 (0.0798)
Income group dummy	7.4186*** (1.9926)	3.1167* (1.7891)	1.4974 (1.7989)	1.6662 (1.9888)	-1.5382 (1.7857)	-4.7098** (1.8199)	-3.0513 (1.8793)	-2.0966 (1.9387)	0.4128 (2.0274)	2.1485 (2.7653)
Remittances x Decile 1	0.2415 (0.2515)									
Remittances x Decile 2		-0.0535 (0.0458)								
Remittances x Decile 3			-0.0389 (0.0410)							
Remittances x Decile 4				-0.1383* (0.0791)						
Remittances x Decile 5					-0.0015 (0.0226)					
Remittances x Decile 6						0.0126 (0.0166)				
Remittances x Decile 7							0.0002 (0.0266)			
Remittances x Decile 8								-0.0108 (0.0171)		
Remittances x Decile 9									0.0057 (0.0156)	
Remittances x Decile 10										0.0412* (0.0243)
Constant	33.402*** (3.9763)	35.335*** (3.9613)	36.154*** (3.9756)	36.167*** (3.9997)	36.366*** (3.9928)	36.233*** (4.0186)	35.538*** (3.9966)	35.950*** (3.9545)	36.059*** (4.1164)	37.826*** (4.1807)
Rho	0.5391	0.5552	0.5509	0.5501	0.5543	0.5543	0.5565	0.5577	0.5489	0.5592
R2	0.2841	0.2257	0.2216	0.2271	0.2248	0.2360	0.2284	0.2221	0.2244	0.2178
Raw R2	0.8374	0.8229	0.8218	0.8233	0.8227	0.8253	0.8237	0.8218	0.8226	0.8200

Note: () : Robust standard errors, ***: Significant at 1 % level, **: Significant at 5 % level, *: Significant at 10 % level, W: Exponential distance weights matrix

Table 1.8: Prevalence of undernourishment and remittances per capita by income decile

Decile	Proportion of undernourished	Remittances per capita
1	35.789	5.377
2	29.358	13.124
3	25.861	21.263
4	24.355	16.564
5	23.016	34.868
6	19.334	59.845
7	21.679	34.199
8	20.297	71.575
9	20.043	76.922
10	13.468	55.718

1.6 Conclusion

The aim of this paper was to highlight the impact of remittances on undernourishment in Sub-Saharan Africa. Our findings reveal that remittances contribute to the reduction of undernourishment in this region. This result is explained by the fact that the money sent by migrants is mainly devoted to consumption in most Sub-Saharan Africa countries. However, the increase in remittances only results in a small increase in calorie consumption. This result supports the literature which argues that calorie consumption reacts very little to an increase in income. Remittances were also found to be a hedge against flood in Sub-Saharan Africa.

The study also controls for others variables that may affect the prevalence of undernourishment. Like remittances, GDP per capita, domestic credit, as well as private investment, were found to contribute to a reduction of the proportion of undernourished in Sub-Saharan Africa. In others words, the more are domestic credits and private investments, the less is undernourishment in Sub-Saharan Africa. The share of the agricultural land area in the total land area also plays a significant role in the reduction of undernourishment in the region. Having a high share of agriculture land enhances the availability of food which can be afforded with a minimum income. This minimum income is provided by the distribution of income, under low inequality of income, and the reception of money from migrants. Regarding official development assistance, our results show that they have no significant effect on undernourishment in Sub-Saharan Africa.

The impact of remittances has also been analyzed in different income deciles. The results show that remittances have a lower impact in lower income deciles and higher income deciles whereas the impact is higher in intermediate income deciles. Since migration is costly, people in low-income

countries are less able to sustain it, which leads to low migration in these countries. As a result, remittances are less important in countries of low-income deciles, which are at the same time the countries suffering the most from undernourishment. Regarding the people in the countries of higher income deciles, they spend more money received from migrants on education, health, and investments than on consumption. This explains the low impact of remittances in countries of higher income deciles.

This research contributes more generally towards a broader view of the benefits of the money that migrants send to their home countries. Governments and international organizations fighting undernourishment in Sub-Saharan Africa should take into account these benefits and also encourage domestic credits as well as private investments.

**Migration, variation in co-residence choices,
and food security of households left behind:
Evidence from Ethiopia and Niger**

2.1 Introduction

Over the last decades, migration has become a key component in the livelihood strategies of an increasing number of households across the developing countries. A large number of people migrate for better-earning opportunities in more prosperous countries or more developed areas within their own country. According to *the new economics of labor migration*, the migration decision is made along with households in order to minimize their risks and overcome limitations caused by the failures of the national markets (Stark and Bloom, 1985). Once migrated, migrants send remittances to the household members left behind. The money received relaxes the liquidity constraints of the households thereby allowing them to invest in consumption, education, health, and housing. However, while in the development literature, most studies have concluded that migration, through remittances, leads to the reduction of the poverty level of households left behind (Adams and Page, 2003; Yang and Martinez, 2006; Acosta et al., 2008; Gubert et al., 2010; Imai et al., 2014; Margolis et al., 2015; Bang et al., 2016), little attention has been given to the effect of migration on their food security¹ status.

The empirical studies that addressed the interface between migration and food security have mostly focused on the health and nutritional status of children in the migrant household left behind. Most of these studies found that migration leads to an improvement of the health and nutritional status of those children (Ssengonzi et al., 2002; Hildebrandt et al., 2005; Adams and Cuecuecha, 2010; Antón, 2010; Frankel, 2011; Carletto et al., 2011; Ponce et al., 2011). However, some authors concluded that migration has a negative effect on child nutritional status in the migrant household left behind (Gibson et al., 2011; De Brauw and Mu, 2011).

Most of the few studies that have examined the relationship between migration and the overall household food security have found that migration results in an improvement of both household food consumption and food diversity (Nguyen and Winters, 2011; Adams Jr. and Cuecuecha, 2013; Sharma and Chandrasekhar, 2016). In contrast to these studies, Karamba et al. (2011) provide evidence of no significant effect of migration on total per capita household food expenditures. They also show that migration has only a minimal effect on the structure of food expenditures.

¹“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (World Food Summit, 1996).

It increases overall food expenditures only in regions with high migration rates, leading to a shift towards the consumption of potentially less nutritious food categories, such as sugar, beverages and prepared meals. This finding shows that migration may also lead to a decline of the food security of households left behind.

The contrasting results obtained by previous studies reveal that there is no *a priori* sign of the effect of migration on household food consumption and food diversification. In addition, these results may be potentially biased since most authors have used households food expenditures to measure both food consumption and food diversification. Indeed, food expenditures reported by households during the survey may not reflect their actual food consumption during this period. Some households may make grouped expenses in order to spread their consumption over several weeks. Besides, households that already have food in stock may not buy extra food during the week in which they were interviewed. Therefore, food expenditures during the interview, even though data were collected in two passages, may not reflect the current household consumption of households. This paper makes a significant contribution to the existing literature by using the frequencies of consumption of different food items instead of per capita food expenditures. From these frequencies, we constructed a food consumption score (FCS), which measures both household food access and food diversification. Our paper also discussed the effect of migration on the stability of food access in migrant-sending households by using a coping strategies index (CSI), which measures household behaviors in order to cope with a food shortage.

Another point which was not taken into account in the previous literature is the variation of the household composition after the migration episode. Recently, [Bertoli and Murard \(2019\)](#) have found that migration is associated with further variation in the household composition within one year around the migration episode. New members may join migrant-sending households to benefit from direct access to the remittances sent back by the migrants. In this case, the distribution of remittances within migrant households may deteriorate since the arrival of new members leads to an increase in food requirements. However, new members can also replace the migrant in the provision of domestic services, such as children or elderly care. In such a case, the arrival of a new member in the migrant-sending household will offset the adverse effect of migration on the labour supply of the household members left behind. Our paper makes another significant contribution to the existing literature by taking into account this variation in co-residence choices after the

migration episode.

In this paper, we provide evidence of the effect of migration on food diversification, food access, as well as stability in food access, for households left behind in Ethiopia and Niger. One of the rationale of choosing these countries is that both of them spend a higher share of remittances received in consumption (Sambo, 2018). Also, both experienced many food crises in their histories which have rendered some people more vulnerable and lead others to migrate toward urban or neighborhood countries. Besides, in Ethiopia, despite the high economic growth observed during the later decade, undernourishment continues to be a major concern in the country. According to FAO, the share of Ethiopians who were undernourished in 2015 stands for 28.8 percent, which was higher than the average in Sub-Saharan Africa. In Niger, significant efforts have been made by the government and international organizations to reduce food insecurity in the country. These efforts have resulted in a decrease in the prevalence of undernourishment as well as food insecurity in Niger. However, Niger remains one of the countries with low per capita GDP in Sub-Saharan Africa, meaning that the population is still vulnerable to any food shock and households with less income may still decide to send a member to migration.

Our analyses are based on data drawn from the third Ethiopian Socioeconomic Survey (ESS3) from 2015/2016, and the two-panel surveys on Household Living conditions and Agriculture in Niger (ECVM/A) dating from 2011 and 2014. We used a linear model estimated with Heckman, Probit two stage least squares (Probit-2SLS), and Maximum Simulated Likelihood (MLS) procedures, which allows the cancellation of selection and reverse causality biases. Regarding migration, the results show that, in Ethiopia, it has a negative impact on food access and food diversification of households left behind. However, this negative effect of migration is offset by the receipt of remittances, with an increase in remittances leading to an improvement of households' food access and food diversification. The arrival of a new member in the household is also found to offset the negative effect of migration on households' food access and food diversification. The results in Ethiopia also show that migration, especially labour migration, provides stability in food access for migrant households when they face a food shortage. However, this effect of migration is less pronounced when migrant households receive a new member after the migration episode. In Niger, migration is found to have no significant effect on households food access and food diversification. This result is explained by the fact that the experience of migration studied in the case of

Niger lasted only three years, which is too short to produce sufficient remittances to households left behind. In both Ethiopia and Niger, we find that the household head characteristics such as age, education, and marital status are determinants of households food security. The household size and welfare also play a significant and positive role in improving its food access and food diversification. However, in Ethiopia, we found that an increase in the household size worsens the coping strategies adopted when there is a food shortage.

The paper is structured as follows; section 2 provides the definition, the models as well as the food security measurement used. Section 3 analyses the case of Ethiopia, while section 4 discusses that of Niger. The conclusion is presented in section 5.

2.2 Migration and food security: definition, theory, and measurement

“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (World Food Summit, 1996). This definition points out four dimensions of food security: food availability, food access, utilization, and stability. The first dimension refers to the availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid). The second dimension refers to the access by individuals to adequate resources (entitlements) for acquiring appropriate foods to provide a nutritious diet. Food security also depends on the utilization of food through adequate diet, clean water, sanitation, and health care to reach a state of nutritional well-being where all physiological needs are met. The stability of access to food is also essential. To be food secure, a population, household or individual should not have to bear the risk of losing access to food as a consequence of sudden shocks.

The definition of migrant considered in this paper is that of IOM which defines a migrant as any person who is moving or has moved across an international border or within a state away from his/her habitual place of residence, regardless of (1) the person’s legal status; (2) whether the movement is voluntary or involuntary; (3) what the causes for the movement are; or (4) what the length of the stay is.

Migration, whether internal or international, can affect household food security through many channels. According to [Zezza et al. \(2011\)](#), for the migrant-sending households, there are three main changes that occur after the migration episode: (i) the household has the possibility to receive remittances from the migrant that can have direct and indirect effects on consumption; (ii) the household can potentially obtain information on nutritional practices from the migrant; and (iii) the household has fewer members, which leads to a decrease in consumption requirements, but also a decrease in the available family labour force. They show that the overall effect of these changes on household food consumption and nutrition can be both positive and negative. In the following sub-sections, we provide two simple models that link migration with the food security of migrant-sending households. Our models complete [Zezza et al. \(2011\)](#)'s points by taking into account the arrival of a new member in the household after the migrant's departure.

2.2.1 Model 1: Migration and food security of households left behind

Consider a basic framework in which, at time t_0 , we have a household A with three members (a_1 , a_2 , and a_3), who generate respectively incomes (I_1 , I_2 , and I_3) for the household and consume (C_1 , C_2 , and C_3). I_i is positive when a member a_i participates in the labor market or help the household in agriculture (Production), and equal zero otherwise. We assume that only members a_1 and a_2 participate in the labor market, and household A spends income I_1 and I_2 only to afford food. Therefore, $I_1 > 0$ and $I_2 > 0$, while $I_3 = 0$. The member a_3 is thus considered as a burden for the household since he is an additional mouth to feed. The food security of household A at time t is a function of its budget constraint (BC), its knowledge on nutritional and sanitation practices (K) and other variables (X): $U_t = f(BC_t, K_t, X_t)$. An increase in BC and K leads to an improvement of the household food security, $\partial U / \partial BC > 0$ and $\partial U / \partial K > 0$.

At time t_0 , the budget constraint of household A is :

$$BC_0 = (I_1 + I_2) - (C_1 + C_2 + C_3) \quad (2.1)$$

(i) Consider that, at time t_1 , the member a_1 migrated to another location; then $I_1, C_1 = 0$. Household A lost a labour force but observed a decrease in its consumption requirement. Its budget

constraint becomes :

$$BC_1 = I_2 - (C_2 + C_3) \quad (2.2)$$

Therefore, after a_1 migrated, only a_2 works to feed the household A . The difference in budget constraints from t_0 to t_1 is: $\Delta BC_1 = -(I_1 - C_1)$. If a time t_0 , income I_1 was entirely devoting to the consumption of the member a_1 , then $\Delta BC_1 = 0$ and the food security of household A is not affected by the departure of a_1 . However, if at time t_0 , I_1 was devoted to the consumption of a_1 , a_2 , and a_3 , then $I_1 > C_1$ and $\Delta BC_1 < 0$. Therefore, the food security of household A will be negatively affected by the departure of member a_1 . However, if a_1 was consuming more than its income I_1 , then $I_1 < C_1$ and $\Delta BC_1 > 0$. Thus, the migration of a_1 will lead to an improvement of household A food security.

(ii) Now, consider that at $t_2 > t_1$, a_1 sent remittances R_1 ($R_1 > 0$) to household A . This case mostly occurs for labour migration, meaning that a_1 left the household in order to work in another location. The budget constraint of household A at time t_2 becomes:

$$BC_2 = (R_1 + I_2) - (C_2 + C_3) \quad (2.3)$$

The difference in budget constraints of household A from t_0 to t_2 is then $\Delta BC_2 = R_1 - (I_1 - C_1)$. Suppose that R_1 is entirely spent on food consumption or production. If a time t_0 , I_1 was entirely devoted to the consumption of the member a_1 , then $I_1 = C_1$ and $\Delta BC_2 = R_1 > 0$. Therefore, the migration of a_1 will result in an improvement of the household A food security. However, if at time t_0 , I_1 was devoting to the consumption of all the household members, then the food security of household A after the migration episode will depend on whether R_1 compensated the loss in income I_1 . If $R_1 > (I_1 - C_1)$ then the migration of a_1 will result in an improvement of household A food security. However, this migration will produce a negative effect on household A food security if $R_1 < (I_1 - C_1)$.

(iii) At $t_2 > t_1$, a_1 did not send remittances to household A but provided information on nutritional and sanitation practices to the household A . The income effect of this case is similar to that of case (i). However, the information on nutritional and sanitation practices received by household A will improve the quality of consumed food as well as food utilization.

Cases *i*, *ii*, and *iii* only provide the direct effect of migration on the food security of the migrant-

sending household A . However, there are also some indirect effects of migration. For instance, by increasing the reservation wage of household A , remittances can lead member a_2 to move out from the labor market, which will result in a loss of income I_2 for the household A . Also, consider that member a_3 is a child, and that member a_2 has to take care of him alone after the migration of a_1 , which could result in the reduction of the labor supply of a_2 as well as income I_2 . Therefore, the effect of the migration of member a_1 on the food security of household A will depend on whether R_1 compensates the loss in incomes I_2 and I_3 . The effect of migration also depends on the time since migration, which is the difference between t_2 and t_1 .

2.2.2 Model 2: Migration, variation of co-residence choices, and household food security

The above model assumes that migration is not associated with further variations in the composition of the migrant-sending household. However, after the migration episode, the migrant household may receive a new member due to the need to replace the migrant in the provision of labor-intensive services (Bertoli and Murard, 2019). We may also observe a dissolution of the households of origin of the migrants, with all the members left behind joining another household within their family network. This variation in co-residence choices changes the effects of migration described in Model 1. To highlight how the variation in the household's composition affect the migration-effect on food security of households left behind, we use the same analytical framework as Bertoli and Murard (2019).

Consider that, at time t_0 , we have the same household A as in model 1, with three members (a_1 , a_2 , and a_3), and two other households, B and C , which include two members each (b_1 and b_2 , and c_1 and c_2 respectively). The members a_1 , a_2 , and a_3 generate incomes I_1 , I_2 , and I_3 respectively for the household A and consume (C_1 , C_2 , and C_3). Suppose that at time t_1 , individual a_1 migrated to another location. Four cases can be observed after this migration episode.

(i) No further variation in co-residence choices is observed; thus a_2 and a_3 remain in the household A . In this case, the effects of migration highlighted in model 1 do not change.

(ii) At $t_2 > t_1$, b_1 joins the migrant household A and is recorded as a new member in this household; b_1 starts co-residing with members a_2 and a_3 , and consuming C'_1 ; but b_1 is not generating

income to household A . Suppose that b_1 joins household A in order to take care of a_3 (The member a_3 may be a child or an elderly). Therefore, member a_2 will not have to reduce his labour supply as a result of the migration of member a_1 . Thus, income I_2 remains unchanged. However, the budget constraint of household A is worsened by the additional consumption requirement due to the arrival of new member b_1 . In this case,

$$BC_2 = I_2 - (C'_1 + C_2 + C_3) \quad (2.4)$$

and the difference in the budget constraint of household A from t_0 to t_2 is $\Delta BC_2 = -[I_1 - (C_1 - C'_1)]$. Therefore, if the food consumption of the new member b_1 equals that of migrant a_1 , then $\Delta BC_2 = -I_1 < 0$ and the food security of household A is negatively affected by both the migration of member a_1 and the arrival of member b_1 . However, this result is conditional on no increase in income I_2 . If, at time t_2 , b_1 consumes more than that was consuming migrant a_1 , then $C_1 < C'_1$ and $\Delta BC_2 < 0$. Again, the arrival of new member b_1 produces a negative effect on household A food security. This assumption implies that any increase in the household size without an increase in income has a negative effect on its food security. If, at time t_2 , b_1 consumes less than that was consuming migrant a_1 , then $C_1 > C'_1$ and the sign of ΔBC_2 will depend on income I_1 .

- When $I_1 = (C_1 - C'_1)$, meaning that the loss of income I_1 is compensated by the gain in food consumption, $\Delta BC_2 = 0$ and the food security of household A is not affected by both the migration of a_1 and the arrival of new member b_1 .
- If $I_1 > (C_1 - C'_1)$, then $\Delta BC_2 < 0$, and the food security of household A is negatively impacted by the arrival of new member b_1 . However, if $I_1 < (C_1 - C'_1)$ then $\Delta BC_2 > 0$, which results in an improvement of the food security of household A .

In other words, in the case where the migrant-sending household does not receive remittances and the new member does not generate additional, the improvement of the overall household food security will depend on whether the migrant was consuming less than the income he was generating and the new member consumes less than that was consuming the migrant.

(iii) At $t_2 > t_1$, b_1 joins the migrant household A and is recorded as a new member in this household; b_1 starts co-residing with members a_2 and a_3 and starts generating income I'_1 for

household A and consuming C'_1 . The budget constraint of household A at time t_2 becomes:

$$BC_2 = (I'_1 + I_2) - (C'_1 + C_2 + C_3) \quad (2.5)$$

The difference in the budget constraint of household A from t_0 to t_2 is then $\Delta BC_2 = (I'_1 - C'_1) - (I_1 - C_1)$. Therefore, if the income I'_1 generated by the new member b_1 is fully dedicated to its consumption C'_1 , then $\Delta BC_2 = -(I_1 - C_1)$ and the arrival of new member b_1 do not change the situation of household A highlighted in case (i) of model 1. However, if b_1 consumes less than the income that he provided to the household A then $I'_1 > C'_1$ and the difference, $I'_1 - C'_1$, will compensate for the loss of income I_1 due to the departure of member a_1 . Hence, the negative effect on the food security of household A produced by the migration of a_1 is offset by the arrival of the new member b_1 . Nonetheless, if new member b_1 consumes more than I'_1 , then he becomes a burden for household A , and his arrival will lead to a deterioration of the food security of A . Therefore, household A will have to rely on remittances to compensate the loss of income I_1 and the additional mouth to feed b_1 .

(iv) At $t_2 > t_1$, a_2 and a_3 join household C and start co-residing with members c_1 and c_2 . Then, household A dissolves and the migration episode is not reported in household C . Therefore, the effect of the migration of individual a_1 on the food security of the left behind a_2 and a_3 will only be observed in household C , in which they are recorded as new members. In this case, migration does affect the food security of not only a_2 and a_3 , but also that of the household who received them. In this situation, the effect of migration on the left behind will depend on many variables. First, do c_1 and c_2 were working? Do a_2 and a_3 received remittances? Are these remittances used in food consumption of all the members of household C ?

2.2.3 Measurement of household food security

At the household level, there are still no indicators combining all the four dimensions of food security. Most household food security indicators measure either food access or food utilization or both. In this paper, we based our analysis on two food security indicators, the Food Consumption Score (FCS), and the Coping Strategies Index (CSI). The former measures both "access" and "utilization" dimensions of food security, while the latter focuses on its "stability" dimension.

Therefore, using these indicators allows us to take into account three dimensions of household food security in our analysis.

The Food Consumption Score (FCS) is the WFP's flagship indicator for establishing the prevalence of food security in a country or region. It measures both dietary diversity and household food access. The construction of FCS indicator is based on a seven recall on the frequency of household consumption of eight food groups (Staples, pulses, vegetables, fruits, meat and fish, dairy products, sugar, and oil). Each food group is assigned different weights (meat, milk, and fish, 4; pulses, 3; staples, 2; vegetables and fruits, 1; sugar and oil, 0.5), which are determined based on the energy, protein, and micronutrient contents that they provide. The FCS is obtained by summing the weighted frequency of consumption of each food group. The higher the FCS is, the better is the household food access and food diversification.

The second food security indicator considered is the Coping Strategies Index (CSI), developed by [Maxwell \(1996\)](#). The index measures household behaviors in order to cope with a food deficit. A series of 12 questions about how households manage to cope with a shortfall in food for consumption and their frequency over the past seven days are asked of households. The number of questions is not limited. It depends on the existing coping strategies in each country and each region. As for FCS, the frequency of each strategy is weighted based on the severity of the strategy used by households. The CSI is then obtained by summing the weighted frequencies of each strategy. A higher CSI means that the household has a poor stability in food access when there is a food deficit.

2.3 The case of Ethiopia

2.3.1 A brief history of migration in Ethiopia

Except for the brief Italian invasion from 1936-41, Ethiopia is the only country in Africa that was not colonized. Historically, migration in the country occurred mainly for political reasons. As described by [Bariagaber \(1997\)](#), the horn of Africa is one of the most critical regions of the world where conflicts and attendant flows have been manifest for decades. Table 2.1 shows that Ethiopia has been the primary producer of refugees in this region. Between 1967 and 1973, the main cause of the movements of refugees from Ethiopia was the fight between national parties ([Bariagaber,](#)

1997). After the 1974 revolution, in which the last emperor, Haile Salisse, was overthrown by the military, a new dimension was added to the mostly local conflict. Various opposition groups within Ethiopia waged armed struggle to overthrow the communist-style totalitarian regime, established by the military junta known as the Dergue. From 1976 to 1979, the Dergue conducted a brutal campaign of killing, detention, and torture against urban-based opponents. This campaign known as the Red Terror, made many people flee to neighboring countries in order to escape persecution (Berhanu and White, 2000). At the same time, in the years 1977-1978, the war with Somalia over the Ogaden region bordering the two countries led to a flow of thousands of Ethiopian to Somalia (Fransen and Kuschminder, 2009). Another political push factor of the movement out of Ethiopia was the war with Eritrea, which started in 1962 and lasted until 1991 (Berhanu and White, 2000).

Political violence is not the only cause of the migration of people in the 1970s. After the 1974 revolution, Ethiopia faced three significant droughts (in 1977-78, 1987-88, and 1993-94) and one national famine, in 1984-85. The famine, combined with the political conflicts, greatly increased the population's vulnerability and led to their migration to better living areas. The famine also led the government to resettle around 600,000 rural citizens from Central and Northern Ethiopia to Southern and Western Ethiopia (Rahmato, 1991). By doing so, the government redistributed the rural population into farming cooperatives in order to deal with the famine (Fransen and Kuschminder, 2009).

In contrast to the historical migration, current international migration in Ethiopia occurs mainly for economic reasons. According to the World Bank, the emigration rate in Ethiopia in 2018 account for 0.8% of the population, which amounts to a stock of 847,712 persons. The top 10 destination countries are the United States, Saudi Arabia, Israel, Sudan, Kenya, Italy, Canada, Germany, the United Kingdom, and Sweden. According to (Fransen and Kuschminder, 2009), Ethiopian migrants spend 1 to 3 years in neighboring countries before migrating to the west. The high unemployment rate in urban areas leads young men to construct migration as a solution to their temporary problem (Mains, 2007). However, international migration involves a cost, and young men usually rely on the chance to win the US Lottery Visa. The same economic reasons also lead to a flow of Ethiopian women to the Middle East (Saudi Arabia, United Arab Emirates, Yemen, Kuwait, Qatar). This migration represents one of the most significant international migration flows in Ethiopia. Women migrate in order to work as servants with the expectation to

Table 2.1: Refugees in the Horn of Africa and Ethiopia: 1972-1992

Year	Refugees in the Horn of Africa	Refugees from Ethiopia	Percentage of Refugees from Ethiopia
1972	55,000	55,000	100.00
1977	102,000	91,000	89.22
1982	1,091,000	1,081,500	99.13
1987	1,343,300	1,122,300	83.55
1992	1,676,800	752,400	44.87

Source: Bariagaber, 1997.

improve the living standard once returning at home. However, even though the initial decision is made by their own free will, this migration occurs through trafficking (Fransen and Kuschminder, 2009). The study of Anbesse et al. (2009) has shown that Ethiopian women working as domestic workers suffer from inadequate working conditions and sexual abuse. The consequences lead to a social defeat for these women.

At the internal level, Ethiopians currently migrate temporally or permanently from rural to urban areas, and from rural to rural through traditional marriage. Rural-rural migrations appear as adaptation strategies for poor agricultural and living conditions (Mberu, 2006). Young people migrate from rural to urban areas in order to escape rural poverty. Because of a high unemployment rate in urban towns, rural-urban migration leads to a shift in rural poverty to urban poverty (Fransen and Kuschminder, 2009). In addition to the rural-rural and rural-urban migration, the government of Ethiopia has initiated a new resettlement program, started in 2003 as part of the National Food Security Strategy. The goal of the program was to resettle 2.2 million people from the chronically food-insecure highlands to the fertile agricultural lowlands within three years (Fransen and Kuschminder, 2009). Resettled people were given a plot of land, some start-up supplies, and eight months of food rations.

2.3.2 Data and descriptive

Describing ESS3

Our empirical analysis is based on data from the third Ethiopian Socioeconomic Survey (ESS3) from 2015/2016, which is a collaborative project between the Central Statistics Agency of Ethiopia (CSA) and the World Bank Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) team. The database covered 4,954 households, and the sample is a two-stage probability

sample and nationally representative. The first stage of sampling entailed selecting primary sampling units, or CSA enumeration areas (EAs). A total of 433 EAs were selected based on probability proportional to the size of the total EAs in each region. The second stage of sampling implied the selection of households from each EA. A total of 12 households were sampled from each rural and small-town EA, while 15 households were selected in each large town EA. The database provides information on the household, water quality, community post-planting agriculture, livestock, and post-harvest agriculture. The household information covered demographics, education, health, labor and time use, partial food and nonfood expenditure, household nonfarm income-generating activities, food security and shocks, safety nets, housing conditions, assets, banking and saving, credit, and others sources of household income.

Migration and variation in co-residence choices in the ESS3

To identify a migrant in the ESS3, households were asked the following question: “Is [NAME] still a member of this household?” When the answer is no, they are asked the reasons why an individual i left the household. They also provide the current location of individual i ; whether he resides in rural or urban locations; and whether he resides inside or outside Ethiopia? We consider that migrants are the individuals who left their household and currently residing in other locations. The minimum year since migration in ESS3 is 2007, meaning that the minimum time since migration is 8 years.

Table 2.2 presents the rate of individuals who left their households according to the reasons for leaving and their current location. It shows that individuals left the households for four main reasons: marriage, join a family already living in another location, left for work, and left for studies. Indeed, 20.23% of individuals left their household to cohabit with their partners; 20.08% joined their family already living in another location; 17.73% moved for work, and 13.07% left for studies. Those who left their households because of marriage, or to join a family already living in another location, mostly went to rural areas; while individuals who left for work or studies moved to urban areas.

Figure 2.1 shows that internal migration dominates in Ethiopia. Indeed, 5% of Ethiopians migrated abroad, compared to 95% who migrated within the country. Of those who migrated outside Ethiopia, 75% went to work (Table 2.2), meaning that most of Ethiopians migrating outside

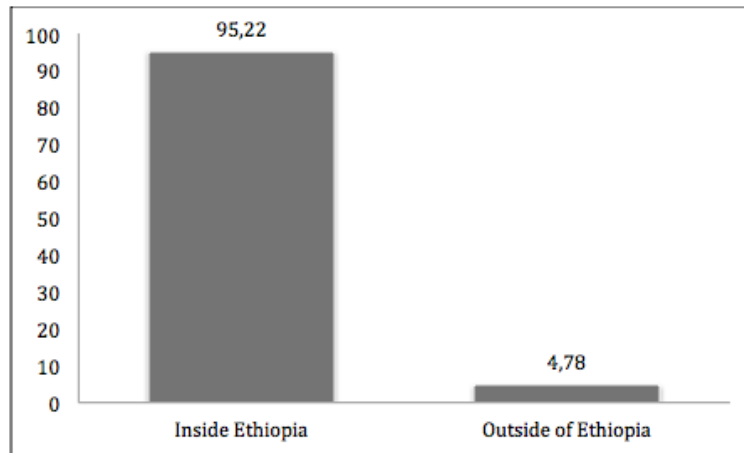
Table 2.2: Reasons of leaving the household and destinations

	All sample	Rural	Urban	Inside Ethiopia	Outside Ethiopia
Divorce/Separation	3.63	5.35	2.70	4.10	3.06
Left for studies/Educational opportunities	13.07	3.61	34.33	15.12	5.61
Left for work	17.73	9.91	24.05	17.12	75.00
Left to find better land	0.98	1.96	0.07	1.15	0.00
Health reasons	0.61	0.45	0.87	0.69	0.51
Security reasons	0.37	0.36	0.51	0.44	0.00
For marriage/Cohabitation	20.23	30.48	14.36	23.71	2.55
To join a family already living in another location	20.08	30.34	14.50	23.43	4.08
Moved with family	4.15	6.20	2.70	4.84	1.02
Left to set own home	6.44	8.79	4.45	7.33	5.10
Dead	9.72	0.04	0.15	0.08	0.00
Other reasons	2.98	2.50	1.31	1.97	3.06
Total	100.00	100.00	100.00	100.00	100.00

Source: Author calculation from the third Ethiopian Socioeconomic Survey (ESS3) 2015/2016 data

their country went for work reason. The share of individuals migrating inside Ethiopia for work is also higher. Indeed, 17% of individuals migrating inside Ethiopia left for work. However, this rate is less than that of individuals who joined their partners (23.71% of total internal migrants) or their family already living in another location (23.43% of total internal migrants).

Regarding the variation in co-residence choice in ESS3, households were asked whether an individual i is a new member of the household. However, ESS3 does not make it possible to know if the new member starts co-residing before or after the migration episode. The information on the household of origin of the new member is also not provided. However, more than 53% of the new members are sons or daughters of the household head, and more than 51% are female (See Table A.4 in Appendix A). This figure suggests that the new members may come from the households in which the husband has migrated. They could also be returning migrants. In the overall sample almost 36% of households have received a new member, with migrant households receiving less than non-migrant households. Indeed, 55% of the total new members are received by non-migrant households compared to 45% for migrant households.



Source: Author calculation from the third Ethiopian Socioeconomic Survey (ESS3) 2015/2016 data

Figure 2.1: Internal and international migration in Ethiopia

Migration, remittances, and food security in the ESS3

Table 2.3 compares the food security of households containing a rural migrant with that of households with an urban migrant. The difference in their coping strategies is not significant. However, households with an urban migrant have a higher food consumption score (FCS), meaning that their food access is higher than that of households with a rural migrant. Households with an urban migrant also received remittances more than those who have a rural migrant. As highlighted in the previous section, rural migrants mostly left their households either to join a family already living in another location or to cohabit with their partner after marriage.

Table 2.3 also shows that there is no significant difference between the food security (both food consumption score and households' coping strategies) of households with an internal migrant and that of households owning an international migrant. However, the amount of remittances received in the households with an international migrant is significantly higher than that received in the households whose migrant resides in Ethiopia. This is because most international migrants left their households in order to work in another location (Table 2.2). Consequently, they are then more likely to send remittances back home.

To understand the difference observed in table 2.2, we also compared the food security of households according to the reasons for which one of their members has migrated. Table 2.4 indicates that households whose members left because of marriage received fewer remittances than other households. Moreover, their food consumption score is lower, and their coping strategies

Table 2.3: Food security and remittances according to migrant locations

	Rural vs Urban migration			Internal vs International migration		
	Rural migrant	Urban migrant	Difference (Prob.)	Internal migrant	International migrant	Difference (Prob.)
CSI	3.66	3.66	0.405	3.63	4.34	0.760
FCS	50.82	56.79	0.000	53.30	51.32	0.921
Remittances (log)	7.03	7.95	0.000	7.44	8.07	0.020

Source: Author calculation from the third Ethiopian Socioeconomic Survey (ESS3) 2015/2016 data

are more severe, compared to households whose members left for other reasons. The amount of remittances received in the households for which a member has left for studies is not significantly different from that of the households whose members migrated for other reasons. However, their food diversification is better and their coping strategies are less severe. Table 2.4 also shows that households whose members left for work received higher remittances than their counterparts. However, their food consumption score and their coping strategies are not significantly different from those of the households whose members migrated for other reasons. Regarding households whose members join their family already living in another location, there is no difference in the amount of remittances received. However, their food consumption score is significantly better.

Table 2.4: Food security and remittances according to the top 4 reasons of migration

	Marriage			Left for studies			Left for work			Join a family		
	YES	NO	Prob	YES	NO	Prob	YES	NO	Prob	YES	NO	Prob
CSI	4.24	3.40	0.015	2.62	3.94	0.033	3.74	3.63	0.271	3.61	3.68	0.401
FCS	51.22	54.13	0.007	56.35	52.37	0.000	53.15	53.24	0.686	54.66	52.61	0.061
Remittances (log)	7.24	7.59	0.057	7.71	7.44	0.290	7.78	7.33	0.076	7.37	7.54	0.637

Author calculation from the third Ethiopian Socioeconomic Survey (ESS3) 2015/2016 data

Food security in urban and rural areas

Table 2.5 compares the food consumption score as well as the frequencies of consumption of each food group in rural and urban areas. Overall, except for pulses, the food consumption frequencies of remaining food groups are higher in urban than rural areas. As a result, the food consumption score in urban areas is higher than that in rural areas. Therefore, people living in urban areas have a better food access and food diversification than those living in rural areas.

While table 2.5 shows that urban people are better-off than rural people with regard to their food consumption score, the opposite is indicated in table 2.6. Indeed, households in rural areas

use less severe coping strategies than those in urban areas, such as having no food of any kind or go for a whole day and night without eating anything. As a result, the coping strategies index (CSI) is higher in urban areas than in rural areas, which means rural households have a better stability in food access than urban households.

Table 2.5: Rural vs Urban food consumption frequencies

Variables	Rural		Urban		Difference in means test (p-value)
	Mean	Sdt. Dev	Mean	Sdt. Dev	
Food groups					
Main staples	9.83	4.56	13.22	4.72	0.000
Pulses	3.66	2.93	3.61	2.59	0.017
Vegetables	2.87	2.84	3.02	2.53	0.803
Fruit	0.53	1.30	1.08	1.64	0.000
Meat and fish	0.70	1.57	1.84	2.44	0.000
Milk	1.86	2.68	1.67	2.50	0.198
Sugar	2.31	3.03	4.76	2.92	0.000
Oil	5.24	2.70	6.50	1.63	0.000
Condiments	7.37	2.76	6.56	2.24	0.000
Food Consumption score	48.13	20.87	61.11	23.42	0.000

Table 2.6: Rural vs Urban coping strategies

Variables	Rural		Urban		Difference in means test (P-value)
	Mean	Sdt. Dev.	Mean	Sdt. Dev.	
Coping strategies					
Rely on less preferred foods?	0.94	1.94	1.03	1.89	0.062
Limit the variety of foods eaten?	0.71	1.66	0.74	1.61	0.832
Limit portion size at meal times?	0.43	1.21	0.43	1.31	0.846
Reduce the number of meals eaten in a day?	0.39	1.15	0.42	1.25	0.247
Restrict consumption by adults for small children to eat?	0.23	0.86	0.26	1.01	0.778
Borrow food or rely on help from a friend or relative?	0.14	0.74	0.25	1.04	0.000
Have no food of any kind in your household?	0.04	0.30	0.13	0.74	0.000
Go a whole day and night without eating anything?	0.03	0.24	0.11	0.64	0.000
Coping Strategy Index	3.99	8.31	5.25	12.94	0.003

Source: Author calculation from the third Ethiopian Socioeconomic Survey (ESS3) 2015/2016 data

2.3.3 Empirical analysis methodology

In this section, I described the empirical methods used to analyse the effect migration on the households food security in Ethiopia using the ESS3 data. I first discussed the Heckman estimate which was employed to investigate both the causal effect of migration on households coping strategies index in the whole population (treated and non-treated), and the effect in the restricted population of migrant households (treated). Secondly, I present the Maximum Simulated Likelihood (MSL) used to analyse the effect of different types of migration on households coping strategies index.

-Heckman estimate procedure

In line with the literature ([Karamba et al., 2011](#); [Nguyen and Winters, 2011](#); [Sharma and Chandrasekhar, 2016](#)), I consider a model of households food security which includes the migration variable, and a set of exogenous household and community variables which are expected to influence household decision making with respect to food consumption.

$$Y_i = \beta_0 + \beta_1 M_i + \beta_2 X_i + \epsilon_i \quad (2.6)$$

where Y_i is the food security status of household i . M_i is a binary variable taking 1 when a household i has a migrant and 0 otherwise, X_i is a vector of socio-economic characteristics of household i .

In this model, there is a concern that the migration variable is endogenous which would make equation 3.2 not estimable with Ordinary Least Squares. First, individuals who migrated are not randomly selected among household members, as their characteristics differ from that of individuals who didn't migrate. The migration variable, M_i , may therefore suffers from a selection bias. The second concern on this variable is a reverse causality bias. Indeed, the recurrence of food deficit shocks can be a push factor for migration, with individuals migrating because of unavailability of food in the household. However, in the case of migration, the most important bias is that of selection (?). It is for this reason, unlike previous studies (Karamba et al., 2011; Nguyen and Winters, 2011) that used 2SLS, I adopt in this paper the two-step estimate proposed by Wooldridge (2010), which is based on Heckman model. Since the approach is based on instrumental variables, it allows the correction of not only the selection bias but also that of reverse causality. The estimation procedure is described as follow:

In a first step, the selection into migration is modeled from the following probit specification:

$$M_i^* = \theta_0 + \theta_1 X_i + \theta_2 Z_i + a_i \quad (2.7)$$

Where:

$$M_i = \begin{cases} 1 & \text{if } M_i^* > 0 \\ 0 & \text{if } M_i^* \leq 0 \end{cases} \quad (2.8)$$

This specification allows to take into account the selection on the observable characteristics X_i and Z_i , where Z_i is a vector of instrumental variables that explain the probability to migrate but have no direct effect on the coping strategies adopted by households.

This first step estimates the probability that the household has a migrant abroad, $Prob[M_i^* > 0] = \Phi(\theta_0 + \theta_1 X_i + \theta_2 Z_i + a_i)$, from which is constructed the inverse of the Mill ratio λ_1 that allows the

correction of the endogenous selection bias of households with a migrant.

$$\lambda_{1i} = \frac{\phi(\theta_0 + \theta_1 X_i + \theta_2 Z_i + a_i)}{\Phi(\theta_0 + \theta_1 X_i + \theta_2 Z_i + a_i)} \quad (2.9)$$

Symmetrically, the selection term applicable to non-migrant households is given by:

$$\lambda_{0i} = \frac{\phi(\theta_0 + \theta_1 X_i + \theta_2 Z_i + a_i)}{1 - \Phi(\theta_0 + \theta_1 X_i + \theta_2 Z_i + a_i)} \quad (2.10)$$

Now that the selection correction terms are known, it becomes possible to estimate, in the second step, the effect of migration on the food security of households. Since migration is considered as a treatment variable, there are two potential outcomes of the level of household food insecurity. In other words, when the household has a migrant, its food security status is Y_{1i} , while when the household does not have a migrant, it is Y_{0i} . Formally:

$$Y_{0i} = \mu_0 + X_i \beta_0 + e_0 \quad \text{with } E(e_0|X) = 0 \quad (2.11)$$

$$Y_{1i} = \mu_1 + X_i \beta_1 + e_1 \quad \text{with } E(e_1|X) = 0 \quad (2.12)$$

While the CSI for any household i (treated or untreated) is given by the equation:

$$Y_i = Y_{0i} + M_i(Y_{1i} - Y_{0i}) \quad (2.13)$$

By substituting equations 2.11-2.12 into 2.13, we get:

$$Y_i = \mu_0 + (\mu_1 - \mu_0)M_i + X\beta_0 + M_i(X\beta_1 - X\beta_0) + e_0 + M_i(e_1 - e_0) \quad (2.14)$$

By posing $\eta = e_0 + M_i(e_1 - e_0)$, $\alpha = \mu_1 - \mu_0$; and making the following assumptions: $E(e_1|X, Z) = E(e_0|X, Z) = 0$, $E(a|X, Z) = 0$, the error terms a, e_0 and e_1 follow a joint normal distribution; It can be proved that:

$$E(Y_i|X_i, M_i) = \mu_0 + \alpha M_i + X\beta_0 + M_i(X - \mu_x)\beta + \rho_1 M_i \lambda_{1i} + \rho_0 (1 - M_i) \lambda_{0i} \quad (2.15)$$

Where λ_1 and λ_0 are the selection correction terms obtained from the first step, and μ_x is the

mean of variable x . Now, the estimation of equation 2.15 with Ordinary Least Squares (OLS) produces consistent and efficient results under selection. α denotes the average treatment effect (ATE), which is the effect of migration on the coping strategies index in the whole population (migrant and non-migrant households).

The second objective of this paper is to study the impact of migration only in the population of households with a migrant. To do so, I calculated the average treatment on treated (ATET), which represents the difference between the observed food security of households with a migrant and the counterfactual food security they would have if they did not have a migrant. This difference can be derived from equation 2.15 as shown Cerulli (2014).

$$ATE_T = \alpha + \Theta \sum_{i=1}^N M_i (X_i - \bar{X}) \beta + (\rho_1 + \rho_0) \times \Theta \sum_{i=1}^N M_i \times \lambda_{1i} \quad (2.16)$$

Where:

$$\Theta = \frac{1}{\sum_{i=1}^N M_i}$$

- Probit two stage least square

In the Heckman estimate, the efficiency the parameters in equation 2.15 relies on the assumption on the joint normal distribution of the error terms a, e_0 and e_1 . Since it is difficult to test this assumption, we also estimate the effect of migration using the three step probit-2SLS, which is an alternative method to address the endogeneity of the migration variable. The estimation strategy is straightforward.

The first step is to estimate the selection into migration with a probit model. Formally:

$$M_i^* = \theta_0 + \theta_1 X_i + \theta_2 Z_i + a_i \quad (2.17)$$

Where:

$$M_i = \begin{cases} 1 & \text{if } M_i^* > 0 \\ 0 & \text{if } M_i^* \leq 0 \end{cases} \quad (2.18)$$

From this first step, we get the predicted probability that the household i has a migrant, $P_{M_i} = Prob[M_i^* > 0]$. Next, this probability is considered as an instrument for the migration

variable in the well-know two stage least square procedure.

Therefore, in the second step, an Ordinary Least Square (OLS) is run on the following equation:

$$M_i^* = \theta'_0 + \theta'_1 X_i + \theta'_2 P_{M_i} + a'_i \quad (2.19)$$

This second step allows to obtain the fitted values M'_i that no longer suffer from endogeneity. Therefore, it is now possible to estimate the effect of migration on households food security with an Ordinary Least Square (OLS) using the following specification:

$$Y_i = \mu_0 + \alpha M'_i + X_i \beta_0 + M'_i (X - \mu_x) \beta + \epsilon_i \quad (2.20)$$

- Maximum Simulated Likelihood estimate procedure

In the above procedures, migrant status is considered as a binary variable taking value 1 if an individual is a migrant and 0 otherwise. This specification does not allow the analysis of the effect of different types of migration on households coping strategies. Therefore, to address this issue, I use the maximum simulated likelihood method following the approach proposed by [Deb and Trivedi \(2006a,b\)](#).

Consider the structural model given by

$$\begin{aligned} E(Y_i | M_i, X_i, l_i) &= f(\beta_0 + \gamma M_i + \beta X_i + \lambda l_i) \\ \Pr(M_{ij} = 1 | X_i, Z_i) &= g(\alpha_0 + \alpha_{1j} X_i + \alpha_{2j} Z_i + \delta_j l_i) \end{aligned} \quad (2.21)$$

where Y_i , X_i and Z_i are the same variable as in the Heckman estimate (Y_i =Coping strategies index, X_i =household and community characteristics, Z_i =Instruments). l_i denotes a vector of latent factors reflecting unobserved heterogeneity and λ and δ are associated vectors of factor loading. M_i denotes the vector of migration choices and M_{ij} is the j^{th} migration alternative.

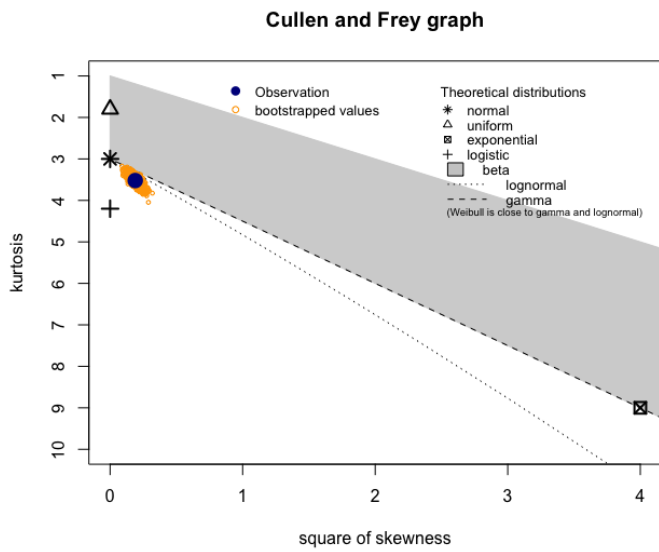
Since Y_i and M_i are conditionally independent, their joint distribution conditional on common latent factors is written as follow:

$$Pr(Y_i, M_i | X_i, l_i) = f(\beta_0 + \gamma M_i + \beta X_i + \lambda l_i) \times g(\alpha_{0j} + \alpha_{1j} X_i + \alpha_{2j} Z_i + \delta_j l_i) \quad (2.22)$$

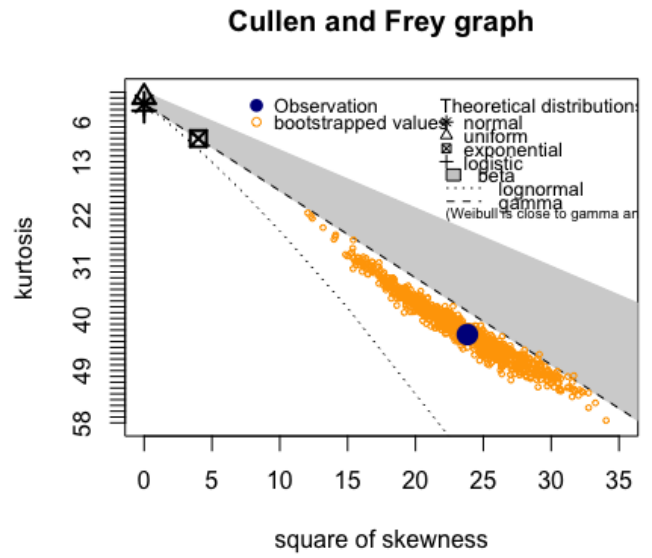
Estimate of the parameters of equation 2.10 by MSL (Maximum Simulated Likelihood) depends on an assumption about the distribution of l_i denoted h , which will be used to integrate l_i out of the joint density. Formally:

$$Pr(Y_i, M_i|X_i) = \int [f(\beta_0 + \gamma M_i + \beta X_i + \lambda l_i) \times g(\alpha_{0j} + \alpha_{1j} X_i + \alpha_{2j} Z_i + \delta_j l_i)] dh(l_i) \quad (2.23)$$

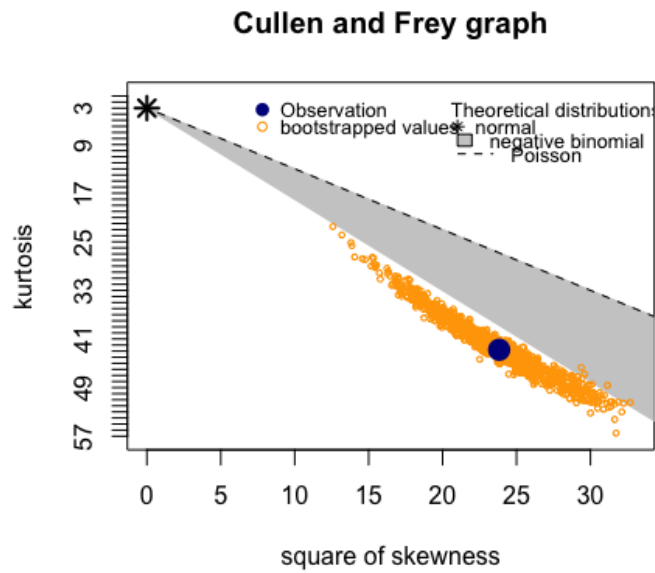
Estimate of the parameters of equation 2.10 by MSL (Maximum Simulated likelihood) depends on an assumption about the distribution of l_i (Gourieroux et al., 1984). To choose the appropriate distribution that best fits our data, we used the Cullen and Frey graph and compared the empirical distribution of our data with selected theoretical distributions. Figure 2.2 shows that food consumption score (FCS)'s data are likely to follow three distributions: Normal, Gamma and Log-normal. When we compared the empirical distribution of FCS with these theoretical distributions (see Figures A.1, A.2, and A.3 in Appendix A), we remarked that the normal distribution best fits the food consumption score's data. Therefore, the FCS equation is estimated with a Normal distribution. Regarding the coping strategies index data, Figure 2.2 shows that it is more likely to follow a log-normal and a negative binomial distribution. The CSI (Coping strategies Index) variable is a discrete variable, since its construction is based on the frequencies of use of different coping strategies (with integer weights). The occurrence of zero values is more critical in this variable, as it is possible that households do not use any coping strategies. The comparison of empirical and theoretical distributions (see Figure A.4 and A.5 in Appendix A) confirms that the CSI data are discrete and they follow a negative binomial distribution. Therefore, in all CSI equations, l_i is supposed to obey a negative binomial distribution.



(a) Food consumption score



(b) Coping strategies index (Continuous distributions)



(c) Coping strategies index (discrete distributions)

Source: Author

Figure 2.2: Fitting the distribution of FCS and CSI

Table 2.7: Migration rate in 2001-2008 and average coping strategies index of regions in 2015-2016

Region	Migration rate 2001-2008	Average CSI 2015-2016
Tigray	9.301	3.305
Afar	3.253	4.149
Amhara	22.699	3.3833
Oromia	21.639	6.073
Somalie	5.277	4.252
Benshagul Gumuz	3.639	1.976
snp	19.735	4.285
Gambelia	3.7831	5.816
Harari	2.530	0.907
Addis Ababa	3.639	7.923
Diredwa	4.506	5.029

- Instruments

The main difficulty with two-stage estimation procedures is the identification of instruments, which must be correlated with the probability of migration but not correlated with the CSI. In this paper, I took the regional rate of migration over the period 2001-2008 as an instrument for the migration variable. There are two main reasons for this choice. The first is that the construction of the CSI is based on the frequencies of adoption of each strategy over the last seven days prior to the survey in 2015-2016. It is therefore unlikely that the migration rate in a region in 2001-2008 would be correlated with the food deficit and the frequencies of coping strategies adopted by households in 2015-2016. As the table 2.7 shows, the two regions Ahmara and Oromia with the highest emigration rates in 2001-2008 are not the ones with the highest coping strategies index in 2015-2016. The second reason for choosing the 2001-2008 regional migration rate is that higher past migration rate leads to richer overseas networks of contacts, which in turn reduce the migration cost and facilitate current migration (Margolis et al., 2015). For instance, using data from 2013 Labor Force Surveys (LFS), Bundervoet (2018) have found that Ahmara and Oromia regions are the main origin regions of internal migrants in Ethiopia. This founding can be explained by their past migration rates observed in 2001-2008 which allow them to have a richer oversea network. The 2001-2008 regional migration rate is therefore a suitable instrument for the migration in this analysis. Regional migration rate has also been used in previous migration studies (Jr. and Page, 2005; Margolis et al., 2015; AO et al., 2016; Nguyen and Winters, 2011).

- Control variables

We follow previous literature ([Karamba et al., 2011](#); [Nguyen and Winters, 2011](#); [Sharma and Chandrasekhar, 2016](#); [Margolis et al., 2015](#); [Jr. and Page, 2005](#)) to select household socioeconomic characteristics that are likely to be related to their food consumption decisions. The considered vector of exogenous variables includes the household-level characteristics and the household head related variables.

The household head variables are gender, age, age squared, marital status, and education (four categories - the category "no education" is the reference). These variables is assumed to differently affect households nutrition. Regarding the marriage status of the household head, I expect singles to be less affected by a food deficit because they have less individuals to feed. Concerning education, the household heads with high educational attainment is expected to be more wealthier and less affected by a food shortage.

The household-level characteristics include the household size, his welfare, and his living place. According to the economy of scale theory, the household size is expected to have a positive effect on the food consumption household ([Barten and Instituut, 1964](#); [Deaton and Paxson, 1998](#)). However, a larger household size means a wider distribution of food within the household. Therefore, when there is a food deficit, the household size becomes a burden that can lead to the adoption of more severe coping strategies. ESS3 does not provides household welfare. Therefore, to measure the household welfare, we follow [Margolis et al. \(2015\)](#) by constructing an assets index², which is a proxy of households income level. The asset index also captures two factors which can affect households food security: capital available for food purchase and collateral against which households can borrow to finance food production.

Table 2.8 reports the summary statistics of all the variables above. The number of households with at least one migrant is almost equal to that of households with no migrants. When comparing

²The asset index is constructed with a multiple correspondence analysis (MCA) basing on dummies variables which denote the presence/absence of the following goods: Kerosene stove, Cylinder gas stove, Electric stove, Blanket/Gabi, Mattress and/or Bed, Wristwatch/clock, Fixed line telephone, Mobile Telephone, Radio/ tape recorder, Television, CD/VCD/DVD/Video Deck, Satelite Dish, Bicycle, Motorcycle, Cart (Hand pushed), Cart (animal-drawn)- for transporting people and goods, Sewing machine, Weaving equipment, Mitad-Electric, Energy saving stove (lakech, mirt etc), Refrigerator, Private car, Jewels - Gold (in grams), Jewels - Silver (in grams), Wardrobe, Shelf for storing goods, Biogas pit, Water storage pit, Sickle (Machid), Axe (Gejera), Pick Axe (Gesó), Plough (Traditional), Plough (Modern), and Water Pump. The first axis (F1) summarizes 17.23 % of the information (see table A.1 in appendix) contained in the variables was retained to construct the index.

the reaction of each subgroup to food shortage, the mean difference in the coping strategies index is significant, with migrant-households being more food secure than non migrant-households. Table [2.8](#) also indicates that household heads in migrant households are older - the average is 50 - and less educated. Most of them are also separated or widowed, compared to the household heads in non-migrant households. Regarding living standards, migrant households are more impoverished than non-migrant households. Also, they are more located in rural areas. The share of household members under 15 and that of household members aged 15-65 are smaller in migrant households. This difference can be explained by migration.

Table 2.8: Summary Statistics

Variables	Observations	Migrant households	sdC	Non-migrant households	sdT	P-value	starS
Food security indicators							
Coping Strategies Index (CSI)	4954	3.66	8.65	5.02	11.15	0.000	***
Food consumption score (FCS)	4954	53.21	22.53	52.00	22.68	0.071	*
Household head characteristics							
Gender: Female	4953	0.32	0.47	0.30	0.46	0.057	*
Age	4947	49.58	15.05	43.78	15.01	0.000	***
Age squared	4947	2684.89	1572.04	2142.07	1533.81	0.000	***
Education							
<i>illiterate</i>	4954	0.58	0.49	0.49	0.50	0.000	***
<i>Primary school</i>	4954	0.28	0.45	0.31	0.46	0.012	**
<i>Secondary school</i>	4954	0.08	0.28	0.10	0.31	0.420	
<i>University</i>	4954	0.06	0.24	0.10	0.30	0.000	***
Marital status							
<i>Never Married</i>	4932	0.03	0.18	0.06	0.24	0.004	***
<i>Married (monogamous)</i>	4932	0.65	0.48	0.68	0.47	0.003	***
<i>Married (polygamous)</i>	4932	0.04	0.19	0.02	0.15	0.062	*
<i>Divorced</i>	4932	0.08	0.27	0.07	0.26	0.059	*
<i>Seperated</i>	4932	0.03	0.16	0.02	0.13	0.020	**
<i>Widowed</i>	4932	0.18	0.38	0.15	0.36	0.007	***
Household-level characteristics							
Household size	4948	4.86	2.40	4.70	2.41	0.646	
Assets index	4954	-0.04	2.50	0.03	2.42	0.059	*
Remittances (log)	1016	7.49	1.67	7.22	1.75	0.107	
New member(s)	4954	0.36	0.48	0.35	0.48	0.307	
Residence place							
<i>Rural</i>	4954	0.73	0.45	0.61	0.49	0.000	***
<i>saml town</i>	4954	0.09	0.29	0.08	0.27	0.436	
<i>Medium and large town</i>	4954	0.18	0.39	0.31	0.46	0.000	***
Share of mem in the household	4954	0.48	0.21	0.47	0.25	0.385	
Share of members under 5 years old	4954	0.09	0.12	0.15	0.17	0.000	***
Share of members aged 5-14	4954	0.17	0.15	0.22	0.19	0.000	***
Share of members aged 15-65	4954	0.43	0.20	0.57	0.26	0.000	***
Share of members over 65 years old	4954	0.04	0.10	0.06	0.18	0.230	

Note: ***: Significant at 1 % level, **: Significant at 5 % level, *: Significant at 10 % level

Results

- Effect of migration on household food security in Ethiopia

Table 2.9 reports three estimates of the average effect of migration on the Food Consumption Scores (FCS) and the Coping Strategies Index (CSI) of households in Ethiopia. Estimate (1) presents the results when regional fixed are not taken into account, while the results in estimate (2) control for these regional fixed effects. In estimate (3), only the sample of households that received remittances was considered.

Estimates (1) and (2) show that migration has a negative and significant effect on households' food consumption score (FCS), meaning that migration is negatively correlated with households' food access and food diversification. However, this result holds when we assume that households do not receive remittances (as presented in case *ii* of section 2.2.1). Indeed, estimate (3) indicates that migration has no significant effect on households' food access and diversification when we control for the receipt of remittances. This result confirms that of [Karamba et al. \(2011\)](#). However, in our case, the non-significant effect of migration is borne by the receipt of remittances. Indeed, an increase in remittances leads to a significant improvement in food access and diversification for remittances-receiving households. Table 2.9 also shows that remittances significantly reduce the severity of the coping strategies adopted in remittances-receiving households.

As described in section 2.2.2, the effect of migration on households' food security may also depend on the arrival of a new member after the migration episode. Table 2.10 reports the estimate of migration-effect on household food security when the variation in co-residence choices is taken into account. It shows that migration has no significant effect on households' food security once we controlled for the receipt of a new member. Estimate (2) of this table also shows that the arrival of a new member in the household has the same effect as remittances. Indeed, the arrival of a new member in the household is associated with an improvement of households' food access and food diversification. This effect is even magnified when we controlled for the receipt of remittances (Estimate 3). The receipt of a new member also reduces the negative effect of migration on households' food diversification and food access. This result is also confirmed in the Probit-2sls estimates (Table 2.11), which are robust to the inclusion of further control variables. Receiving a new member after the migration episode therefore mitigates the adverse effect of migration on

households' food access and diversification, as indicated in model 2 (see section 2.2.2). However, the interaction term between a receipt of a new member and the remittances received is not significant, meaning that new members are less likely to come from a former migrant household.

In table 2.12, we also took into account the time since the migrant left his or her household. The result shows that the time since migration has a quadratic and significant effect on household's food access and diversification. This pattern involves the existence of an initial increase phase following a detachment phase. In the short term, migration has a positive and significant impact on food diversification and access to food, while in the long term the opposite effect is observed. This result highlights the inverted U-Shaped pattern usually followed by remittances. Indeed, according to the new labor migration theory, migration is presented as an investment decision that can be subject to liquidity constraints. To overcome these liquidity constraints, migrants rely on resources pooled across household members and other relatives. Thus, the migrant is constrained to remit during his early years abroad. However, once his social debt has been paid, he will start reducing the amount of remittances sent to his household and other relatives.

Table 2.9: Heckman estimates of the effect of migration on household food security

Variables	(1)		(2)		(3)	
	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>
Migrant(s)	-1.031*** (0.233)	4.090 (4.315)	-0.518* (0.295)	4.513 (5.358)	-0.410 (0.261)	0.531 (7.326)
Remittances (log)					0.035*** (0.012)	-0.705*** (0.348)
Control variables	YES	YES	YES	YES	YES	YES
Regional FE	NO	NO	YES	YES	YES	YES
Control for receipt of remittances	NO	NO	NO	NO	YES	YES
Observations	4873	4925	4873	4925	1002	1010
Adjusted-R2	0.152	0.045	0.234	0.070	0.271	0.075

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity, FE: Fixed effects

Table 2.10: Heckman estimates of the migration effect on household food security controlling the variation in co-residence choices

Variables	(1)		(2)		(3)		(4)	
	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>
Migrant(s)	-0.518*	4.513	-0.041	-2.531	-0.425*	2.165	-0.424*	1.999
	(0.295)	(5.358)	(0.152)	(3.381)	(0.243)	(6.483)	(0.235)	(6.392)
New member(s)			0.054***	-0.303	0.067**	-1.416	0.102	-2.394
			(0.018)	(0.420)	(0.032)	(0.979)	(0.105)	(3.266)
Remittances (log)					0.035***	-0.740**	0.037***	-0.783**
					(0.012)	(0.347)	(0.012)	(0.346)
Remittances x New member(s)							-0.005	0.134
							(0.014)	(0.420)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4873	4925	4873	4925	1002	1010	1002	1010
Adjusted-R2	0.234	0.070	0.235	0.070	0.271	0.075	0.271	0.075

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity, FE: Fixed effects

Table 2.11: Probit-2sls estimates of the migration effect on household food security controlling remittances and variation in co-residence choices

Variables	(1)		(2)		(3)	
	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>
Migrant(s)	-0.447*	0.612	-0.383*	2.000	0.445	5.776
	(0.248)	(3.800)	(0.223)	(3.990)	(5.394)	(58.498)
New member(s)			0.076***	-0.885*	-0.044	-0.877
			(0.025)	(0.477)	(0.593)	(4.803)
Remittances (log)					0.013	-1.478
					(0.172)	(2.503)
Controls	YES	YES	YES	YES	YES	YES
Control for receipt of remittances	NO	NO	NO	NO	YES	YES
Regional FE	YES	YES	YES	YES	YES	YES
Observations	4873	4925	4873	4925	1002	1010

Table 2.12: Heckman estimates of the migration effect on household food security controlling the duration

Variables	(1)		(2)		(3)	
	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>	<i>FCS (log)</i>	<i>CSI</i>
Migrant(s)	-0.518*	4.513	-0.959**	8.036	-1.020**	9.391
	(0.295)	(5.358)	(0.482)	(8.946)	(0.502)	(8.714)
Time since migration			0.277*	-2.509	0.289**	-2.827
			(0.142)	(2.349)	(0.146)	(2.280)
Time since migration squared			-0.019*	0.127	-0.019*	0.141
			(0.010)	(0.142)	(0.010)	(0.139)
New member					0.041**	-0.424
					(0.017)	(0.420)
Control variables	YES	YES	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES	YES	YES
Control for receipt of remittances	NO	NO	NO	NO	NO	NO
Adjusted-R2	0.234	0.070	0.244	0.075	0.245	0.077
Observations	4873	4925	3111	3150	3119	3157

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity, FE: Fixed effects

- What would be the food security of migrant households in absence of migration?

In this section, we are mainly interested in the effect of migration in the subgroup of migrant-sending households. We thus addressed the following question: "would the food security status of households with a migrant be better or worse if there had been no migrants?".

Inspection of table 2.13 indicates that the coping strategies adopted by migrant-sending households when there is a food deficit would be worse if they did not have any member who migrated. Thus, migration leads to more stability in food access for migrant-sending households. This positive impact of migration on the stability in food access for migrant-sending households is mainly driven by remittances, as found in the above section. Indeed, when these households face a food shortage, they can rely on remittances which ease their liquidity constraints by allowing them to afford more food.

Table 2.13 also shows that the effect of migration on the stability in food access is more

pronounced when migrant-sending households did not receive a new member, while it is less pronounced when they have a new member. This result reflects again the effect of the household size, which worsens the coping strategies used by households when there is a food shortage. Indeed, the reception of a new member in the household increases the number of mouths to feed, thus reducing the positive effect of remittances.

The *ATE* on food consumption score indicates that the food diversification of migrant households would not change if they didn't have a migrant. This result confirms that of the previous section, which shows that migration in itself has no significant impact on food access and diversification when the analysis is restricted to migrant-sending households.

Table 2.13: Average treatment effect on the treated: effect of migration on food security in migrant households

Variables	Overall sample	With new member(s)	No new member
FCS	-0.11 (0.12)	-0.07 (0.12)	0.02 (0.18)
CSI	-6.12** (2.68)	-5.88* (3.11)	-8.03* (4.09)

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity

- Type of migration and household food security

Table 2.14 shows that, compared to a non-migration case, having an internal migrant or an international migrant does not significantly affect households' food access and diversification. However, having a member who migrated inside Ethiopia is significantly associated with an improvement of the coping strategies adopted by the household when there is a food deficit. Indeed, the MLS estimates presented in table 2.14 indicate that only internal migration is negatively and significantly linked with the coping strategies index (CSI). Hence, migration inside Ethiopia (95 percent of total migrants) ensures stability in food access for migrant-sending households, compared to international migration which counts for only 4.78 percent of total migration.

Table 2.14 also reports the results of MLS estimates comparing rural migration, urban migration, and non-migration. It shows that only urban migration has a significant effect on household food security (both FCS and CSI). Indeed, urban migration leads to a reduction of the severity of

coping strategies adopted by households when there is a food shortage. This result is explained by the fact that individuals who migrated to urban areas mostly left their household for work and studies reasons. However, notice that this type of migration also reduces the labor force of households leading to the diminution of their food access. It thus justifies the negative effect of urban migration on FCS obtained in estimates (2) of table 2.14. However, this result does not take into account the receipt of remittances and the arrival of a new member which may mitigate the adverse effect of urban migration on households' food access and diversification. In order to take into account the receipt of remittances, we compared the effect of labor migration with that of education migration and the migration for other reasons.

Inspection of table 2.15 indicates that only labor migration significantly affects household food security. It significantly improves households' food access and diversification, while also reducing the severity of their coping strategies when there is a food deficit. Therefore, though urban migration leads to the reduction of households' food access and diversification, this effect is not caused by labor migration which produces remittances. The coefficient of education migration is negative but not significant. Therefore, the negative effect of urban migration on households' food access and diversification may come from this type of migration or other migrations. As shown in table 2.4, the amount of remittances sent by students is not significantly different from that of other migrants. The lack of remittances from this type of migration also justifies its non-significant effect on the coping strategies of households.

Table 2.14: MSL estimates of the effect of migration according to the living location of the migrant

Variables	(1)		(2)	
	FCS	CSI	FCS	CSI
Migrant destination 1 (ref: non-migrant)				
Internal migrant(s)	-0.003 (0.055)	-0.204** (0.086)		
International migrant(s)	0.024 (0.069)	0.002 (0.222)		
Migrant destination 2 (ref: non-migrant)				
Rural migrant(s)			0.030 (0.034)	-0.133 (0.108)
Urban migrant(s)			-0.083*** (0.029)	-0.282*** (0.107)
Constant	3.835*** (0.094)	2.710*** (0.428)	3.783*** (0.099)	2.753*** (0.434)
Control for Exogenous variables	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES
Observations	4856	4908	4856	4908

Table 2.15: MSL estimates of the effect of migration according to the reasons of migration

Variables	FCS	CSI
Migrant(s) by reasons of migration (Ref: Non-migrant)		
Migration for studies	-0.016 (0.035)	-0.243 (0.149)
Migration for work	0.146*** (0.034)	-0.247** (0.121)
Other migrations	0.032 (0.031)	-0.140 (0.120)
Constant	3.854*** (0.097)	2.663*** (0.427)
Control for Exogenous variables	YES	YES
Regional FE	YES	YES
Observations	4856	4908

- Other determinants of household food security in Ethiopia

Table A.6 reports the full result of the heckman estimates when regional fixed effects are not considered and when they are controlled. It shows that taking into account regional fixed effects does not significantly change the findings.

The results indicates that each additional year of schooling for a household head has a positive and significant impact on household food security. Indeed, university attainment by the household head is associated with an improvement of the household's food access and diversification. It also leads to the use of less severe coping strategies adopted. The age of the household head is also found to be significant and negative in the CSI equation, meaning that an increase of the age of the household head is significantly linked to the use of less severe coping strategies.

Regarding the marital status of the household head, it is found to play a significant role in the food security (both FCS and CSI) of the household. The results show that, compared to households with non-married heads, those which heads are married have higher food consumption score, meaning that they have a better food access and diversification. Regarding the coping strategies of households, those with divorced and widowed heads are more likely to use severe strategies to cope with food deficit. Meanwhile, the result also indicates that, compared to households with non-married heads, those with married heads are more likely to use severe coping strategies. This ambivalent result can be explained by the two-sided effect of the household size. On the one hand, from economies of scale theory ([Barten and Instituut, 1964](#); [Deaton and Paxson, 1998](#)), marriage leads to an increase in household size, which produces a substitution effect towards shared goods that become cheaper. The resources released by sharing allow more to be spent on foods. Marriage also increases the household's labor supply, which in turn generate additional income for the household. Thus, through an increase in the household size, marriage leads to an improvement of the household food consumption. However, the increase in the household size also means that there is an additional mouth to feed. Therefore, when there is a food deficit, households with higher size will tend to adopt more severe coping strategies.

While the gender of the household head has no significant effect on the household's food consumption score, it is positively and significantly related to the household's coping strategies index. Indeed, female-headed households have less stability in food access than their counterparts. This result could be explained by the fact that female household heads are more likely to have

never been married or to be divorced, separated, or widowed. As shown the coefficients of the marital status variable, households with divorced and widowed heads are more likely to adopt severe coping strategies than married head households.

Like education, the household wealth measured by the asset index has a positive and significant effect on household's food security (both FCS and CSI). Indeed, households' food access and diversification as well as their stability in food access improve as they become more wealthier. This finding confirms that of [Maxwell et al. \(2008\)](#) who shows that the coping strategies index is negatively correlated with the household assets index. From the [Sen \(1981\)](#) entitlement theory, the household welfare represents an endowment which can be exchanged for food in the market.

Regarding the household's place of residence, rural households have more stability in food access, while urban households have better food diversification and food access. Indeed, living in rural areas is negatively and significantly linked to both FCS and CSI. This finding confirms that of table [2.5](#) and [2.6](#). Considering the FCS equation, the results indicate that households living in rural areas have less food diversification and food access, compared to those living in urban. This result can be explained by the fact that rural households are less wealthy than households living in urban areas. Besides, the result from the CSI equation implies that the coping strategies of households living in rural areas are less severe than that of those living in urban, meaning that rural households have more stability in food access. This result can be attributed to the fact that agriculture is usually more developed in rural areas than in urban areas. Thus, a household facing a food shortage will be more likely to seek help from a relative rather than go a whole day and night without eating anything.

2.4 The case of Niger

2.4.1 Data and descriptive statistics

ECVM/A surveys

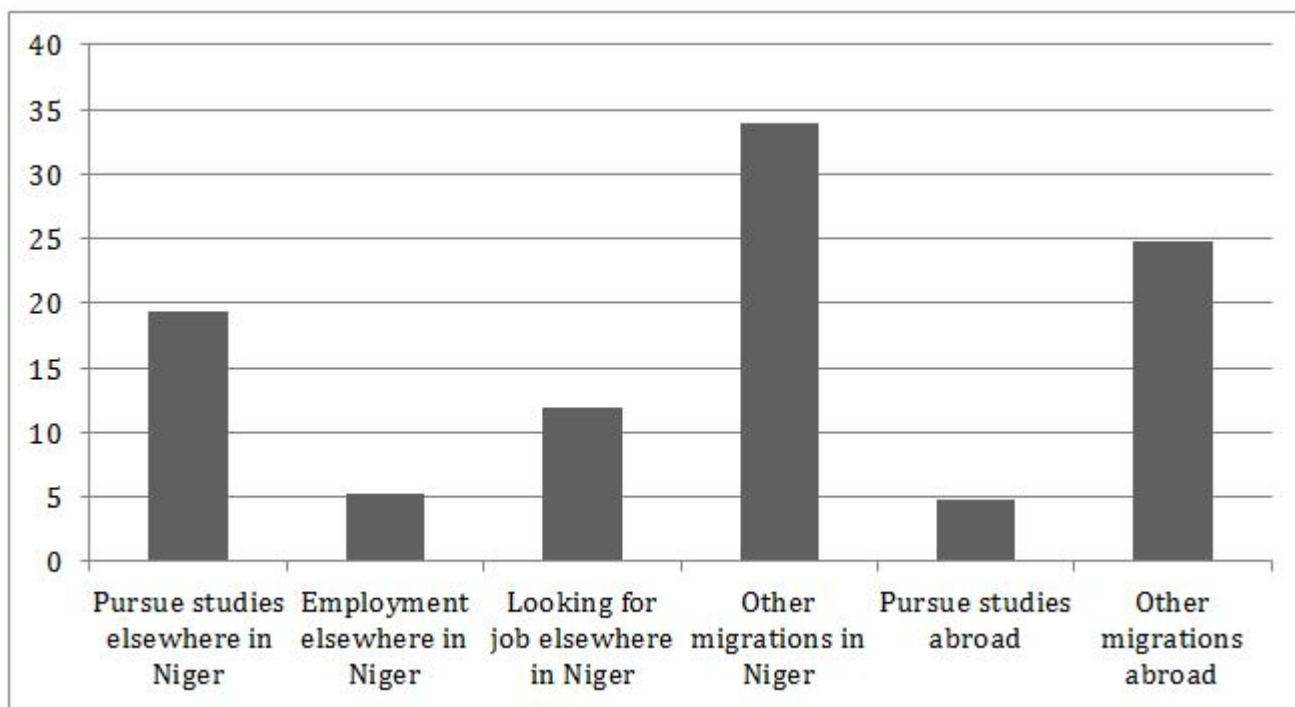
Data for empirical analysis are drawn from two-panel surveys on Household Living conditions and Agriculture in Niger (ECVM/A). The ECVM/A is an integrated multi-topic household survey conducted to evaluate poverty and living conditions in Niger. The two surveys were implemented

by the National Institute of Statistics (Institut National de la Statistique - INS) with technical and financial assistance from the World Bank. The first survey which provides baseline information was conducted in 2011, while the second survey was fielded in 2014. The ECVM/A-2011 was designed to have national coverage, including both urban and rural areas in all the regions of the country. The ECVM/A-2011 data were collected in two visits to the household. In the first passage, information was collected on 24,628 individuals in 4,045 households. In the second visit, enumerators were supposed to check on the location of all individuals interviewed in the first passage and then to indicate if those individuals were still living in the household. Besides, the enumerators were supposed to interview ten any individuals who were new to the household, or who had been in the household in the first visit, but who had not been interviewed at that time. At the end of the second visit, information had been verified and collected from 25,066 individuals in 3,968 households.

In the ECVM/A-2014, all households that had been interviewed in 2011 were tracked. Households that did not move were interviewed in their existing location. Households that had moved to other locations in Niger were followed and interviewed in their new locations if they could be found in the new location. Households that moved outside of Niger were not followed. The ECVM/A-2014 was able to follow 3,617 households out of 3,968 households in ECVM/A-2011. Thus, the rate of attrition over the two periods stands for 8.85 percent. However, using aggregate data on households in ECVM/A-2011 and The ECVM/A-2014, we were only able to match 3498 households' information. Then, we lost information on 116 households.

Migration in ECVM/A

As ECVM is a panel data, the occurrence of migration in a household is only observed in the ECVM/A-2014. Households were asked if an individual who was interviewed in the 2011 survey is still living in the household. If the answer is no, the respondent provides the reasons why this individual left the household. The migration variable is then generated based on this information. Migrants are those who left their household to live in another location either in Niger (Internal migrants) or in another country (International migrants). Over the 3,617 households interviewed in 2014, 27.4 percent have at least one migrant. 16.5 percent of households have an internal migrant while 10.9 percent have an international migrant. Figure 1 shows that individuals mostly migrate



Source: ECVM/A-2014

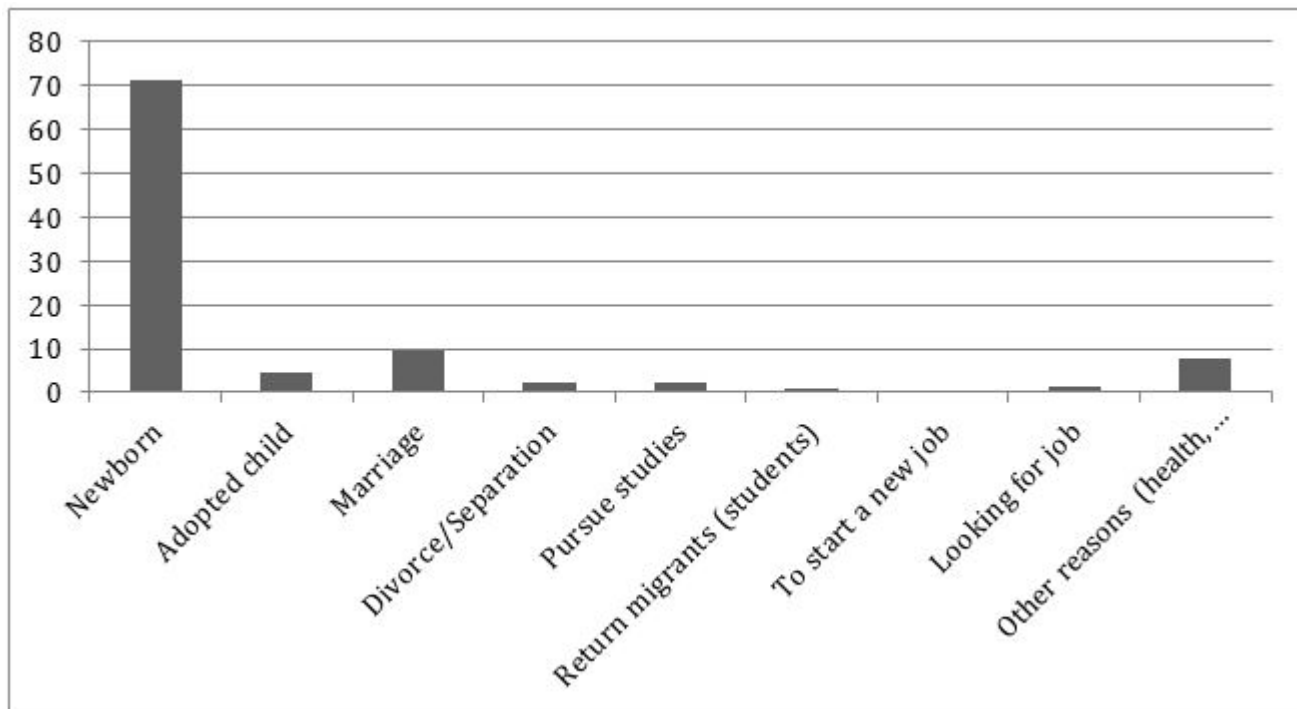
Figure 2.3: Share of migrants according to the reasons behind migration

for reasons other than job search or further education elsewhere. Indeed, 24.2 percent of migrants left their household to pursue studies elsewhere (19.4 in Niger and 4.8 abroad); 17.2 are work migrants; while 58.7 percent of migrant left their household for other reasons (34 percent in Niger and 24.7 abroad). Apart from the pursuit of studies, ECVM does not provide a clear picture of the other reasons why individuals migrated abroad. It is therefore possible to find among the latter people who have migrated for professional reasons. ECVM also does not make it possible to know the destination location of the migrant, rural vs. urban.

Variation in co-residence choices in ECVM/A

As the case of migration, variation in co-residence choices is only observed in ECVM/A-2014. To identify new members, households were asked if individual i was interviewed in 2011. Therefore, new members are individuals who currently live in the household but were not interviewed in 2011. However, it is possible that some new members been a household member who is forgotten in the ECVM/A-2011. In the empirical analysis, we do not take into consideration visitors, as they are temporary new members in the household. Figure 2 shows that the new members in the household

are mostly newborns. Indeed, 71.3 percent of new members are newborns. The second reason why individuals join households is marriage. However, the marrieds count for only 9.7 percent of the total new members. These figures demonstrate that the new members are less likely to come from dissolved migrant households.



Source: ECVM/A-2014

Figure 2.4: Share of new members in 2014

Remittances in ECVM/A

Both ECVM/A-2011 and ECVM/A-2014 have a section on the receipt of remittances by some members of the household. It provides information on the household members who received transfers from a relative; the nature of the transfers received (money, foods, and non-food goods); the relationship with the sender; the location of the sender; the reasons as well as the amount of the transfers received.

Using the location of the sender, we define remittances as all transfers for which the sender is in another location. The reason behind this definition is that senders who reside in another location are more likely to be migrants. Table 2.16 shows that, in both 2011 and 2014 surveys, the share of transfers that likely comes from former migrants stands for almost 75 percent. Apart from

transfers which were sent from the same location, most of outside transfers come from the capital of Niger (Niamey) and other cities in Niger. International transfers mostly come from Nigeria and other African countries.

Table 2.17 indicates that more than half of remittances' recipients reported having received money in both ECVM/A-2011 and ECVM/A-2014. The second most received items are non-food goods, with 33.7 percent and 20.4 percent of recipients reported having received non-food goods respectively in 2011 and 2014. Only 15.3 percent and 12.3 percent of recipients have received foods respectively in 2011 and 2014.

Table 2.16: Share of recipients of transfers in Niger by senders' location (2011 and 2014)

Transfers's senders location	2011		2014	
	Observations	Percent	Observations	Percent
Same location	1,083	25.88	708	24.04
Niamey	713	17.04	463	15.72
Other cities in Niger	606	14.48	476	16.16
Rural	190	4.54	206	6.99
Benin	124	2.96	51	1.73
Côte d'ivoire	128	3.06	97	3.29
Nigeria	558	13.33	333	11.31
Other WAEMU countries	221	5.28	136	4.62
Other African countries	409	9.77	371	12.60
Outside Africa	153	3.66	104	3.53
Total	3103,083	100	2945	100

Source: Author calculation from ECVM/A-2011 and ECVM/A-2014

Table 2.17: Share of remittance's recipients by nature goods received in Niger (2011 and 2014)

Nature of goods	2011		2014	
	Observations	Percent	Observations	Percent
Money	1,582	51.00	1,504	67.23
Food	475	15.31	276	12.34
Non-food goods	1,045	33.69	457	20.43
Total	3,102	100.00	2,237	100.00

Source: Author calculation from ECVM/A-2011 and ECVM/A-2014

Descriptive statistics

We consider the same household head characteristics as in the case of Ethiopia. However, the socio-economic characteristics of the household differ slightly from that we used for Ethiopia. For instance, instead of constructed an asset index to measure household welfare, we use the welfare indicator provided by the ECVM surveys. Also, ECVM makes it possible to control for community variables such as access to health services, access to paved road, access to electricity. . . .

The food security indicator retained for the empirical analysis is the Food consumption score (FCS), which measures both household food diversification and food access. Indeed, only FCS could be tracked over the 2011 and 2014 surveys. Questions on households coping strategies in ECVM/A-2011 are different from that in ECVM/A-2014. Therefore, we were not able to construct the same coping strategies index for ECVM/A-2011 and ECVM/A-2014.

Table 2.18 provides the summary statistics of households' food security status and their socio-economic characteristics in migrant and non-migrant households. Notice that migrant households in 2011 are those for whom a member migrated in 2014. In both 2011 and 2014, the mean differences in food consumption score of households that we were able to follow-up are not significant. Thus, there is no significant difference between the food diversification of households with a migrant and that of households with no migrant. However, in both 2011 and 2014, the average food consumption score of migrant households is slightly higher than that of non-migrant households.

Table 2.18 also shows that, in 2011, the share of female-headed households was identical for households with a migrant and those with no migrant. However, in 2014, the share of households with a female head has more than doubled among households with a migrant, while it remained unchanged among non-migrant households. Indeed, this share rose from 13 percent to 27 percent in migrant households, which represents an increase of 10 percentage points, while it remains 13 percent in non-migrant households. In the same line, the share of individuals aged 15 to 65 years old was almost identical in both 2011 and 2014 survey. However, in 2014, this share was reduced by 17 percentage point in migrant households, while the reduction in non-migrant households stands only for six percentage points. These figures show that migrants are more likely to be men and aged 15 to 65 years old.

The household size which is significantly higher in migrant households in the 2011 survey was also reduced in the 2014 survey. Indeed, on average, in 2011, households with a migrant

were composed of eight members while those without a migrant had six members. In 2014, the household size was reduced by two members in migrant households, while it almost remains the same in non-migrant households. The share of men in migrant households was also reduced in 2014, while it was unchanged in non-migrant households. These changes in migrant household's composition reflect the migration of individuals between 2011 and 2014 surveys.

Table 2.18 also shows that, in both 2011 and 2014 surveys, household heads are more aged in migrant and non-migrant households. The amount of remittances received in migrant households is also higher than that in non-migrant households in both surveys. However, while in 2011, migrant households were less wealthy than non-migrant household, it is the opposite that was observed in 2014.

2.4.2 Empirical analysis

Methodology

In contrast to the case of Ethiopia, the occurrence of migration in the household in Niger is reported in the second panel survey in 2014. Therefore, to analyze the effect of migration on food security of households in Niger, we follow (Deb and Seck, 2009) by modeling households food security status conditionally on their pre-migration's food security status with their pre-migration characteristics. We use the Heckman procedure to estimate the following equation:

$$E(Y_i | Mig_i, Y_{i0}, X_{i0}) = \gamma + \beta_0 Y_{i0} + \beta_1 Mig_i + \beta_2 X_{i0} + Mig_i (X_{i0} - \mu_{X_{i0}}) \delta + \rho_1 Mig_i [\phi / \Phi] + \rho_2 (1 - Mig_i) \{\phi / [1 - \Phi]\} \quad (2.24)$$

Where ρ_1 and ρ_2 are selection bias correction terms. Φ and ϕ are functions of α_0 , α_1 , and α_2 ; with $\Phi(q\alpha) = \Phi(\alpha_0 + \alpha_1 X_i + \alpha_2 Z_i)$ and $\phi(q\alpha) = \phi(\alpha_0 + \alpha_1 X_i + \alpha_2 Z_i)$; where α_0 , α_1 , and α_2 are estimated from a probit model. X_i is a vector of household's socio-economic characteristics, and Z_i is a vector of instrumental variables. Y_i is the food security status of household i in 2014, while Y_{i0} is its food security status in the baseline survey (ECVM/A-2011). As explained by (Deb and Seck, 2009), the inclusion of the baseline outcome as a regressor can be interpreted as analogous to the addition household fixed effects. Indeed, when changes in outcomes are modeled with two points in time in the panel dataset, the first difference of the outcome serve to cancel time-invariant

household characteristics. The use of baseline outcome as a control variate also gives the coefficient on migration a difference-in-difference interpretation.

The instrumental variables used to estimate equation ?? are the interactions terms between regional migration rate and two household characteristics, namely the household size and the share of men in the household. The reasons for using these variables had been provided in section 2.3.3. The first stage estimate reported in table A.11 shows that both instruments are significant at 1 percent level.

As the Heckman estimate assumes a trivariate normal distribution of the error terms, we also estimate the effect of migration on household food security with the Probit-2SLS procedure described in (Wooldridge, 2010).

Since the effect of migration on household food security may be different regarding the type of migrant (Migrant living in rural areas vs migrant living in urban areas), it is also reasonable to consider the multinomial aspect of the migration variable in the estimation. As in the case of Ethiopia, we consider a structural model given by:

$$\begin{aligned} E(Y_i | Mig_i, Y_{i0}, X_{i0}, l_i) &= f(\beta_0 Y_{i0} + \gamma Mig_i + \beta X_{i0} + \lambda l_i) \\ \Pr(Mig_{ij} = 1 | Y_{i0}, X_{i0}, Z_{i0}) &= g(\alpha_{0j} Y_{i0} + \alpha_{1j} X_{i0} + \alpha_{2j} Z_{i0} + \delta_j l_i) \end{aligned} \quad (2.25)$$

where l_i denotes a vector of latent factors reflecting unobserved heterogeneity and λ and δ are associated vectors of factor loading. Mig_i denotes the vector of migration choices and Mig_{ij} is the j^{th} migration alternative. When comparing the effect of internal migration against that of international migration on the household food security, Mig_{ij} is assigned 0 for non-migrant households, 1 for international migrant households, and 2 for internal migrant households. Z_i is a set of instrumental variables, which are the same as above.

Since Y_i and Mig_i are conditionally independent, their joint distribution conditional on common latent factors is written as follow:

$$Pr(Y_i, Mig_i | X_i, l_i) = f(\beta_0 Y_{i0} + \gamma Mig_i + \beta X_{i0} + \lambda l_i) \times g(\alpha_{0j} Y_{i0} + \alpha_{1j} X_{i0} + \alpha_{2j} Z_{i0} + \delta_j l_i) \quad (2.26)$$

Estimate of the parameters in equation 2.26 depends on the assumption made about the

distribution of l_i . Figure 2.5 shows that the distribution of FCS is close to that of Normal and beta distribution. However, figure 2.6 indicates that the Normal distribution best fits FCS data. Therefore, equation 2.26 is estimated with a density function of a normal distribution.

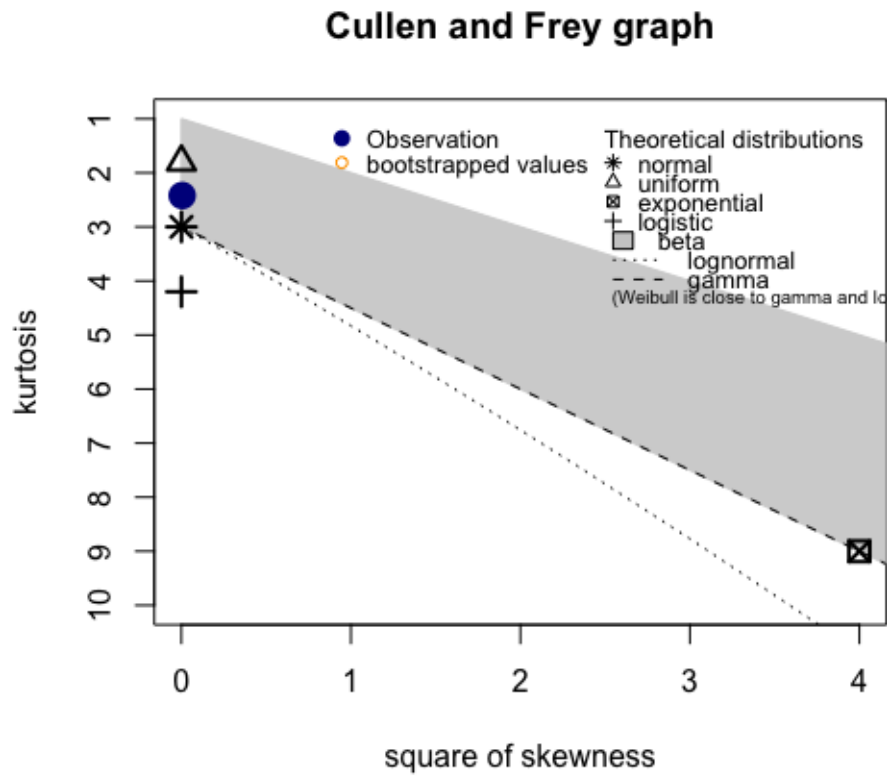


Figure 2.5: Food consumption score

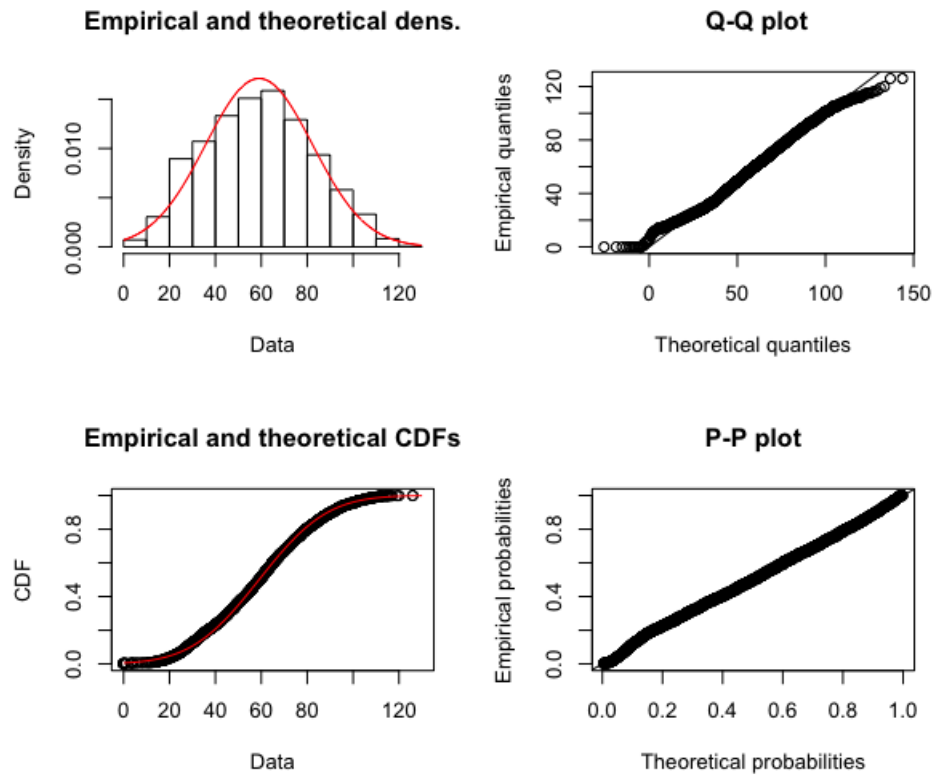


Figure 2.6: Fitting the distribution of FCS in ECVM/A

Table 2.18: Summary statistics

Variables	2011					2014				
	Migrant households		Non-migrant households		Probabilities	Migrant households		Non-migrant households		Probabilities
	Mean	SdC	Mean	sdT		Mean	SdC	Mean	sdT	
Food consumption score	59.94	23.86	58.68	23.12	0.231	58.85	27.27	58.48	26.45	0.255
Head gender: female	0.13	0.34	0.13	0.33	0.132	0.27	0.44	0.13	0.34	0.000***
Age of head	49.39	14.09	44.28	14.22	0.000***	51.20	14.65	46.64	13.92	0.000***
log of welfare index	12.32	0.59	12.43	0.59	0.000***	12.59	0.65	12.48	0.65	0.000***
Preschool: head	0.75	0.43	0.75	0.43	0.452	0.77	0.42	0.75	0.43	0.165
Primary school: head	0.12	0.33	0.12	0.33	0.687	0.10	0.30	0.12	0.32	0.058*
1st secondary school: head	0.09	0.29	0.10	0.30	0.408	0.10	0.29	0.09	0.29	0.872
2nde secondary school: head	0.03	0.18	0.03	0.18	0.716	0.04	0.19	0.04	0.19	0.652
Urban	0.38	0.49	0.36	0.48	0.372	0.38	0.49	0.36	0.48	0.372
Rural	0.62	0.49	0.64	0.48	0.372	0.62	0.49	0.64	0.48	0.372
Share of members aged under 5 years old	0.20	0.16	0.25	0.19	0.000***	0.12	0.12	0.20	0.17	0.000***
Share of members aged between 5 and 15 years old	0.26	0.17	0.22	0.19	0.000***	0.21	0.15	0.26	0.18	0.000***
Share of members aged between 15 and 65 years old	0.51	0.20	0.50	0.22	0.179	0.34	0.15	0.44	0.20	0.000***
Share of individuals with preschool level	0.00	0.02	0.00	0.01	0.642	0.00	0.01	0.00	0.02	0.185
Share of individuals with primary school level	0.09	0.13	0.08	0.15	0.014**	0.05	0.09	0.07	0.13	0.162
Share of individual with secondary school level (General)	0.04	0.09	0.04	0.11	0.620	0.03	0.07	0.03	0.10	0.245
Share of individual with secondary school level (Pro and technique)	0.01	0.03	0.01	0.06	0.544	0.01	0.03	0.00	0.03	0.192
Share of individual with high school level (General)	0.00	0.02	0.01	0.05	0.685	0.00	0.02	0.00	0.03	0.565
Share of individual with high school level (Pro and technique)	0.00	0.03	0.00	0.03	0.513	0.00	0.02	0.00	0.03	0.624
Share of individuals with university level	0.01	0.05	0.01	0.07	0.814	0.01	0.04	0.01	0.07	0.094*
Share of male in the household	0.51	0.17	0.49	0.19	0.370	0.46	0.21	0.49	0.20	0.000***
log of remittances	11.12	1.39	10.64	1.29	0.000***	11.19	1.28	10.70	1.29	0.000***
Household size	8.07	3.63	5.97	3.11	0.000***	6.56	3.50	6.30	3.16	0.192

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; Migrant households in 2011 are households for whom a member has migrated in 2014

Results

- Effect of migration on household food security in Niger

Table 2.19 reports both the Heckman and Probit-2SLS estimates of the effect of migration, occurred between 2011 and 2014, on households' food consumption score in 2014 in Niger. The Probit-2SLS seems to be robust the control of regional fixed effect and variation in co-residence choices, as the coefficient of migration variable is almost the same in the three estimates.

In all estimates, we found that households' food consumption follows a dynamic process. Indeed, the previous food consumption score of households is positively and significantly associated with their current food consumption scores. Therefore, an improvement in the previous households' food access and diversification leads to an improvement of their current food access and food diversification. This result implies that households can be trapped in food insecurity if they experienced a significant decrease in their previous food security status.

The results of both Heckman and Probit-2SLS show that migration has no significant effect on households' food diversification and food access. This non-significant effect can be explained by the fact that the migration experience between 2011 and 2014 (maximum of three years), is too short of producing remittances to migrant-sending households. To test this hypothesis, we estimated a simple linear model between the variation in remittances from 2011 to 2014 and the occurrence of the migration of at least one household member between these two years. The finding reported in Table 2.20 confirms that the dynamic change in remittances from 2011 to 2014 is not related to individuals migration within this period. The effect of migration remains unchanged when we control for the receipt on a new member in 2014. As shown in figure 2.4, most of the new members in the household are newborns. Therefore, their arrival is less likely to affect the migration-effect on household food security. The Probit-2SLS estimate also provides evidence of no significant effect of the arrival of a new member on household food diversification and food access.

In table 2.21, we controlled for the receipt of remittances in 2011 and 2014. These controls do not change the non-significant effect of migration on FCS. However, Heckman estimates show that both remittances in 2011 and 2014 have a positive and significant effect on household food access and diversification, while the Probit-2SLS estimates indicate that this effect is not significant. The interaction term between remittances in 2014 and the receipt of a new member also shows

no significant effect on households' food access and diversification. This result confirms that new members registered in 2014 are less likely to come from a former migrant household and thus receive remittances. It also implies that newborns, which represent 71.3 percent of new members, are less likely to be sons/daughters of migrants.

The MLS estimate reported in table 2.22 shows that, even by separating internal migration from international migration, there is still a non-significant effect of migration on food access and diversification in Niger.

Table 2.19: Estimates of the effect of migration on households' food consumption score (FCS) in Niger

Dependent variable: Food consumption score 2014 (log)						
	Heckman	Probit-2SLS	Heckman	Probit-2SLS	Heckman	Probit-2SLS
Migrant(s)	-0.130 (0.360)	0.221 (0.197)	0.276 (0.260)	0.222 (0.171)	0.336 (0.227)	0.232 (0.162)
FCS 2011 (log)	0.046** (0.022)	0.054 (0.047)	0.070*** (0.022)	0.079** (0.035)	0.070*** (0.022)	0.069** (0.035)
New member(s)					0.038** (0.019)	0.011 (0.030)
Control variables	YES	YES	YES	YES	YES	YES
Regional FE	NO	NO	YES	YES	YES	YES
Adjusted-R2	0.153	0.080	0.178	0.096	0.178	0.090
N	3478	3478	3478	3478	3478	3478

Table 2.20: OLS estimate of the relationship between migration within the period 2011-2014 and variation of remittances from 2011 to 2014

Dependent variable: Variation of remittances between 2011 and 2014	
Migrant(s)	0.108 (0.118)
Constant	-0.049 (0.075)
Observations	714

Table 2.21: Estimates of the effect of migration and remittances on households' food consumption score (FCS) in Niger

	Dependent variable: FCS 2014 (log)					
	Heckman	Probit-2SLS	Heckman	Probit-2SLS	Heckman	Probit-2SLS
Migrant(s)	0.612 (0.446)	0.352 (0.223)	0.328 (0.466)	0.177 (0.205)	0.229 (0.403)	0.140 (0.171)
FCS 2011 (log)	0.051 (0.039)	0.095 (0.062)	0.108*** (0.042)	0.126* (0.075)	0.104** (0.041)	0.122* (0.069)
Reimttances 2011 (log)	0.028** (0.013)	0.007 (0.019)				
Remittances 2014 (log)			0.025** (0.012)	0.018 (0.032)	0.017 (0.018)	0.025 (0.031)
New member 2014					-0.032 (0.250)	0.092 (0.396)
New member x Reimttances 2014					0.012 (0.023)	-0.005 (0.038)
Control variables	YES	YES	YES	YES	YES	YES
Reginal FE	YES	YES	YES	YES	YES	YES
Control for receipt of remittances	YES	YES	YES	YES	YES	YES
Adjusted-R2	0.213	0.070	0.156	0.039	0.158	0.066
Observations	1438	1438	1378	1378	1378	1378

Table 2.22: MSL estimate of the effect of migration by types of migrant(s) in Niger

Dependante variable: FCS(log)	
Internal migrant(s)	-0.070 (0.048)
International migrant(s)	-0.068 (0.051)
FCS 2011 (log)	0.067** (0.027)
Constant	0.938** (0.387)
Control variables	YES
Regional FE	YES

- Other determinants of households food security in Niger

The full Heckman and Probit-2SLS estimates, when regional fixed effects are controlled, are reported in Table A.10 (See Appendix B). This table shows that the main determinants of households' food access and food diversification are the household's welfare, the gender of the household head and the access to road station.

In both Heckman and Probit-2SLS estimates, the welfare index is positively and significantly associated to household food consumption score, meaning that an improvement in households' welfare leads to an improvement in their food access and food diversification. Both estimates also suggest that having a female household head is negatively associated with household food access and food diversification. Thus, female-headed households are more food insecure than their counterparts. These results confirm our findings in the case of Ethiopia.

While the Heckman estimate shows that the household head's education attainment, especially university, has a positive effect on household food access and food diversification, the Probit-2SLS estimate indicates that this effect is not statistically significant. The Heckman estimate also indicates a significant positive impact of the household size on food access and diversification, while Probit-2SLS estimate shows no significant effect. The coefficient of the rural dummy which is negative and significant in Heckman estimate is found to be non-significant in Probit-2SLS estimate. Therefore, we assume that the effects of these variables have probably been affected by the trivariate assumption on errors terms in the Heckman estimate.

2.5 Conclusion

This paper investigates the effect on migration on the food security of households left behind using the third Ethiopian Socioeconomic Survey (ESS3) from 2015/2016, and two-panel surveys on Household Living conditions and Agriculture in Niger (ECVM/A) taken place in 2011 and 2014. The analysis focuses on households food diversification, their food access as well as the stability in this access. In all estimates, we controlled for the household head characteristics, the household-level characteristics and the regional fixed effects.

Significant effects for migration were only found for the case of Ethiopia. The result indicates that the overall migration has a negative impact on the food access and the food diversification

of households left behind. However, this negative effect is caused by other migration different from labour migration. Indeed, labour migration producing remittances have a positive effect on the food access and the food diversification of households left behind. The receipt of remittances therefore offsets the negative effect of the overall migration, supposing the household has both a labour migrant and a student who migrated to pursue studies. The arrival of a new member in the household was also found to cancel the negative effect of the overall migration.

There is also evidence that migration reduces the severity of coping strategies adopted by migrant-sending households. This result is explained by the fact that migrant-sending households can ask the migrant for the help when they are experiencing a food deficit. Therefore, migration provides stability in food access for households that have migrants.

Results show that the household head education, especially when he or she attained university, plays a significant and positive role in the household's food diversification and food access. Households with married heads are also likely to have better food access. However, households with old and female heads are less likely to have a good food consumption. The households welfare is also an important determinant of their food security. Indeed, wealthy households have a better food diversification and food access. Their coping strategies are also less severe, meaning that their food access is more stable.

The findings also indicate that living in rural areas has a negative effect on households' food consumption diversification and food access. However, the coping strategies adopted by households in rural areas are less severe than of their counterpart in urban areas. Therefore, rural households have more stability in food access when there is a food shortage, while urban households have better food diversification and food access. The household size is found to be positively linked to its food diversification and food access. An increase in the household size leads to an improvement of its food access and food diversification. However, when there is a food deficit, higher household size is associated with the adoption of more severe coping strategies. Household size is, therefore, a hindrance to stability in access to food.

This paper makes two significant contributions to the existing literature. It shows that migration improves the food diversification and food access of the household left behind only when they receive remittances. Migration is also a strategy adopted by households to have stable access to food.

**Migration, remittances, and child nutritional
status: Evidence from Burkina-Faso**

3.1 Introduction

Malnutrition is a global scourge that undermines the life chances of millions of children, especially in developing countries. The food insecurity and the malnutrition crisis affecting the Sahel region has severely hit the children of Burkina Faso. According to the 2014 National Nutrition Survey, the prevalence of chronic malnutrition among the children is 29.1 per cent, and acute malnutrition is 8.6 per cent, including 1.7 per cent of severe acute malnutrition. In absolute terms, these estimates suggest that, in 2014, around 350,000 children suffered from acute malnutrition, including 144,000 with severe acute malnutrition.

In order to limit this scourge, researchers and practitioners investigate the factors that play an important role in explaining differentials in child health outcomes. A considerable body of researchers and practitioners suggests that maternal characteristics are the most important factors, more than paternal characteristics, health service availability and socioeconomic status (Caldwell, 1979; Martin et al., 1983; Young et al., 1983; Ware, 1984; United Nations, 1985; Martin and Juarez, 1995; Frost et al., 2005; Kabubo-Mariara et al., 2008).

Furthermore, more recent research finds that remittances are also a factor that may affect child nutritional status (Ssengonzi et al., 2002; Hildebrandt et al., 2005; Adams and Cuecuecha, 2010; Antón, 2010; Frankel, 2011). According to Hildebrandt et al. (2005), remittances positively affect child nutritional status by increasing household income and wealth, allowing households to purchase nutritional and medical inputs. As a result of a more relaxed family budget constraint, households have a higher investment in children. So, if remittances relax liquidity constraints, it may allow parents to make additional investments they could not have made otherwise (Antón, 2010).

However, some evidence from worldwide research calls into question the causal association between remittances, maternal characteristics and child health outcomes (Behrman and Deolalikar, 1987; Bicego and Boerma, 1993; Hobcraft, 1993; Basu, 1994; Barrett and Browne, 1996; Subramanian and Deaton, 1996b; Desai and Alva, 1998; Haddad et al., 2003). For example, regarding the effect of maternal education on child health outcomes, Desai and Alva (1998) find that maternal education is mostly a proxy for socioeconomic status and geographic area of residence : thus, the effect of maternal education disappears or is greatly reduced once controlling for these factors.

With respect to migration, the impact of remittances on nutrition depends on how households use it. If the remittances are dedicated to wedding, dowries, christenings or tasty foods which are more expensive, then there will be no substantial improvements in nutrient intakes ([Behrman and Deolalikar, 1987](#); [Banerjee and Duflo, 2011](#)).

Cosequently, there is continued debate regarding the influence of maternal characteristics and migration on child health outcomes; additional research is needed to further understand of how maternal characteristics and migrations impact child health. It is this gap in the literature that we attempt to address.

Specifically, we use the 2014 Continuous Multisectoral Survey (EMC-BF) micro data from Burkina Faso and three anthropometric indicators for children aged 5 years old and under (weight-for-height (WHZ), weight-for-age (WAZ) and height-for-age z-scores (HAZ)) to explore several specific pathways through which remittances and maternal characteristics likely influence child nutritional status. For this purpose, we follow a two-step strategy for applying the Instrumental Variable (IV) approach. This study finds a positive and significant effect of maternal education on short-term, midterm and long-term child nutritional status. We show that remittances, maternal education, mother's age and common-law relationships significantly improve children nutritional status. On the other hand, household size and living in a rural area appear to negatively affect child nutritional status.

The paper is organized as follows. Section [3.2](#) presents the data and Section [3.3](#) outlines our empirical strategy. We present our results in Section [3.4](#) and test the robustness to selection bias in Section [3.5](#). The conclusion is presented in Section [3.6](#).

3.2 Data

Our empirical analysis is based on data from Burkina-Faso Continuous Multisectoral Survey (EMC-BF) from 2014 collected by the National Institute of Demographics and Statistics of Burkina-Faso, funded by the National Budget of Burkina Faso and Swedish International Development Cooperation Agency, with cooperative funding from the World Bank. The database covered around 10,860 households. The sample is representative for the national, rural and urban, and regional levels. A stratified two-stage survey was conducted to collect the data, where in the first stage,

the primary units or enumeration areas (EAs) were drawn with a proportional probability to the number of households counted in the EA. A staff of 905 enumeration areas were drawn on that occasion. In the second stage, 12 households were drawn with equal probability in each enumeration area. Each household was visited four times, three months apart. There were 18,730 children under 6 years old who were residing members of these households. Some children had to be dropped because of incomplete data, leaving a sample size of 8,045 for analysis.

Characteristics of remittances in EMC-BF 2014

Table 3.1 shows that family care was the main reason for which migrants remit to individuals in Burkina-Faso in 2014. Indeed, 83.6 percent of recipients report receiving remittances for family support. The share of individuals who reported receiving remittances to finance education and health remains very low, only 4.8 percent and 3.7 percent respectively. Remittances are mainly composed of money, 67.2 percent, followed by food, 20.5 percent, and non-food goods, 11.4 percent (Table 3.2).

Table 3.1: Share of remittances' recipients according to the reasons for remitting to family left in Burkina-Faso

	Observation	Percent
Family care	3,369	83.62
Education	193	4.79
Health	148	3.67
Marriage/Baptism	89	2.21
Funeral support	52	1.29
Support for agricultural activities	54	1.34
Support for business activities	22	0.55
Others	102	2.53
Total	4,029	100

Table 3.2: Share of remittances’s recipients by the nature of the good received in Burkina-Faso

	Observations	Percent
Money	2,706	67.18
Food	826	20.51
Non-food goods	458	11.37
Service	38	0.94
Total	4,028	100.00

Child nutritional status indicators

To assess children nutritional status, three types of anthropometric z-scores are used: weight-for-height (WHZ), weight-for-age (WAZ), and height-for-age (HAZ) as proxies to health level. Each one of these scores is associated with specific types of malnutrition. Weight-for-height and weight-for-age low z-scores indicate bad health due to current acute malnutrition, while low z-scores for height-for-age indicate long-run (chronic) malnutrition, also known as stunting ([Alves and Belluzzo, 2004](#); [Antón, 2010](#)). Low or high z-scores are the result of comparisons with normal, healthy populations. On the other hand, z-scores below -1 are usually associated with unhealthy children. In general, the lower a child’s score, the worse the health problems he or she is likely to suffer.

These indicators have been widely used in development economics as a dependent variable of analysis to assess short, middle and long-term nutritional status ([Sahn and Alderman, 1997](#); [Alves and Belluzzo, 2004](#); [Borooah, 2005](#); [Kabubo-Mariara et al., 2008](#); [Antón, 2010](#)). We use the Stata macro made available by World Health Organization (WHO) to compute these indicators. Table 3.3 presents summary statistics. It includes mean and standard deviation of some variables and means tests that aim to identify differences between households that receive remittances and non-recipient households. Table 3.3 and Figure B.1 confirm that children living in household receiving remittances have better nutritional status indicator than those in non-recipient households. The table also contains the summary statistics of maternal and household characteristics.

Table 3.3: Summary Statistics

	Observation	Household receives remittances				Difference in means test (p-value)
		Yes		No		
		Mean	SD	Mean	SD	
Maternal education						
No education	7,915	0.83	0.34	0.87	0.38	
Primary	7,915	0.08	0.26	0.08	0.27	
Secondary and more	7,915	0.09	0.24	0.06	0.29	**
Family structure						
Monogamous	8,000	0.57	0.5	0.54	0.5	***
Polygamous	8,000	0.37	0.49	0.39	0.48	*
Free union	8,000	0.01	0.18	0.03	0.12	***
Single/Divorced/Widow	8,000	0.05	0.18	0.03	0.22	***
Household head : Female	8,045	0.1	0.2	0.04	0.29	***
Age of household head	8,045	48.32	14.2	45.0	16.02	***
Household size	8,045	100.92	70.51	110.06	60.74	
Head of household education						
No education	8,045	0.82	0.37	0.84	0.39	
Primary	8,045	0.11	0.3	0.1	0.31	
Secondary and more	8,045	0.08	0.23	0.06	0.27	
Place of residence						
Urban	8,042	0.26	0.43	0.24	0.44	
Rural	8,042	0.74	0.43	0.76	0.44	
Potable water access						
0-14 mns	8,043	0.83	0.4	0.79	0.37	***
15-29 mns	8,043	0.1	0.32	0.12	0.31	
30-44 mns	8,043	0.04	0.21	0.05	0.2	
45-59 mns	8,043	0.01	0.11	0.01	0.11	
60mns and more	8,043	0.01	0.17	0.03	0.11	***
Access to health centre						
0-14 mns	8,044	0.24	0.41	0.22	0.43	
15-29 mns	8,044	0.2	0.39	0.19	0.4	-
30-44 mns	8,044	0.19	0.37	0.17	0.39	***
45-59 mns	8,044	0.11	0.3	0.1	0.31	***
60mns and more	8,044	0.26	0.47	0.33	***	
Access to vaccination centre						
0-14 mns	8,035	0.18	0.37	0.16	0.39	
15-29 mns	8,035	0.18	0.36	0.15	0.38	**
30-44 mns	8,035	0.18	0.38	0.18	0.39	
45-59 mns	8,035	0.11	0.3	0.1	0.31	-
60mns and more	8,035	0.35	0.49	0.4	0.48	***
Child characteristics						
Child gender : Female	8,045	0.5	0.5	0.49	0.5	*
Weight-for-length/height z-score	8,045	-0.33	1.32	-0.4	1.3	
Length/height-for-age z-score	8,045	-1.28	1.63	-1.4	1.65	***
Weight-for-age z-score	8,045	-0.94	1.18	-1.05	1.12	***

Sources: Authors' calculations, *** p<0.01; ** p<0.05; * p<0.1

3.3 Empirical Strategies

We use two identification strategies in order to estimate the effect of remittances and maternal characteristics on child nutritional status. First, we follow [Strauss and Thomas \(1995\)](#); [Thomas et al. \(1996\)](#) and [Kabubo-Mariara et al. \(2008\)](#) to estimate the following least square regression:

$$N_i = \beta_0 + X_i' \beta_1 + \beta_2 R_i + \epsilon_i, \quad \forall i = 1, \dots, n. \quad (3.1)$$

where N_i denotes the nutritional status (WHZ, HAZ and WAZ); X_i represents a vector of control variables such as the child gender (1 for female and 0 for male), the marital status of the mother, the mother education, the size of the household, the mother age and the residence (1 for rural and 0 for urban); R_i is a dummy variable equals 1 if the household received remittances and 0 otherwise; ϵ_i denotes an error term associated with individual unobserved heterogeneity. We estimate heteroskedasticity robust standard errors when estimating the equation (3.1) to deal with the potential clustering of observations.

Second, endogeneity of remittances variable in Equation (3.1) is a form potential bias that may occur. Indeed, as argued by [Antón \(2010\)](#), it is possible that migration (or remittances receipt) is more likely to occur in households with children with low-nutritional status. For example, if a child is sick or unhealthy and more money is needed for the child's care, it is possible to imagine that household members other to the mother may go abroad to increase the resources available for the household, which would mean that households are negatively selected into migration. It is also possible that there are unobservable shocks (crop failures, floods, droughts, etc.) that affect child health and that, at the same time, are correlated with remittances, for example, if migrants send more money to face these shocks ([Antón, 2010](#)). Furthermore, the main challenges confronting the identification of the causal effect of remittances on children nutritional status are the potential issues of omitted variables bias, the measurement errors and reverse causality. To resolve these potential endogeneity issues, we use the instrumental variables approach. This method involves estimating a two-stage model in which the second stage consists of estimating equation (3.1), while the first stage consists of estimating the following equation :

$$R_i = \theta_0 + X_i' \theta_1 + Z_i' \theta_2 + \mu_i, \quad \forall i = 1, \dots, n. \quad (3.2)$$

where Z_i is the vector of instruments and X_i the vector of control variables as defined in Equation (3.1). We instrument the remittances received with two variables. Building on Adams and Cuecuecha (2013), we use the distance to the nearest railroad station in 1954 times the age of household head as an instrument for remittances. Indeed, in Burkina Faso, as in most of West Africa countries, migratory flows have their roots in the colonial era. The first migrations of populations in West Africa after the slave trade were targeted at the peanut growing areas or coffee and cocoa plantation areas of Ghana or Cote d'Ivoire. Railroad, built from 1913 and 1954, was the best way for the Burkinabe to get to Cote d'Ivoire. As shown in Figure 3.1, Cote d'Ivoire is the second source of remittances received in Burkina-Faso due to its long migration history with the country. Since the nearest railroad station in 1954 is not correlated to the present children nutritional status, it is then a good instrument to address the endogeneity of remittances.

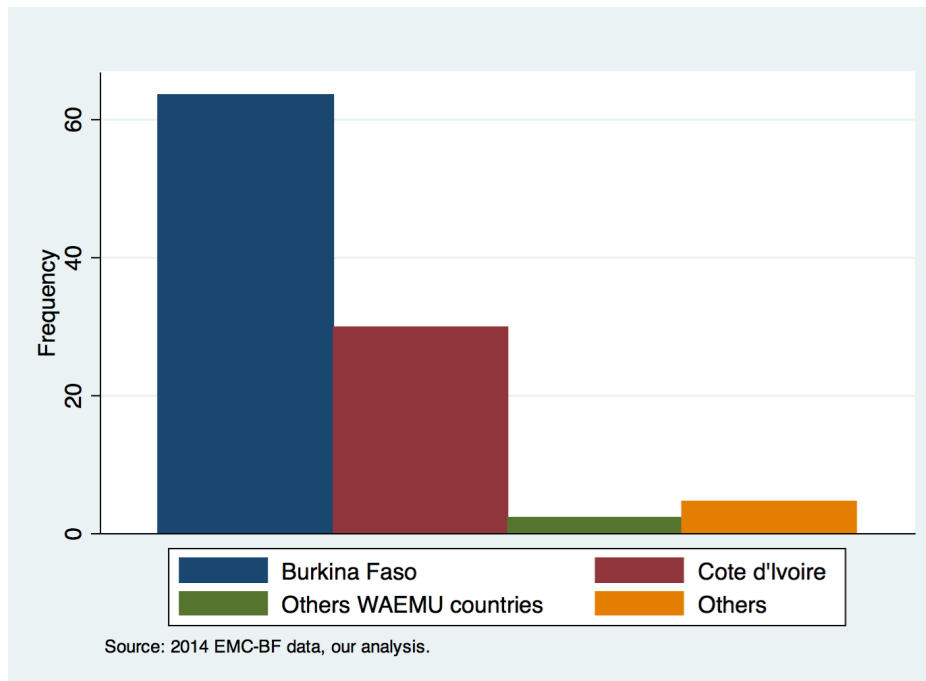


Figure 3.1: Remittances by Source Countries : Percentage of Total Remittances Received.

In addition, following Hildebrandt et al. (2005), we use as a second instrument, the state-level migration rate in 1985 in Burkina-Faso. Data for this second instrument comes from national census of 1985. As for the first instrument, state-level migration rate in the past allow the understanding of the current migrations stocks for each state and thus the likelihood of receiving

remittances. However, unlike the first instrument that affects only the migration network of Burkina Faso in Cote d'Ivoire, the migration rate at the state level takes into account the global network. As discussed in [Adams and Cuecuecha \(2013\)](#), we multiply the variable by the age of household to obtain variation at the household level.

3.4 Results

In this section, we report our estimates contrasting baseline estimates with those obtained using the instrumental variable approach. In addition, we control for community level characteristics that may be correlated with observable determinants of child nutritional status. For this purpose, we introduce in the models, dummy variables for each region, for the time taken to have access to drinking water, to a health centre and to go to a pharmacy.

3.4.1 OLS Estimates

We first report the OLS estimates of Equation (3.1). These estimates are presented in Table 3.4. It shows that each additional level of schooling for the mother has a positive and significant impact on his child health when health is measured by weight-for-height. A positive effect for the weight-for-age, and the height-for-age was expected. Several studies indicate a positive impact of the mother's education on the improvement of child health in developing countries ([Behrman and Wolfe, 1984](#); [Thomas et al., 1990](#); [Alderman and Garcia, 1993](#); [Kassouf and Senauer, 1996](#); [Alves and Belluzzo, 2004](#)). Living in monogamous, polygamous family is not very important to explain children nutritional status. In contrast, living in urban sector has a significant positive impact in weight-for-height, weight-for-age, and height-for-age. This result contrasts with the results of [Kassouf and Senauer \(1996\)](#) indicating a negative impact of urbanization on child health and [Thomas and Strauss \(1992\)](#) and [Alves and Belluzzo \(2004\)](#) who found a positive impact of urbanization on child height-for-age and weight-for-height.

Receiving remittances have positive and significant effect on the weight-for-height, the weight-for-age and the height-for-age equations. This result suggest that remittances have a positive effect on short, middle and long-term nutritional status of Burkina Faso children. This result confirms the important role of remittances in the fight against child malnutrition in developing countries.

The coefficient of living standard, indicated by *welfare indicator* in Table 3.4 and Table 3.5 is positive and significant in the height-for-age and in the weight-for-age equations. In the weight-for-height equation, the effect is negative and is not significant. These results indicate that stunting and wasting are positively associated with poverty. To the extent that weight-for-height captures the long run impact of malnutrition, our results indicate that poverty takes a long-term toll in terms of child health. The variable *mother age* also has a positive and significant coefficient on all the child health outcomes. This result confirms the predictions of Horton (1988) and can be due to the fact that young mothers in Burkina Faso generally benefit from the support of more experienced mothers in the treatment of children, leading to a higher health for their children. This result also suggests the importance of reducing teenage births. There is no evidence of significant differences in health levels associated with the gender and the sex of the head of household. In contrast, being from a larger family decreases significantly the effect of the weight-for-height.

Finally, controlling for the health infrastructure variables shows that access to the vaccination centre allows mothers to be easily advised by health professionals and thereby improve the health of their children. The results also show that household size has a negative effect on the weight-for-height, suggesting competition for food among siblings.

3.4.2 IV Estimates

The IV estimates are presented in Table 3.5. To examine the validity of the instruments, we undertake three statistical tests. First, we test the null hypothesis that remittances are exogenous. The Hausman test indicates that we can consider remittances as an endogenous variable and therefore we should deal with the identification issue. Second, we perform the Sargan-Hansen test for overidentification when we use both instruments. The test indicates that the instruments are valid when health is measured by the height-for-age (HAZ). Third, we perform the Stock-Yogo test, which tests weak identification of instruments. The weak instrument problem arises when the correlation between the endogenous regressor and the set of instrumental variables is weak. We reject the null hypothesis of weak identification in all the three specifications of the test. All these tests reassure that the estimated effect of remittances on children nutritional status when health is measured by the height-for-age (HAZ) is causal. Results indicate that receiving remittances increases child health outcome by 0.895 in the height-for-age (HAZ), which is close to

Table 3.4: OLS Estimation: Determinants of children nutritional status

Variables	WHZ	HAZ	WAZ
Maternal education			
No education	0.153**	-0.314***	-0.0713
Primary	0.190**	-0.277***	-0.0121
Secondary and more : reference			
Mother age	0.0340***	0.0270*	0.0376***
Mother age square	-0.0004**	-0.0002	-0.0004**
Child : Female	0.0952***	0.258***	0.178***
Family structure			
Monogamous	-0.142	0.0895	-0.0630
Polygamous	-0.0575	0.0930	-0.0001
Free union : reference			
Single/Divorced/Widow	-0.114	0.101	-0.0356
Household head : Female	-0.0096	-0.132	-0.0746
Age of household head	-0.0036	-0.0021	-0.0042
Household size	-0.0073***	0.0048	-0.0024
Head of household education			
No education	-0.272***	-0.0359	-0.212***
Primary	-0.254***	0.0269	-0.168**
Secondary and more : reference			
Residence: urban	0.209***	0.140***	0.224***
Access to vaccination centre			
0-14 mns : reference			
15-29 mns	0.0465	0.0105	0.0550
30-44 mns	-0.116**	0.150**	0.0164
45-59 mns	0.280***	-0.109	0.145***
60mns and more	0.110**	-0.0015	0.0824**
Remittances receipt	0.0671*	0.0860**	0.0938***
Welfare indicator (in log.)	-0.0098	0.131***	0.0754**
Control variables			
Region	Yes	Yes	Yes
Access to health centre	Yes	Yes	Yes
Access to pharmacy	Yes	Yes	Yes
Access to drinking water	Yes	Yes	Yes
Observations	7,876	7,876	7,876
R-squared	0.099	0.426	0.453
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Table 3.5: IV Estimation : Determinants of children nutritional status

Instruments	Both IVs	Both IVs	Both IVs
Variables	WHZ	HAZ	WAZ
Maternal education			
No education	0.210***	-0.271***	-0.0102
Primary	0.237***	-0.241**	0.0390
Secondary and more : reference			
Mother age	0.0376***	0.0302*	0.0417***
Mother age square	-0.0004**	-0.0003	-0.0004***
Child : Female	0.0831***	0.248***	0.164***
Family structure			
Monogamous	-0.0427	-0.0130	-0.0377
Polygamous	0.0709	-0.0578	0.0190
Free union	0.195	-0.0158	0.141
Single/Divorced/Widow : reference			
Household head : Female	-0.206**	-0.279**	-0.292***
Age of household head	-0.0017	0.0010	-0.0007
Household size	0.0003	0.0011	0.0003
Head of household education			
No education	-0.261***	-0.0573	-0.218***
Primary	-0.259***	0.0043	-0.185**
Secondary and more : reference			
Residence: urban	0.226***	0.155***	0.244***
Access to vaccination centre			
0-14 mns	-0.141***	-0.0243	-0.118***
15-29 mns	-0.104**	-0.0191	-0.0731
30-44 mns	-0.243***	0.140**	-0.0842**
45-59 mns	0.147**	-0.120*	0.0400
60mns and more : reference			
Remittances receipt	0.990***	0.895***	1.187***
Welfare indicator (in log.)	-0.0344	0.110**	0.0469
Control variables			
Access to health centre	Yes	Yes	Yes
Access to drinking water	Yes	Yes	Yes
Access to pharmacy	Yes	Yes	Yes
Observations	7,868	7,868	7,868
Haussman test : statistic (p-value)	13.627 (0.000)	6.8058 (0.009)	24.405 (0.000)
Sargan-Hansen test	52.743 (0.000)	0.457 (0.4992)	24.374 (0.000)
Weak ID (Cragg-Donald Wald F-stat.)	76.636	76.636	76.636
Stock-Yogo weak ID test critical values :			
10% maximal IV relative bias	16.38	16.38	19.93
15% maximal IV relative bias	8.96	8.96	11.59
20% maximal IV relative bias	6.66	6.66	8.75
25% maximal IV relative bias	5.53	5.53	7.25

Notes : Heteroskedasticity-robust standard errors and p-values for Haussman and Sargan tests are in parentheses. In each column (also called Both IVs), both instruments are used. *** p<0.01; ** p<0.05; * p<0.1

the OLS estimate of 0.0860 when the region, access to drinking water and access to a pharmacy are controlled.

There are a several ways in which this paper can be extended. First, information on the migrants and the socio-economic conditions experienced by his family before his migration can help to better identify the effect of remittances on children health outcomes. Secondly, further studies can use a human development index by household as an instrumental variable for remittances. Indeed, it can be assumed that before making the decision to migrate, migrants make a benchmark between the economic situation of their family and the economic situation it could live in the host country. In other words, an individual will decide to migrate if the difference between the human development index of his household and that of the host country is positive. This difference can serve as instrumental variable in subsequent studies.

3.5 Robustness test: Assessing the causal effect of remittances using a propensity score matching

One of the main challenges when assessing the causal effect of remittances is self-selection. Selection bias arises because households receiving remittances can differ fundamentally from non-received households according to their different characteristics. If selection into sending remittances is not a random decision, analysis of the effect of remittances on child nutritional status will give biased estimates unless the problem of self-selection is addressed.

Propensity score matching is one of the methods used to address this issue ([Cox-Edwards and Rodríguez-Oreggia, 2009](#); [Clément, 2011](#)). In this study, we use a propensity score matching to test the robustness of the results obtained with the instrumental variables method.

The idea of the propensity method is to first create one scalar that summarizes observable covariates of children nutritional status, X_i , into a probability of receiving remittances. The propensity score of children in household i is then defined as:

$$e_i = P(T_i = 1|X_i) \tag{3.3}$$

Where $T_i = 1$ denote the receipt of remittances by household i . Estimation of the propensity

scores involves the choice of the covariates to be included. This choice is guided by tradeoffs between variables' effects on bias (distance of estimated treatment effect from true effect) and efficiency (precision of estimated treatment effect). Since the use of variables that are related to the children nutritional status but not the receipt of remittances would reduce bias (Brookhart et al., 2006; Austin, 2011b), we include all the variables used in the instrumental variables method. Although non-parametric methods such as boosted CART (Classification and Regression Trees) and generalized boosted models (gbm) often show very good performance (McCaffrey et al., 2004; Setoguchi et al., 2008; Lee et al., 2010), logistic regression is the most common method used in the literature. In this regard, we employed logit regression to estimate the propensity scores.

After the propensity scores are estimated, households are split into two groups, those who receive remittances and those who don't, and ranked according to their propensity score. At the next step, the households are matched with similar households from the other group. The common matching methods used in the literature are nearest neighbor matching, Caliper matching and kernel matching. In its simplest form, 1 : 1 nearest neighbor matching selects for each children in remittances-received household i the control children with the smallest distance (measured by the propensity score) from i . A common complaint regarding 1 : 1 matching is that it can discard a large number of observations and thus would apparently lead to reduce power. In addition, without any restrictions, k : 1 matching can lead to some poor matches, if for example, there are no control individuals with propensity scores similar to a given treated individual. One strategy to avoid poor matches is to impose a caliper and only select a match if it is within the caliper. According to Austin (2011a), a 0.2 Caliper of the standard deviation of the logit of the propensity score is optimal. In contrast to the k :1 nearest neighbor matching and the Caliper matching which discard unmatched individuals from the comparison group, kernel matching averages over multiple individuals in the control group for each children in remittances-received households, with weights defined by their distance within a range, or bandwidth, of the propensity score. As there is not a clearly superior method of matching or weighting data by propensity scores, we test all the three methods and choose the strategy that best balances our sample as recommended by some authors (Ho et al., 2007; Luo et al., 2010).

The mean standardized difference in covariates across treatment and comparison groups in the original sample was 9.3 percent (Table B.4). Of the matching, Caliper and one-to-one matching

had the best reduction in mean standardized difference. After matching, variables such as access to drinking water, welfare, child gender, household age, household size, and mother age were found to be unbalanced. We dropped the variables household age and household size since they have no significant effect on children health outcomes in the IV estimation. In order to keep the other variables in the matching process, we create an interaction term between welfare and child gender, and use the square of mother age instead of the simple mother age. Tables B.5 and B.6 indicates that, after the one-to-one matching and the caliper matching, all the variables were balanced (the ratios of variances of the propensity score and covariates from the treatment and comparison groups are between 0.5 and 2). Once the matching is done one can estimate the average treatment effect on the treated (ATT) and the average treatment effect for the entire sample. The average treatment effect on the treated (ATT) is preferred in this study as it compares the potential nutritional status of children in remittances-received households with its counterfactual obtained with the matching methods.

Consider $D = 0, 1$ to be a binary indicator where 1 denotes being in remittances-received households and 0 otherwise. If Y_1 denotes the nutritional status of children when the household receives remittances and Y_0 denotes the nutritional status of children when the household does not receive remittances, then the average treatment effect on the treated is defined by:

$$ATT = E(Y_1/D = 1) - E(Y_0/D = 1) \tag{3.4}$$

Where $E(Y_0/D = 1)$ is the counterfactual nutritional status that children in remittances-received households would have experienced, on average, had their household did not receive the money.

Table 3.6 indicates that remittances have a positive causal effect on two of the three child health indicators considered in this study. Indeed, the receipt of remittances leads to the reduction of both the acute and the chronic malnutrition in migrant-sending households. This result confirms the finding from the IV estimation and make it possible to conclude that migrant remittances play a significant role in child health improvement in Burkina-Faso.

Table 3.6: Average treatment effect on treated for children in remittances-received households

	ATT	P-value
weight-for-height zscore	(0.0516) (0.0511)	0.313
weight-for-age zscore	0.1014 (0.0439)	0.021
height-for-age zscore	0.1179 (0.0640)	0.065

Note: Abadie-Imbens robust standard errors in parentheses

3.6 Conclusion

This paper investigates the determinants of children nutritional status in Burkina Faso using the 2014 Continuous Multisectoral Survey (EMC-BF) micro data and three anthropometric indicators for children aged 5 years old and under (weight-for-height (WHZ), weight-for-age (WAZ) and height-for-age z-scores (HAZ)) to explore several specific pathways. In estimation, we control for four variables : region, access to health centre, access to drinking water and access to a pharmacy. The paper make two important contributions to the existing literature. First, we are not aware of any paper that explains children nutritional status using nationally representative data for Burkina Faso. Secondly, we find that access to vaccination centre may be a very important factor explaining children health outcomes.

Results also show that remittances, welfare index, and age of the mother have a positive effect on children health outcomes. Women with at most primary education are likely to have better nutritional status in the short term for their children. But in the long run, they will not succeed. These results suggest the possibility that specific nutrition education for girls and women may yield high returns in terms of enhanced children nutritional status. Our findings also suggest that women with at most primary education are likely to have better nutritional status in the short term for their children. But in the long term, they cannot manage to do that. The policies aimed at improving child food security will be more effective if there is a food education scheme in place, along with awareness among girls and women. More generally, by highlighting the importance of maternal characteristics on children health outcomes, we believe that our study provides new insights into the role of maternal education and remittances in infant health attainment.

Conclusion générale

L'objectif principal de cette thèse était d'étudier la relation entre la migration et la sécurité alimentaire dans les pays d'origine des migrants, en s'intéressant particulièrement au cas des pays de l'Afrique Sub-Saharienne. L'analyse a été limitée à trois dimensions de la sécurité alimentaire, jugées fondamentales dans la théorie. Il s'agit notamment de l'accessibilité des individus ou des ménages aux denrées alimentaires, de la stabilité d'accès à ces denrées, et l'utilisation des denrées par les individus ou les ménages.

Pour atteindre cet objectif, il a été question d'analyser, dans un premier temps, l'impact des transferts internationaux des migrants sur la prévalence de sous-alimentation dans 35 pays d'Afrique Sub-Saharienne, disposant de données sur une longue période. Il ressort de cette première analyse que les transferts internationaux des migrants contribuent significativement à une baisse de la prévalence de sous-alimentation dans les pays considérés. Les transferts internationaux vers les pays d'origine des migrants permettent donc d'améliorer globalement l'accès aux denrées alimentaires dans ces pays. Toutefois, l'ampleur de cet impact dépend du niveau de revenu par habitant des pays. En effet, l'impact des transferts internationaux est plus fort dans les pays dont le revenu annuel par habitant est compris entre 420 USD et 518 USD, soit en 2007, le Burkina-Faso, la Gambie, le Mozambique, la Sierra-Léone, le Malawi, et Madagascar. Il est plus faible lorsque ce revenu est en dessous de 420 USD, et au-dessus de 518 USD. L'impact faible dans les pays ayant un revenu annuel par habitant inférieur à 420 USD (Exemple en 2011 : l'Éthiopie, la Guinée, le Libéria et le Niger) est dû au faible montant des transferts internationaux reçus par les ménages les plus pauvres de ces pays. Quant aux pays pour lesquels le revenu annuel par habitant est supérieur à 518 USD, le faible effet des transferts internationaux se justifie par une forte répartition des transferts vers des dépenses autres que la consommation alimentaire (Exemple : Éducation, Santé, Immobilier, Investissement, . . .). L'étude a permis également d'identifier d'autres variables contribuant à la baisse de la prévalence de sous-alimentation dans les pays considérés dans l'analyse. Il s'agit, outre le niveau du PIB par habitant, de l'offre de crédit domestique, de l'investissement privé, et de la part de la surface cultivable sur la surface totale disponible dans le pays. En d'autres termes, une augmentation du revenu par habitant dans un pays a pour résultat la réduction de la proportion de personnes sous-nourries dans ce pays. De la même manière, plus l'investissement privé et l'offre de crédit sont élevés dans un pays, plus son niveau de sous-alimentation est moindre. Enfin, plus la part de la surface cultivable sur la surface totale, qui traduit les possibilités de

production agricole, est importante dans un pays, moins est sa prévalence de sous-alimentation.

Cette première analyse permet de souligner les facteurs pouvant permettre d'améliorer l'accès aux denrées alimentaires au niveau macroéconomique pour certains pays d'Afrique subsaharienne : les transferts internationaux des migrants, le PIB par habitant, l'investissement privé, l'offre de crédit domestique, et la part de la surface cultivable sur la surface totale. Pour mener une analyse plus précise de l'impact de la migration sur la sécurité alimentaire des individus et des ménages, il convenait de réaliser également des études de cas à partir de données d'enquêtes. Ainsi, deux études de cas, portant sur l'impact de la migration sur la sécurité alimentaire des ménages dans les pays d'origine, ont été effectuées respectivement en Éthiopie et au Niger. Contrairement à la première analyse qui se limitait à la dimension 'accessibilité', ces études de cas ont permis d'analyser également l'impact de la migration sur l'utilisation des denrées alimentaires (diversification alimentaire) et la stabilité dans l'accès à ces denrées. Aussi, les études de cas ont permis de prendre en considération aussi bien la migration internationale que la migration interne.

Dans le cas du Niger, la migration étudiée n'avait aucun impact significatif sur la sécurité alimentaire des ménages. Par contre, en Éthiopie, l'étude a montré que la migration entraîne une détérioration de l'accès et de la diversification des denrées alimentaires des ménages lorsqu'elle n'engendre pas les transferts de la part des migrants. Cependant, lorsque les ménages perçoivent des transferts, l'effet négatif disparaît, et tout accroissement du montant des transferts conduit à une amélioration de l'accès et de la diversification des denrées alimentaires dans les ménages comptant un migrant. Ainsi, les migrations produisant peu (ou pas) de transferts aux ménages, telles que les rapatriements familiaux, les migrations pour les études, et les migrations forcées, ont un impact négatif sur l'accès et la diversification alimentaire des ménages. A contrario, les migrations de travail, qui sont suivies des transferts, entraînent une amélioration de l'accès et de la diversification des denrées alimentaires dans les ménages comptant un migrant. L'étude sur le cas de l'Éthiopie a montré également que la migration assure une stabilité dans l'accès aux denrées alimentaires pour les ménages comptant un migrant. En effet, le migrant constitue pour ces ménages une assurance contre les chocs alimentaires dans la mesure où ils peuvent solliciter son aide lorsqu'ils font face à une pénurie alimentaire. Le migrant effectue ainsi des transferts de fonds et de nourritures à son ménage d'origine pour l'aider à pallier aux difficultés d'accès aux denrées alimentaires durant la pénurie. Toutefois, en Éthiopie, la migration dominante est la migration

interne, comptant plus de 95 % des migrants. Ainsi, la migration internationale, produisant moins de transferts internationaux vers le pays, tel que montré dans la première analyse, n'a pas d'impact significatif sur la sécurité alimentaire des ménages éthiopiens en général.

Les deux études de cas (Éthiopie et Niger) ont permis également d'identifier d'autres facteurs déterminants de la sécurité alimentaire des ménages. Il s'agit, entre autres, du niveau d'éducation du chef de ménage, de son statut matrimonial, du niveau de richesse du ménage, de la taille du ménage, ainsi que son lieu d'habitation. En ce qui concerne le niveau d'éducation du chef de ménage, plus il est élevé plus le ménage possède un meilleur accès et une bonne diversification alimentaire. Le niveau de richesse du ménage a également un effet positif sur son accès et sa diversification alimentaire. Autrement dit, plus les ménages sont riches, plus leur accès et leur diversification des denrées alimentaires sont meilleures. Quant à la taille du ménage, elle constitue un avantage pour l'accès et la diversification alimentaire ; cela parce qu'elle permet au ménage d'avoir une offre élevée de travail, et donc un niveau plus élevé de revenu. Cependant, la taille du ménage représente un frein à la stabilité dans l'accès aux denrées alimentaires car, en cas de choc alimentaire, un nombre important de membres implique une répartition des denrées au sein du ménage. Cela se traduit, notamment, par l'adoption de stratégies de survie plus sévères en période de pénurie alimentaire. Le fait de vivre en milieu urbain est aussi associé à un meilleur accès et à une meilleure diversification alimentaire des ménages. Cependant, les ménages ruraux ont une meilleure stabilité dans l'accès aux denrées alimentaires car, en cas de pénurie alimentaire, ils peuvent plus facilement recourir à l'aide d'un proche ou d'un voisin pour se nourrir. Quant au statut matrimonial du chef de ménage, son effet sur l'accès et la diversification alimentaire suit celui de la taille du ménage. En effet, compte tenu de l'effet 'taille', les ménages dont le chef est en couple ont tendance à avoir un meilleur accès et une meilleure diversification alimentaire que ceux dont le chef n'est pas en couple (divorcé, séparé, veuf,...). Par contre, la stabilité d'accès aux denrées alimentaires est meilleure dans les ménages dont le chef n'est pas en couple.

Une autre question également abordée dans les études de cas, en Éthiopie et au Niger, concerne les changements de la composition des ménages après la migration, et comment ceux-ci affectent leur sécurité alimentaire. Dans le cas de l'Éthiopie, l'arrivée d'un nouveau membre dans le ménage joue le même rôle que les transferts des migrants. En effet, cette arrivée annule l'effet négatif de la migration sur l'accès et la diversification alimentaire des ménages comptant un migrant. L'arrivée

d'un nouveau membre dans les ménages compense donc la perte de dotation, et donc de revenu, due au départ du migrant. Cependant, en augmentant la taille du ménage, l'arrivée du nouveau membre dans le ménage représente une entrave à son accès stable aux denrées alimentaires lorsqu'il y a une pénurie alimentaire. En effet, cette arrivée entraîne une répartition supplémentaire des denrées au sein du ménage, qui s'accompagne de l'adoption de stratégies de survie plus sévères en cas de choc alimentaire.

Cette thèse s'est également intéressée, dans un troisième temps, à l'impact de la migration sur la sécurité alimentaire des enfants, car ceux-ci représentent une proportion élevée de la population vulnérable. Un accent particulier a été mis sur les transferts des migrants, constitués des transferts matériels et des transferts immatériels (inobservables dans les données). L'étude de cas, réalisée au Burkina-Faso, a montré que les transferts des migrants contribuent à une amélioration du statut nutritionnel des enfants dans les ménages comptant un migrant. La migration favorise donc une meilleure utilisation des denrées alimentaires dans ces ménages. On déduit également que les transferts des migrants peuvent contribuer à sortir ces enfants d'un futur piège de pauvreté, dû à une malnutrition durant l'enfance. L'étude au Burkina-Faso a mis également en évidence d'autres variables déterminantes de la nutrition des enfants, le principal étant le niveau d'éducation de la mère. Plus la mère est éduquée plus le statut nutritionnel de l'enfant est meilleur. Le niveau de richesse du ménage exerce aussi un effet positif sur le statut nutritionnel des enfants, comme on s'y attend. En effet, celui-ci s'améliore au fur et à mesure que le revenu du ménage augmente. L'accès aux centres de vaccination dans le milieu de résidence des enfants joue également un rôle important dans l'amélioration de leur état nutritionnel.

Cette thèse a permis de mettre en lumière les mécanismes qui lient la migration et la sécurité alimentaire des ménages comptant un migrant. Il ressort de l'ensemble des analyses menées que, la migration, à travers les transferts des migrants, contribue à une amélioration de leur accès et de leur utilisation des denrées alimentaires. Elle offre également, à ces ménages, une stabilité d'accès aux denrées alimentaires en temps de pénurie alimentaire. La migration constitue donc une stratégie adoptée par les ménages pour améliorer leur sécurité alimentaire.

Le caractère 'privé' de la migration et des transferts des migrants rend difficile la formulation de politiques visant à améliorer leur utilisation dans les pays en développement. Toutefois, les conclusions de cette thèse permettent de formuler quelques recommandations pouvant permettre

d'améliorer la sécurité alimentaire des ménages dans les pays d'Afrique Sub-Saharienne. Ces recommandations se présentent comme suit :

- Baisser les coûts des transferts vers les pays d'Afrique Sub-Saharienne afin d'augmenter le volume des envois des migrants vers ces pays.
- Mettre en place des politiques permettant aux banques de capter plus les fonds des migrants, et d'offrir plus de crédit, en s'associant aux organismes de microfinance par exemple, pour accroître les investissements privés.
- Réduire les risques et les coûts liés à la migration, en passant des accords de visa avec des pays d'accueil, et en faisant un meilleur suivi des migrants dans les pays ou localités d'accueil.
- Mettre en place des politiques visant à augmenter le revenu des ménages, telles que les transferts conditionnels de l'État aux plus pauvres. Ces transferts peuvent être conditionnés à une meilleure utilisation des denrées alimentaires au sein des ménages, et à une scolarisation des enfants.
- Organiser des formations sur les bonnes pratiques alimentaires, en visant notamment les femmes, et les ménages dont le chef possède un faible niveau d'éducation.
- Améliorer l'accès au centre de santé dans les zones rurales (construction des centres de santé, subvention des soins, . . .)
- En période de choc alimentaire, les interventions doivent viser en priorité les ménages pauvres n'ayant pas de migrant et vivant en milieu urbain.

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A

Annexe A

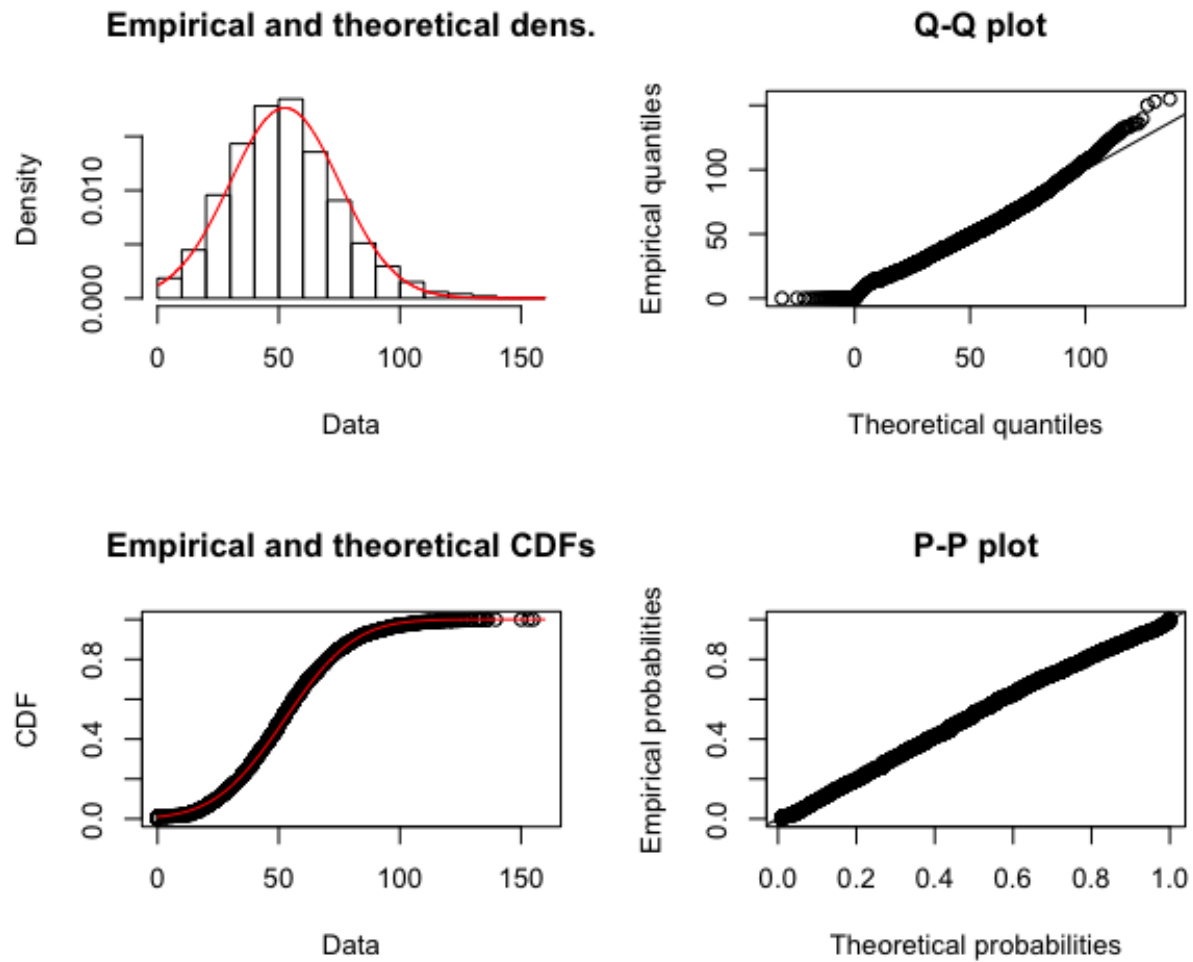
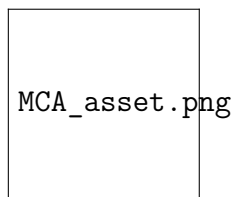


Figure A.1: Food consumption score (Normal distribution)

Table A.1: Principal componet results (Asset index)



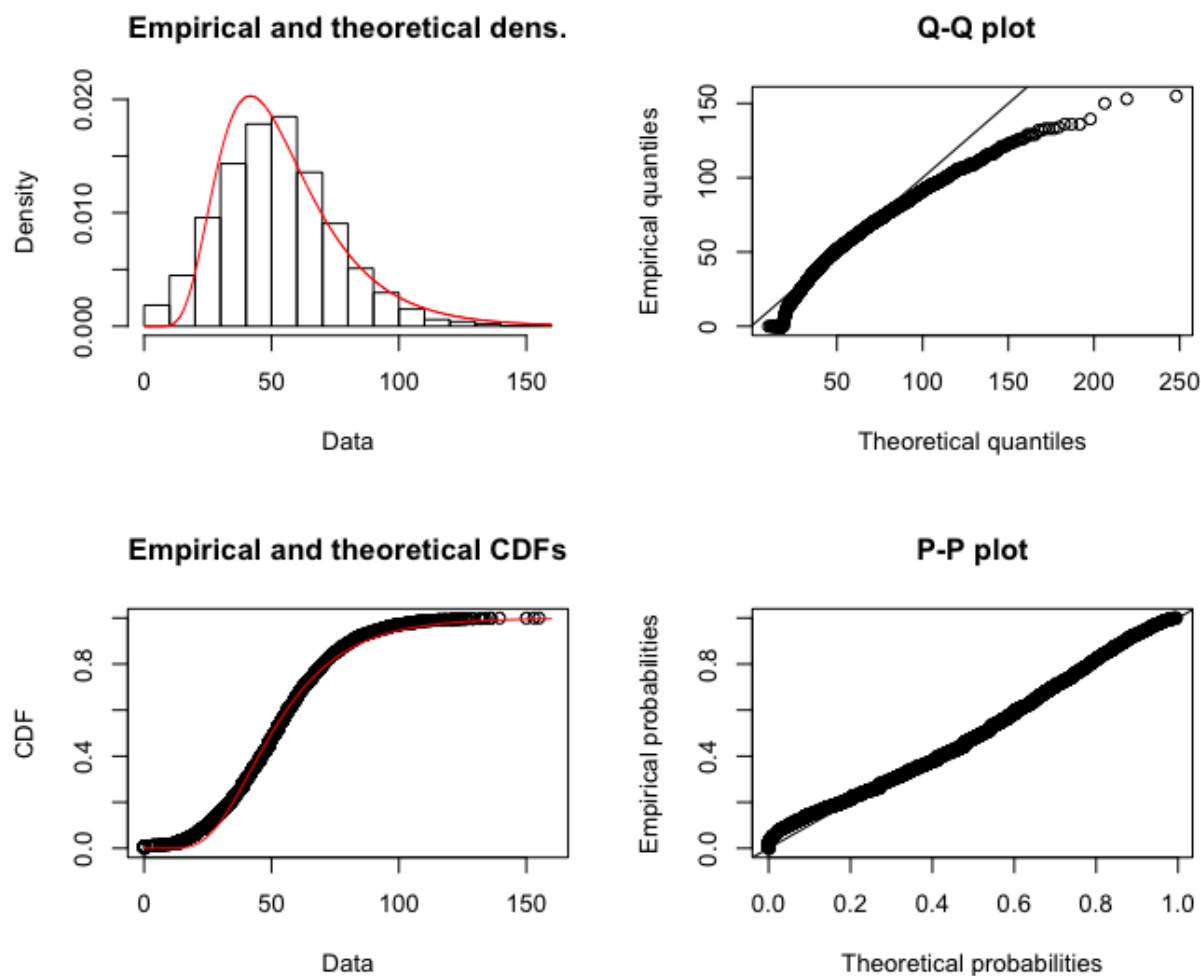


Figure A.2: Food consumption score (Log-normal distribution)

Table A.2: Per capita food expenditure by food groups

Per capita food expenditure	Migrant households	SD	Nonmigrant households	SD	p-value	stars
Cereals	15.479	32.650	20.940	103.970	0.000	***
Pulses and Nuts	7.349	13.699	8.939	15.720	0.001	***
Seeds	12.479	35.169	14.520	28.979	0.001	***
Vegetables	0.129	0.920	0.289	3.410	0.168	
Fruits	1.190	4.349	1.710	5.670	0.001	***
Tubers and Stems	2.220	4.909	2.599	8.5	0.015	**
Meat, Poultry, and Fish	9.5	30.420	18.809	348.390	0.249	
Dairy, Eggs, Sugar and Salt	13.689	69.940	14.729	24.719	0.011	**
Beverages and Stimulants (Coffee, Tea, Beer, Soft drink, Tella and chat)	10.399	26.219	13.369	35.529	0.003	***
Beverages and Stimulants (Purchased Injera, Purchased Bread and Biscuits, Pasta, other prepared food)	4.719	14.960	8.060	54.610	0.03	**

Note: ***: Significant at 1 % level, **: Significant at 5 % level, *: Significant at 10 % level

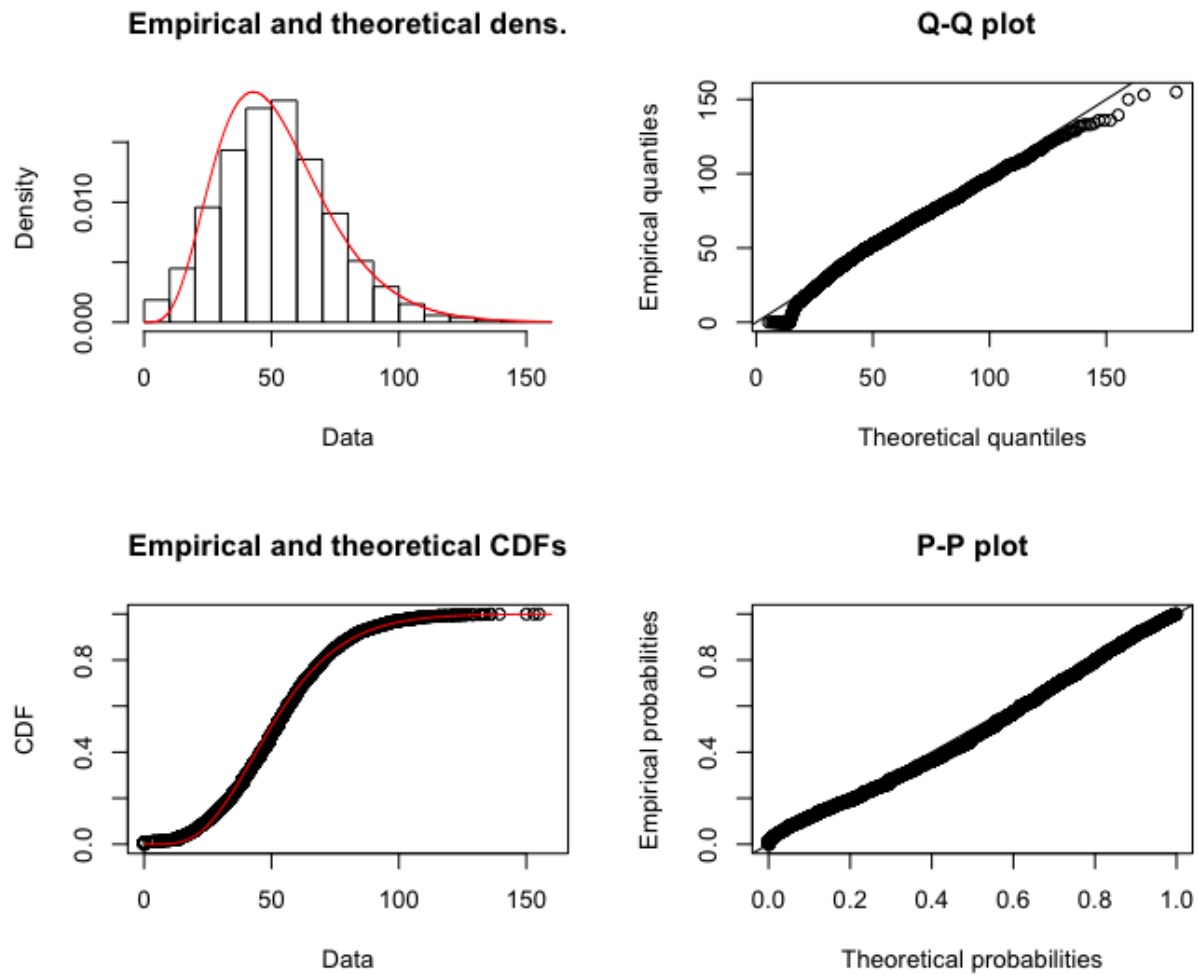


Figure A.3: Food consumption score (Gamma distribution)

Table A.3: Share of new members by households

Does the household have a migrant ?	Does the household receive a new member ?		Total
	No	Yes	
No	1,794	958	2,752
Yes	1,411	791	2,202
Total	3,205	1,749	4,954

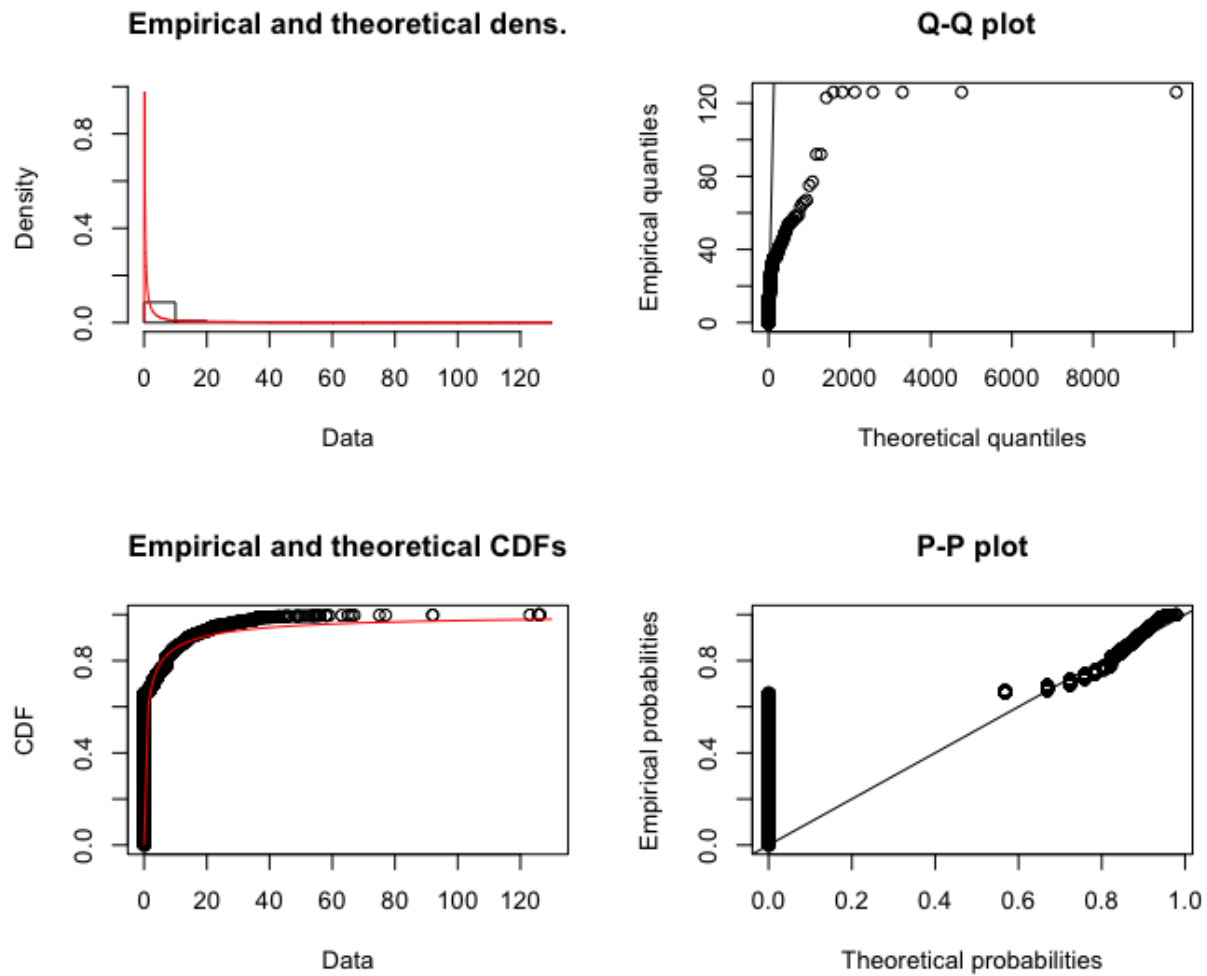


Figure A.4: Coping strategies index (Log-normal distribution)

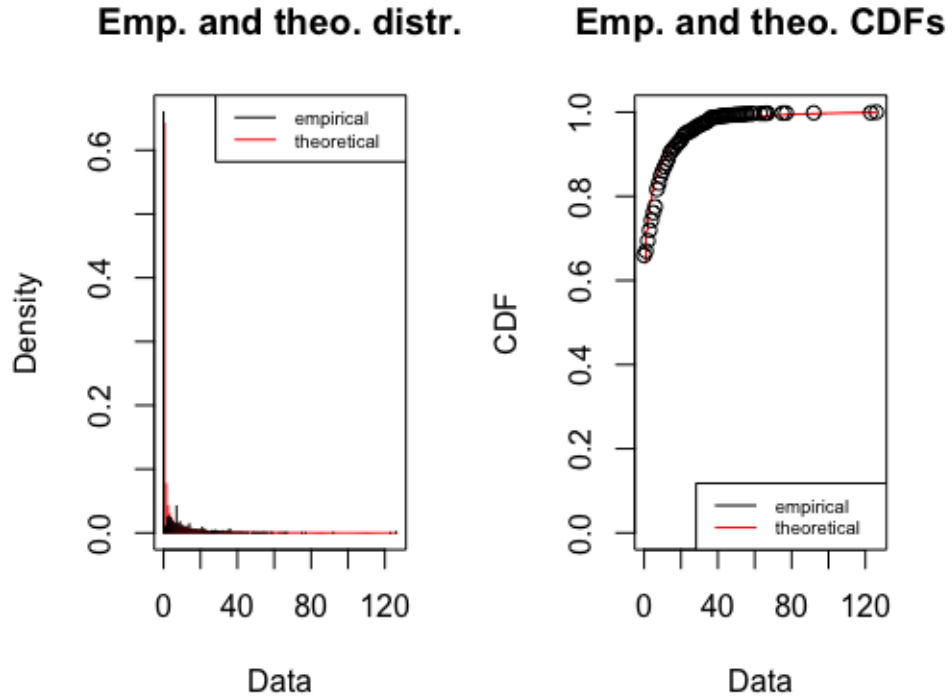


Figure A.5: Coping strategies index (Negative binomial distribution)

Table A.4: Relationship of the new member with the household head

	Is a new member ?		
	Yes	No	Total
Head	3.20	21.87	19.96
Spouse	6.75	14.00	13.26
Son/Daughter	52.84	53.99	53.87
Grandchild	12.47	3.67	4.57
Father/Mother	1.82	0.74	0.85
Sister/Brother	4.34	1.41	1.71
Niece/Nephew	3.87	1.16	1.44
Uncle/Aunt	0.32	0.17	0.19
Son/Daughter-in-Law	3.39	0.58	0.87
Father/month-in-Law	0.36	0.17	0.19
Brother/Sister-in-Law	0.67	0.30	0.34
Grandparent	0.20	0.07	0.08
Other Relative	3.95	0.87	1.18
Servant	2.96	0.40	0.66
Non Relative	2.88	0.58	0.81
Total	100.00	100.00	100.00

Table A.5: Share of new members by gender

Is a new member ?	gender		
	Male	Female	Total
No	48.68	51.32	100.00
Yes	49.08	50.92	100.00
Total	49.04	50.96	100.00

Table A.6: First stage estimates using Heckman method

Variables	Probability of having at least one migrant		
Instruments			
Share of men	0.277*** (0.089)	0.281*** (0.089)	0.535*** (0.183)
Share of individuals under 5 years old	-1.596*** .1603692 (0.099)	-1.812*** (0.165)	-1.279*** (0.364)
Migration rate x HH size	0.162 (0.099)	0.189* (0.099)	0.542** (0.239)
New member		0.247*** (0.043)	0.214** (0.097)
Remittances (log)			0.091*** (0.029)
Control variables			
Gender: female	0.181*** (0.062)	0.176*** (0.062)	0.174 (0.125)
Age	0.030*** (0.008)	0.035*** (0.008)	0.023 (0.017)
Age square	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)
Married (monogamous)	0.146 (0.105)	0.129 (0.106)	0.096 (0.195)
Married (polygamous)	0.381** (0.152)	0.374** (0.153)	0.293 (0.329)
Divorced	0.132 (0.121)	0.112 (0.121)	-0.185 (0.247)
Seperated	0.432*** (0.163)	0.426*** (0.163)	0.321 (0.281)
Widowed	-0.018 (0.117)	-0.039 (0.117)	-0.089 (0.228)
Primary school	0.013 (0.048)	0.018 (0.048)	-0.201* (0.117)
Secondary school	0.084 (0.078)	0.086 (0.078)	-0.261 (0.167)
University	-0.145* (0.087)	-0.161* (0.087)	-0.370** (0.179)
Welfare (Assets index)	0.059*** (0.011)	0.056*** (0.011)	0.023 (0.024)
Household Size	-0.010 (0.018)	-0.026 (0.018)	-0.088** (0.042)
Rural	0.512*** (0.056)	0.522*** (0.057)	0.415*** (0.120)
Constant	-1.447*** (0.238)	-1.560*** (0.239)	-1.509*** (0.519)
Regional FE	YES	YES	YES
Receipt of remittances	NO	NO	YES
Observations	4925	4926	1010
Pseudo R2	0.072	0.077	0.075

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity, FE: Fixed effects

Table A.7: Heckman estimates of the effect of migration on household food security

Variables	(1)		(2)		(3)	
	FCS	CSI	FCS	CSI	FCS	CSI
Migrant(s)	-1.031*** (0.233)	4.090 (4.315)	-0.518* (0.295)	4.513 (5.358)	-0.410 (0.261)	0.531 (7.326)
Remittances (log)					0.035*** (0.012)	-0.705*** (0.348)
Household head characteristics						
Gender: female	0.030 (0.027)	1.612** (0.801)	0.031 (0.027)	1.665** (0.795)	-0.029 (0.047)	3.426* (1.798)
Age	-0.005 (0.004)	0.037 (0.099)	-0.005 (0.004)	0.038 (0.101)	-0.005 (0.007)	-0.160 (0.202)
Age square	0.000 (0.000)	-0.000 (0.001)	0.000 (0.000)	-0.000 (0.001)	0.000 (0.000)	0.001 (0.002)
Marital status (Ref: Never married)						
<i>Married (monogamous)</i>	0.101** (0.045)	2.072** (0.843)	0.094** (0.045)	2.382*** (0.877)	0.063 (0.066)	2.940 (2.387)
<i>Married (polygamous)</i>	0.154* (0.080)	1.951 (1.285)	0.139* (0.073)	2.553* (1.329)	-0.141 (0.203)	3.438 (3.506)
<i>Divorced</i>	0.009 (0.054)	2.695** (1.076)	-0.027 (0.054)	3.785*** (1.101)	-0.185* (0.095)	3.238 (2.308)
<i>Seperated</i>	0.082 (0.068)	4.963 (3.738)	0.053 (0.069)	5.145 (3.587)	0.113 (0.120)	4.616 (5.747)
<i>Widowed</i>	-0.018 (0.054)	4.455*** (1.103)	-0.028 (0.053)	4.517*** (1.137)	-0.035 (0.086)	3.474 (2.268)
Education (Ref: No education)						
<i>Primary school</i>	0.023 (0.022)	0.624 (0.522)	0.062*** (0.021)	0.222 (0.525)	-0.050 (0.049)	0.783 (1.874)
<i>Secondary school</i>	0.037 (0.032)	-0.018 (0.900)	0.075** (0.032)	-0.856 (0.878)	-0.065 (0.066)	1.309 (2.691)
<i>University</i>	0.082* (0.036)	-1.555*** (0.592)	0.119*** (0.036)	-1.651*** (0.611)	-0.024 (0.074)	0.670 (2.242)
Household-level characteristics						
Welfare (Assets index)	0.058*** (0.006)	-0.883*** (0.118)	0.055*** (0.007)	-1.006*** (0.149)	0.058*** (0.010)	-1.291*** (0.340)
Household Size	0.013*** (0.005)	0.245*** (0.104)	0.015*** (0.005)	0.186* (0.105)	0.021** (0.009)	0.637** (0.263)
Rural	-0.086*** (0.030)	-4.315*** (0.755)	-0.067** (0.029)	-3.642*** (0.756)	-0.035 (0.057)	-4.389** (1.744)
Constant	3.965*** (0.087)	3.635* (2.051)	4.027*** (0.091)	4.826** (2.380)	4.160*** (0.184)	8.167 (6.824)
Regional FE	NO	NO	YES	YES	YES	YES
Control for receipt of remittances	NO	NO	NO	NO	YES	YES
Observations	4873	4925	4873	4925	1002	1010
Adjusted-R2	0.152	0.045	0.234	0.070	0.271	0.075
Sargan Test	3.922	3.320	3.922	3.320	3.922	3.320
P-val of Sargan Test	0.141	0.190	0.141	0.190	0.141	0.190

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity, FE: Fixed effects

Table A.8: Full MSL estimates 1

Variables	(1)		(2)	
	FCS	CSI	FCS	CSI
Migrants location (Ref: Non-migrant)				
Internal migrant(s)	-0.003 (0.055)	-0.204** (0.086)		
International migrant(s)	0.024 (0.069)	0.002 (0.222)		
Migrants location (Ref: Non-migrant)				
Rural migrant(s)			0.030 (0.034)	-0.133 (0.108)
Urban migrant(s)			-0.083*** (0.029)	-0.282*** (0.107)
Household head characteristics				
Gender hear : Female	0.052* (0.027)	0.291** (0.124)	0.062** (0.028)	0.324** (0.127)
Age head	-0.003 (0.004)	-0.043*** (0.016)	-0.000 (0.004)	-0.042*** (0.016)
Age square head	0.000 (0.000)	0.000** (0.000)	0.000 (0.000)	0.000** (0.000)
Married (monogamous)	0.201*** (0.060)	0.521** (0.249)	0.196*** (0.066)	0.455* (0.259)
Married (polygamous)	0.316*** (0.074)	0.376 (0.334)	0.291*** (0.082)	0.275 (0.347)
Divorced	0.066 (0.063)	0.847*** (0.305)	0.045 (0.070)	0.763** (0.311)
Seperated	0.100 (0.084)	0.157 (0.410)	0.076 (0.092)	0.136 (0.430)
Widowed	0.071 (0.062)	0.577** (0.275)	0.047 (0.069)	0.452 (0.288)
Primary school	0.039* (0.021)	0.068 (0.102)	0.043* (0.022)	0.098 (0.104)
Secondary school	0.051 (0.032)	-0.241 (0.183)	0.067* (0.034)	-0.317* (0.186)
University	0.123*** (0.036)	-0.440* (0.233)	0.107*** (0.038)	-0.427* (0.234)
Household level characteristics				
Assets index	0.054*** (0.007)	-0.216*** (0.034)	0.057*** (0.007)	-0.208*** (0.034)
Household Size	0.012*** (0.005)	0.014 (0.023)	0.009* (0.005)	0.016 (0.024)
Rural	-0.087*** (0.027)	-0.892*** (0.121)	-0.091*** (0.025)	-0.940*** (0.122)
Constant	3.835*** (0.094)	2.710*** (0.428)	3.783*** (0.099)	2.753*** (0.434)

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity

Table A.9: First stage estimates using the MSL method

	Internal migration		International migration		Migration to rural		Migration to urban	
	<i>With FCS</i>	<i>With CSI</i>	<i>With FCS</i>	<i>With CSI</i>	<i>With FCS</i>	<i>With CSI</i>	<i>With FCS</i>	<i>With CSI</i>
Household head characteristics								
Gender: female	0.296 (0.171)	0.274 (0.169)	1.095* (0.500)	1.132* (0.490)	0.172 (0.219)	0.150 (0.217)	0.531* (0.218)	0.492* (0.217)
	0.084*** (0.024)	0.078*** (0.023)	0.147** (0.056)	0.148** (0.055)	0.041 (0.027)	0.034 (0.026)	0.132*** (0.034)	0.131*** (0.033)
Age	-0.001** (0.000)	-0.001** (0.000)	-0.001* (0.000)	-0.001* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.001** (0.000)	-0.001** (0.000)
Married (monogamous) & (0.310)	-0.078 (0.305)	-0.044 (0.652)	-0.434 (0.650)	-0.388 (0.434)	0.496 (0.425)	0.480 (0.404)	-0.389 (0.400)	-0.398 (0.435)
Married (polygamous)	0.470 (0.427)	0.520 (0.423)	-0.404 (1.054)	-0.373 (1.041)	1.321* (0.541)	1.308* (0.534)	-0.323 (0.540)	-0.331 (0.539)
Divorced	0.087 (0.360)	0.195 (0.354)	-1.422 (0.752)	-1.416 (0.749)	0.832 (0.508)	0.850 (0.495)	-0.498 (0.440)	-0.399 (0.435)
Seperated	0.561 (0.460)	0.588 (0.459)	1.016 (0.863)	1.008 (0.868)	1.326* (0.619)	1.302* (0.610)	0.354 (0.553)	0.354 (0.548)
Widowed	-0.408 (0.339)	-0.369 (0.336)	-1.207 (0.783)	-1.197 (0.781)	0.540 (0.484)	0.532 (0.474)	-1.251** (0.427)	-1.234** (0.425)
Primary school	-0.055 (0.128)	-0.069 (0.128)	0.523 (0.338)	0.526 (0.337)	-0.214 (0.151)	-0.223 (0.150)	0.269 (0.173)	0.253 (0.172)
Secondary school	0.502* (0.210)	0.487* (0.209)	0.283 (0.570)	0.272 (0.560)	0.017 (0.283)	0.017 (0.280)	1.015*** (0.273)	0.988*** (0.272)
University	-0.298 (0.247)	-0.317 (0.247)	-0.800 (0.623)	-0.813 (0.622)	0.065 (0.326)	0.038 (0.325)	-0.606 (0.319)	-0.610 (0.316)
Household-level characteristics								
Assets index	0.130*** (0.034)	0.133*** (0.034)	0.194** (0.067)	0.199** (0.069)	0.017 (0.049)	0.018 (0.049)	0.223*** (0.042)	0.224*** (0.042)
	-0.047 (0.051)	-0.058 (0.051)	0.026 (0.095)	0.022 (0.094)	0.075 (0.063)	0.069 (0.064)	-0.051 (0.063)	-0.051 (0.063)
Rural	1.257*** (0.154)	1.278*** (0.154)	1.277** (0.415)	1.300** (0.418)	1.746*** (0.210)	1.762*** (0.211)	0.837*** (0.196)	0.859*** (0.196)
Instruments								
Share of male	0.392 (0.247)	0.389 (0.242)	0.793 (0.790)	0.834 (0.781)	0.072 (0.297)	0.070 (0.297)	1.044** (0.320)	1.028** (0.318)
Share of individuals under 5 years old	-3.555*** (0.434)	-3.682*** (0.432)	-1.276 (0.905)	-1.248 (0.896)	-2.799*** (0.497)	-2.881*** (0.505)	-4.877*** (0.630)	-4.969*** (0.631)
Migration rate x Household size	0.127 (0.273)	0.198 (0.272)	-0.583 (0.576)	-0.585 (0.570)	-0.385 (0.337)	-0.346 (0.339)	0.064 (0.336)	0.066 (0.335)
Constant	-3.557*** (0.662)	-3.380*** (0.653)	-9.249*** (1.598)	-9.326*** (1.593)	-4.249*** (0.782)	-4.032*** (0.772)	-5.842*** (0.953)	-5.783*** (0.931)

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity, FE: Fixed effects

Table A.10: Full estimates with Heckman and Probit-2sls: Effect of migration of food consumption score (Niger)

	Dependent variable: FCS (log)	
	Heckman	Probit-2SLS
Migrant(s)	0.276 (0.260)	0.222 (0.171)
FCS 2011 (log)	0.070*** (0.022)	0.079** (0.035)
Household head characteristics in 2011		
Gender: Female	-0.086** (0.034)	-0.094** (0.048)
Age head	0.005 (0.005)	0.007 (0.007)
Age square head	-0.000 (0.000)	-0.000 (0.000)
Primary	0.001 (0.029)	-0.042 (0.047)
Secondary	0.043 (0.032)	0.024 (0.050)
University	0.131*** (0.042)	0.108 (0.069)
Household socio-economic characteristics in 2011		
Welfare index (log)	0.158*** (0.024)	0.116*** (0.035)
Rural	-0.123*** (0.034)	-0.067 (0.053)
Share of individuals under 5 years old	0.031 (0.139)	0.333 (0.214)
Share of individuals aged between 5 and 15 years	-0.030 (0.137)	0.104 (0.206)
Share of individuals aged between 16 and 65 years	0.023 (0.125)	0.078 (0.171)
Share of male	-0.040 (0.054)	-0.025 (0.080)
Household size	0.033*** (0.005)	0.005 (0.016)
Number of health services	0.005 (0.012)	0.024 (0.019)
Constant	1.642*** (0.314)	1.978*** (0.469)
Access to electricity	YES	YES
Presence of paved road	YES	YES
Presence of laterite road	YES	YES
Presence of road station	YES	YES
Presence of cereal bank	YES	YES
Regional FE	YES	YES
Adjusted-R2	0.178	0.096
Observations	3478	3478

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity, FE: Fixed effects

Table A.11: First-stage estimate: Probability that a household has a migrant (Niger)

	Coef.	Std. Err.
Instruments		
Migration rate x Share of male	-7.759***	1.059
Migration rate x household size	-0.949***	0.077
Household baseline characteristics		
FCS 2011 (log)	0.074	0.057
Head gender: Female	0.043	0.081
Age head	-0.010	0.012
Age square head	0.000	0.0001
Welfare index (log)	-0.219***	0.069
Education attainment of head (ref: No education)		
Primary	0.093	0.079
Secondary	0.065	0.093
University	0.143	0.155
Rural	-0.011	0.099
Share of children (age <5 years)	-0.429	0.399
Share of individuals aged between 5 and 14 years	0.222	0.395
Share of individuals aged between 15 and 65 years	0.527	0.368
Share of male	1.125***	0.177
Household size	0.205***	0.012
Access to electricity	-0.127	0.079
Access to paved road	-0.138**	0.068
Access to laterite road	0.032	0.058
Access to road station	0.142**	0.069
Cereal bank	0.017	0.057
Number of health service	-0.008	0.032
Constant	2.163**	0.9378
Regional fixed effects	YES	YES
Pseudo R2	0.164	-

Notes: ***, ** and * denote significance at the 1, 5 and 10 percent level respectively; standard errors in parentheses are robust to heteroskedasticity

B

Annexe B

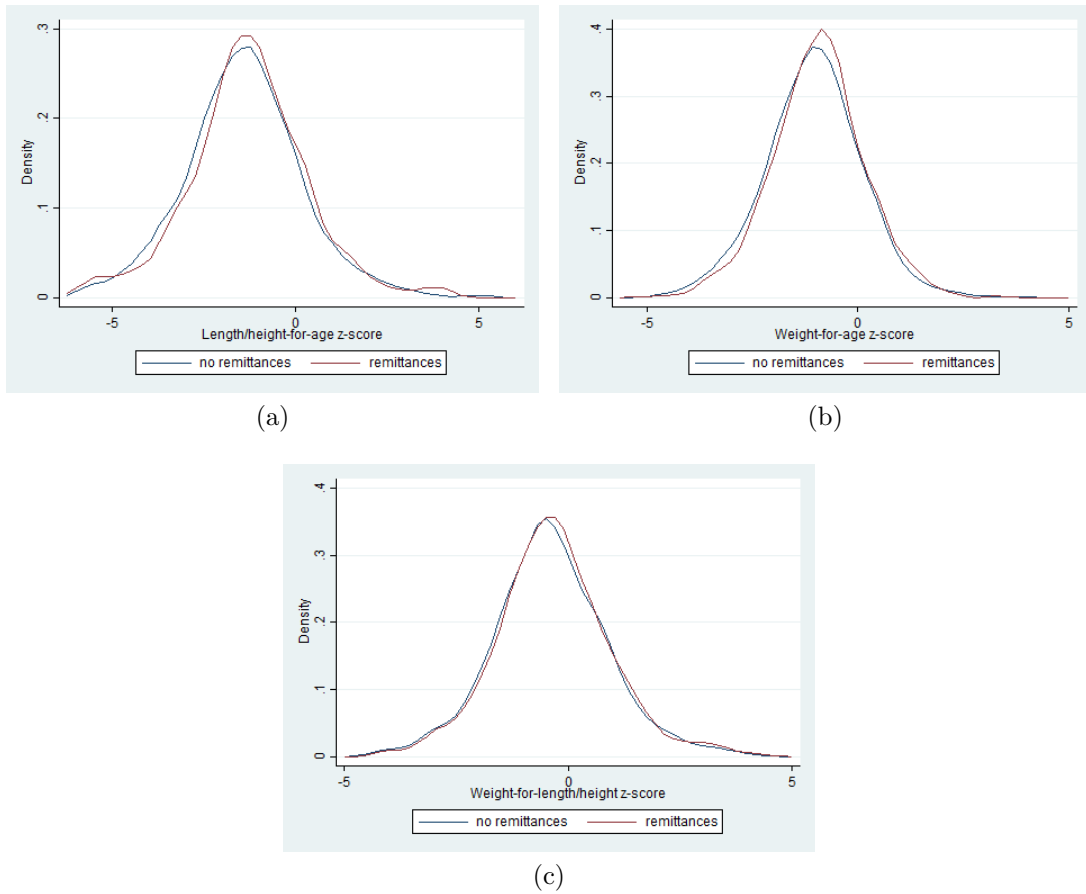


Figure B.1: Anthropometric measures for children in Burkina Faso by remittances receipt.

Table B.1: OLS Estimation: Determinants of Weight-for-height (WHZ) z-score

Variables	Dependent Variable is: WHZ		
	(1)	(2)	(3)
Maternal education			
No education	-0.452***	-0.457***	0.152**
Primary	-0.332***	-0.335***	0.166**
Child : Female	0.0988***	0.101***	0.0930***
Family structure			
Monogamous		-0.00659	-0.117
Polygamous		0.00723	-0.0575
Free union		0.133	
Single/Divorced/Widow			-0.140
Household head : Female			-0.0246
Age of household head			0.00182
Household size			-0.00361
Head of household education			
No education			-0.277***
Primary			-0.278***
Residence: rural			-0.182***
Access to drinking water			
0-14 mns			0.134
15-29 mns			0.268
30-44 mns			0.295
45-59 mns			0.380
60mns and more			0.236
Access to health centre			
0-14 mns			0.181
15-29 mns			0.245
30-44 mns			-0.0283
60mns and more			0.0948
Access to vaccination centre			
15-29 mns			0.0563
30-44 mns			-0.0892*
45-59 mns			0.202***
60mns and more			0.0617
Remittances receipt	0.0634*	0.0701**	0.0638*
Food expenditures			-0.0215
Control variables			
Region	No	No	Yes
Access to pharmacy	No	No	Yes
Observations	7,915	7,896	7,868
R-squared	0.078	0.078	0.123

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B.2: OLS Estimation: Determinants of Height-for-age z-scores (HAZ) z-score

Variables	Dependent Variable is: HAZ		
	(1)	(2)	(3)
Maternal education			
No education	-1.564***	-1.535***	-0.296***
Primary	-1.432***	-1.415***	-0.274***
Child : Female	0.264***	0.260***	0.264***
Family structure			
Monogamous		0.00518	0.174
Polygamous		-0.0644	0.0930
Free union		-0.103	
Single/Divorced/Widow			0.175
Household head : Female			-0.0674
Age of household head			0.00314**
Household size			-0.00708*
Head of household education			
No education			-0.0571
Primary			0.0221
Residence: rural			-0.165***
Access to health centre			
0-14 mns			-0.243
15-29 mns			-0.246
30-44 mns			-0.349*
60mns and more			-0.113
Access to vaccination centre			
15-29 mns			0.0174
30-44 mns			0.143**
45-59 mns			-0.111
60mns and more			0.00301
Remittances receipt	0.0943**	0.0922**	0.0909**
Food expenditures			0.163***
Control variables			
Region	No	No	Yes
Access to pharmacy	No	No	Yes
Access to drinking water	No	No	Yes
Observations	7,915	7,896	7,868
R-squared	0.420	0.420	0.431

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B.3: OLS Estimation: Determinants of Weight-for-age (WAZ) z-score

Variables	Dependent Variable is: WAZ		
	(1)	(2)	(3)
Maternal education			
No education	-1.171***	-1.158***	-0.0651
Primary	-0.997***	-0.989***	-0.0292
Child : Female	0.185***	0.184***	0.180***
Family structure			
Monogamous		-0.00280	0.00107
Polygamous		-0.0307	-0.000105
Free union		0.0505	
Single/Divorced/Widow			-0.0132
Household head : Female			-0.0494
Age of household head			0.00287***
Household size			-0.00682***
Head of household education			
No education			-0.230***
Primary			-0.189***
Residence: rural			-0.219***
Access to health centre			
0-14 mns			-0.0427
15-29 mns			0.00511
30-44 mns			-0.246*
60mns and more			-0.0211
Access to vaccination centre			
15-29 mns			0.0648
30-44 mns			0.0291
45-59 mns			0.0898
60mns and more			0.0504
Remittances receipt	0.0956***	0.0996***	0.0953***
Food expenditures			0.0813***
Control variables			
Region	No	No	Yes
Access to pharmacy	No	No	Yes
Access to drinking water	No	No	Yes
Observations	7,915	7,896	7,868
R-squared	0.440	0.440	0.461

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B.4: Mean and Median Standardized Differences across All Covariates in Original and Matched Samples

	Mean Standardized Difference in Covariates (%)	Median Standardized Difference in Covariates (%)
Sample type		
Original sample	9.3	11.0
one-to-one neighbor matching	2.0	1.5
Caliper matching with replacement	1.3	1.0
Kernel matching	3.4	2.9

Table B.5: Covariate Balance across Treatment and Comparison Groups before and after a one-to-one Matching

	Original sample				One-to-one matching sample			
	Mean treatment	Mean control	Standardized difference (%)	Variance ratio (V(T)/V(C))	Mean treatment	Mean control	Standardized difference (%)	Variance ratio (V(T)/V(C))
Welfare*Child gender	6.1043	5.8713	3.8	1.00	6.0941	5.6922	6.6	0.93
household head gender	0.09565	0.04023	22.2	1.32*	0.09628	0.09733	-0.4	1.00
household head education	1.2624	1.2181	7.9	1.19	1.2627	1.2543	1.5	1.06
residence	0.26087	0.23805	5.3	1.04	0.26269	0.24961	3.0	1.07
access to drinking water	1.2655	1.3647	-12.6	0.72*	1.2684	1.2841	-2.0	0.86
access to pharmacy	2.9355	3.1149	-11.5	0.99	2.9566	2.9566	0.0	0.97
access to health centre	2.9581	3.145	-12.1	1.00	2.978	2.9728	0.3	0.96
access to vaccination centre	3.2538	3.4228	-11.0	1.10	3.2716	3.2595	0.8	0.99
mother education	1.2608	1.1939	11.8	1.30*	1.2611	1.2402	3.7	1.10
Mother age square	906.78	893.01	2.7	1.12	909.35	914.18	-1.0	0.98
family structure	1.5447	1.557	-1.7	1.13	1.5385	1.5201	2.5	1.04

Notes : * if 'of concern', i.e. variance ratio in [0.5, 0.8) or (1.25, 2]; ** if 'bad', i.e. variance ratio <0.5 or >2

Table B.6: Covariate Balance across Treatment and Comparison Groups before and after a Caliper Matching

	Original sample				Caliper matching			
	Mean treatment	Mean control	Standardized difference (%)	Variance ratio	Mean treatment	Mean control	Standardized difference (%)	Variance ratio (V(T)/V(C))
Welfare*Child gender	6.1043	5.8713	3.8	1.00	6.0941	5.9148	3.0	1.03
household head gender	0.09565	0.04023	22.2	1.32*	.09628	0.09545	0.3	1.00
household head education	1.2624	1.2181	7.9	1.19	1.2627	1.2537	1.6	1.04
residence	0.26087	0.23805	5.3	1.04	.26269	0.25102	2.7	0.98
access to drinking water	1.2655	1.3647	-12.6	0.72*	1.2684	1.2736	-0.7	0.92
access to pharmacy	2.9355	3.1149	-11.5	0.99	2.9566	2.9643	-0.5	0.94
access to health centre	2.9581	3.145	-12.1	1.00	2.978	2.9825	-0.3	0.94
access to vaccination centre	3.2538	3.4228	-11.0	1.10	3.2716	3.2463	1.7	1.02
mother education	1.2608	1.1939	11.8	1.30*	1.2611	1.2509	1.8	1.04
Mother age square	906.78	893.01	2.7	1.12	909.35	906.81	0.5	1.03
family structure	1.5447	1.557	-1.7	1.13	1.5385	1.531	1.0	1.07

Notes : * if 'of concern', i.e. variance ratio in [0.5, 0.8) or (1.25, 2]; ** if 'bad', i.e. variance ratio <0.5 or >2

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Titre : Trois essais sur la migration et la sécurité alimentaire dans les pays d’Afrique Sub-saharienne.

Résumé : Malgré les progrès réalisés au niveau mondial, l’insécurité alimentaire continue d’être un problème majeur dans plusieurs pays en développement, en particulier les pays d’Afrique Sub-Saharienne. Si plusieurs facteurs peuvent expliquer cette persistance, il reste que la cause principale est l’absence de conditions favorables à l’échange de la force de travail des individus dans ces économies. Dans ce contexte, la migration se présenterait comme une solution au problème d’insécurité alimentaire dans la mesure où les individus, en commun accord avec leurs familles, peuvent exporter leur force de travail vers une destination disposant de meilleures conditions d’échange (Opportunités d’embauches, différence positive des salaires,...). L’objectif de cette thèse est donc d’étudier empiriquement l’impact de la migration sur la sécurité alimentaire des familles du migrant restées dans les localités d’origine en Afrique Sub-Saharienne. Une première analyse macroéconomique, portant sur l’impact des transferts internationaux des migrants, révèle que ceux-ci contribuent à une baisse de la proportion de personnes sous-alimentées dans les pays récipiendaires. Dans une logique d’approfondissement, une deuxième analyse, portant aussi bien sur la migration internationale que sur la migration interne, a été réalisée à partir de données d’enquêtes dans deux pays d’Afrique Sub-Saharienne : l’Ethiopie et le Niger. Celle-ci montre que la migration d’un membre, lorsqu’elle produit des envois de fonds et de biens à la famille, entraîne une amélioration de l’accès aux denrées alimentaires et une meilleure diversification alimentaire. Aussi, le migrant constitue pour sa famille une assurance contre les chocs alimentaires. Enfin, une troisième étude sur le Burkina-Faso montre que la migration favorise une amélioration de la nutrition des enfants de moins cinq ans appartenant à des familles qui comptent un migrant.

Mots clés: Migration; transferts de fonds des migrants; sécurité alimentaire; Afrique Sub-saharienne

Title: Three essays on migration and food security in Sub-Saharan Africa

Abstract: Despite global progress, food insecurity continues to be a major problem in many developing countries, especially in Sub-Saharan Africa. While several factors may explain this persistence, the main cause is the failure of markets characterized by unfavorable conditions for the exchange of individuals' labor endowment. In this context, migration appears to be a solution to food insecurity insofar as individuals, in common agreement with their families, can export their labor force to a destination with better exchange conditions (employment opportunities, positive wage differences, etc.). The objective of this thesis is therefore to empirically study the impact of migration on the food security of migrant families left behind in Sub-Saharan Africa. A first macroeconomic analysis, focusing on the impact of international remittances, reveals that those remittances contribute to a decrease in the proportion of undernourished in Sub-Saharan Africa. As a further step, a second analysis, covering both international and internal migration, was carried out using survey data from two countries in sub-Saharan Africa: Ethiopia and Niger. This analysis shows that migration leads to an improvement of households' food access and food diversification only when it produces remittances to migrant-sending households. In addition, migrants provide his or her family with insurance against food shocks. Finally, a third study on Burkina Faso indicates that migration leads to improvement of the nutritional status of children less than five years in migrant households.

Key words: Migration; Remittances; Food security; Sub-Saharan Africa