Fintech, Credit Constraints and Educational Intergenerational Mobility: Evidence from Cameroon*

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Abstract

Economic theory suggests that credit constraints hinder educational intergenerational mobility (IM). However, empirical evidence on this hypothesis is mixed, with limited insights on the role of fintech. In this paper, we use data from Cameroon to explore this issue in the under-researched context of sub-Saharan Africa. We find four main results: (1) Eliminating credit constraints in Cameroon would increase upward mobility by 9% and reduce downward mobility by 2%. (2) Children who potentially benefited from fintech during their schooling are 65% more likely to experience upward mobility and 7% less at risk of downward mobility. (3) The fintech effect is indirect and partly mediated through the reduction (15% to 40%) of credit constraints that hinder IM. (4) The magnitude of fintech's indirect effect on IM through credit constraints varies by gender, depending on the context in which the child grows up. Our results are robust across different econometric techniques and not sensitive to control variables, suggesting fintech is a private solution to enhance IM through market mechanisms.

Keywords: Mobile money, financial constraints, unequal opportunities, intersectional gender.

JEL classification: G21, I24, J62, O33, O55

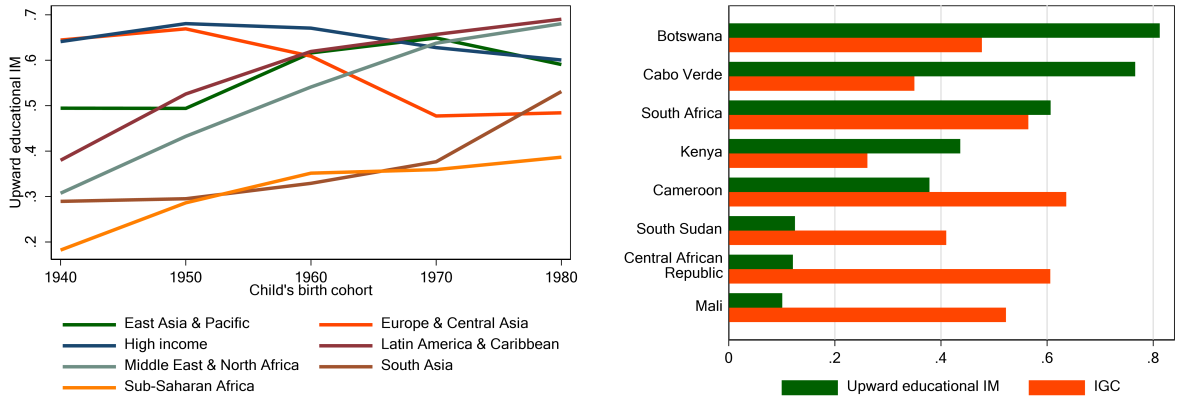
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1 Introduction

Intergenerational mobility (IM) ensures that people have the opportunity to climb the socioeconomic ladder regardless of their parents' status. In sub-Saharan Africa (SSA), educational IM is low and has only modestly increased since 1940 (Figure 1a)[1]. This implies that children of illiterate parents, often poorer, tend to achieve lower educational outcomes compared to those whose parents are educated. Thus, in SSA, even before birth, there are already inequalities of opportunity between children from different backgrounds[2]. This situation can be explained by credit constraints[3] faced by households in financing their children's education (Becker and Tomes, 1986; Lee and Seshadri, 2019). However, the rapid spread of fintech[4] in recent decades has promoted financial inclusion (Avom et al., 2023; Vuković et al., 2024), offering the potential to alleviate these constraints that may hinder IM in SSA. Hence, our interest in this paper lies in examining the interrelationship between these concepts in Cameroon, a SSA country.



(a) Evolution by region (1940–1980)

(b) Cameroon in SSA

Figure 1: Educational IM worldwide. Source: Global Database on IM (GDIM, 2018). Note: Absolute upward mobility measures the conditional probability that a child exceeds his parents' educational level. IGC is the correlation coefficient between the years of schooling of the child and those of his parents (averaged between the father and mother).

In addition to the availability of data, Cameroon's characteristics make it an interest-

[1]By studying the intergenerational correlation coefficient (IGC) between 1950 and 1990, Dendir (2023) even finds that educational IM in SSA has worsened over time.

[2]This situation implies that families become trapped in poverty, and inequalities are reproduced across generations (Narayan et al., 2018), making economic growth less inclusive (Ebeke, 2023).

[3]In this article, credit constraints (or financial constraints) refer to parents' inability to borrow when needed to optimally invest in their children's human capital (Becker and Tomes, 1986; Lee and Seshadri, 2019).

[4]Fintech (financial technology) encompasses innovations, such as mobile money, that use technology to deliver financial services more efficiently (Thakor, 2020).

ing case study. Indeed, like other countries in SSA, Cameroon enjoys moderate upward mobility, coupled with a strong intergenerational correlation in educational outcomes (Figure 1b). At the same time, the country lacks financial inclusion, with only 24% of adults having bank accounts and less than 12% accessing formal credit (World Bank, 2022). These figures highlight the extent to which credit constraints can be prevalent in Cameroon. However, when considering fintech, account ownership in the country rises to 52%, and access to credit increases to 59% (World Bank, 2022). This raises the question: Can fintech alleviate households' credit constraints to enhance educational IM?

This paper aims to address this question. Indeed, since the seminal model by Becker and Tomes (1979, 1986), the impact of credit constraints on IM has been a topic of debate among economists. Some argue that credit constraints hinder IM (Caucutt and Lochner, 2020; Lafortune and Lee, 2014), while others find no significant effect (Grawe, 2004; Mazumder, 2005). However, existing studies focus on developed countries, leaving SSA under-researched in this area (Iversen et al., 2021). Moreover, the role of fintech in educational IM has been largely unexplored. Therefore, examining this topic in Cameroon significantly enriches the literature.

We hypothesize that fintech indirectly increases educational IM through financial inclusion in general, and more specifically by reducing credit constraints. To test this hypothesis, we examine a sample of 10,274 children drawn from Cameroonian household surveys. Adopting the absolute approach to IM, we estimate both upward and downward educational IM in Cameroon. We then conduct a mediation analysis to determine the indirect effect of fintech on educational IM, with a focus on the portion of this effect that operates through credit constraints. Next, we address endogeneity issues using the instrumental variables techniques and counterfactual experiment, to establish the causal chain of mediation between fintech, credit constraints, and educational IM. We then perform a heterogeneity analysis by gender and intersectionality. Finally, sensitivity check controls for the influence of child and household characteristics, as well as institutional, historical, and geographic factors.

This article makes three key original contributions. First, existing studies have thus far separately analyzed the relationship between fintech and financial inclusion on one hand, and the relationship between credit constraints and IM on the other. This study is one of the first to bridge these two strands of literature, linking fintech to IM through the financial

inclusion channel, especially access to credit. Second, unlike previous research, which has focused on the effect of fintech on intragenerational economic outcomes (poverty, income, inequality, etc.), we explore here the role of fintech in the intergenerational transmission of economic outcomes, specifically education between parents and their children. Finally, in contrast to the vast majority of previous studies, we are following the new trend by carrying out an empirical investigation of the Becker-Tomes hypothesis that uses a direct approach to detect credit constraints faced by households in financing their children's education, and counterfactual experiment to assess their causal effect on IM.

Following this introduction, section 2 situates our contribution within the literature and lays out the conceptual framework. section 3 and section 4 then present the data and empirical strategy, respectively. section 5 analyzes and discusses the results obtained. Lastly, the conclusion summarizes the paper, offers recommendations, and outlines potential avenues for future research.

2 Literature and conceptual framework

2.1 Related literature

This article brings together two previously distinct strands of literature. The first examines IM and its determinants (see Black and Devereux, 2011; Piraino, 2021, for a review). The central question is what factors explain the differences in IM within and between countries. Economists agree that IM depends either on factors related to family status, which can be explained, or on market forces, which are unpredictable due to their random nature (Emran et al., 2019). Regarding family status, it would be irrelevant if the financial market were perfect, as any parent could borrow to optimally invest in their children's human capital. Unfortunately, poor households have limited resources and cannot incur debt due to financial market frictions. According to Becker and Tomes (1986), these credit constraints faced by households are the main cause of IM issues[5]. Although initially criticized (e.g. Goldberger, 1989; Han and Mulligan, 2001; Mulligan, 1999), this hypothesis has proven consistent in explaining IM (Lee and Seshadri, 2019), particularly

[5] Another factor is the number of children in the family, which reduces the amount of resources available for each child.

in the context of poor regions like SSA[6].

Indeed, educational IM is relatively low in SSA compared to other regions of the world (Hertz et al., 2007; Narayan et al., 2018). Furthermore, comparative studies on the continent reveal disparities between and within countries (Alesina et al., 2021; Azomahou and Yitbarek, 2020; Dendir, 2023; Razzu and Wambile, 2022). However, with the exception of South Africa (Nimubona and Vencatachellum, 2007; Piraino, 2015), country-specific studies remain rare in SSA[7]. For instance, in the case of Cameroon, it is difficult to find an estimation of IM using traditionally recognized approaches in economics. Nevertheless, Mbenga Bindop (2019) shows, based on surveys on employment and the informal sector, that parental status tends to overshadow children's education when entering the labor market. Using the same data, Fontep and Sen (2020) find a gender bias against daughters in educational and occupational IM in Cameroon. We contribute here by adopting the absolute approach to IM to analyze both upward and downward educational IM in Cameroon, at both national and regional levels, while integrating gender and intersectionality.

Regarding the determinants of IM in SSA, little is known apart from cultural and geographic factors related to the colonial past (Alesina et al., 2021; Funjika and Getachew, 2022). Curiously, while the literature documents significant credit constraints[8], the Becker-Tomes hypothesis has hardly been tested in SSA[9]. Studies conducted elsewhere, in developed countries, do not agree. A first wave finds that credit constraints have no significant influence on IM (Carneiro and Heckman, 2002; Grawe, 2004; Keane and Wolpin, 2001; Mazumder, 2005; Restuccia and Urrutia, 2004). These authors conclude that the observed disparities in IM are better explained by differences in innate abilities among children from different backgrounds. In contrast, more recent studies suggest that credit constraints significantly hinder IM (Caucutt and Lochner, 2020; Caucutt et al., 2017; Gaviria, 2002; Lafortune and Lee, 2014; Niimi, 2018). They recommend measures such

[6]Indeed, the Becker and Tomes (1986) model is based on the assumption that parents cannot use their children's future income as collateral to borrow. This assumption is not realistic in the context of Northern countries, where financial markets are highly developed. Instead, it reflects the reality of less developed countries like Cameroon, where the student loan market is still in its early stages.

[7]See also Asiedu et al. (2021); Haile (2018); Lambert et al. (2014) for studies in Nigeria, Ethiopia, and Senegal, respectively.

[8]These constraints harm household well-being and hinder children's enrollment in school (Branson et al., 2014; Gurgand et al., 2023; Kedir and Ibrahim, 2011).

[9]This gap is attributed to a lack of data, or rather to the underutilization of existing data. Indeed, almost all countries in SSA have household surveys (see GDIM, 2018), the co-residence data of which allow for such studies, even though they are more cumbersome to process.

as targeted social transfers and redistributive policies.

However, this field of research faces two major challenges. On one hand, credit constraints are difficult to detect. On the other hand, establishing the causal effect on IM is not straightforward. Researchers navigate these obstacles by adopting indirect methods. For example, the non-linearity between the economic outcomes of children and those of their parents serves as a test to detect credit constraints (Black and Devereux, 2011; Piraino, 2021). Grawe (2004) challenges these methods and advocates for direct approaches, such as the one adopted by Niimi (2018)[10]. We contribute in this regard by proposing one of the first empirical investigations of the Becker-Tomes hypothesis, which constructs an indicator linking directly parental credit constraints to children's school dropout based on survey data[11]. Additionally, we analyze the causal impact of these constraints on educational IM through a counterfactual experiment.

The second branch of the literature focuses on the economic effects of fintech in developing countries. Indeed, fintech has profoundly transformed the financial landscape in SSA, where mobile money is now unavoidable (Demirgüç-Kunt et al., 2022, 2018). By providing low-cost financial services that are easy to use and better suited to their needs, fintech facilitates the financial inclusion of households that were previously excluded from the formal financial system[12] (Avom et al., 2023; Ndung'u, 2022; Vuković et al., 2024). Through this channel, this innovation has numerous well-documented economic effects. For example, fintech, particularly mobile money, sustainably reduces poverty and gender inequality in Kenya (Suri, 2017; Suri and Jack, 2016). Several studies also show the positive effects of fintech on health and life expectancy (Ahmed and Cowan, 2021; Asongu et al., 2023), per capita income (Kanga et al., 2022), income inequality (Demir et al., 2022), empowerment of women and youth (Kedir and Kouame, 2022), as well as education and household well-being (Fourmy, 2020; Juma, 2020; Sakyi-Nyarko et al., 2022).

Currently, the existing literature provides limited insights into the role of fintech in IM in general[13] and specifically in educational IM. Nonetheless, by impacting household living standards and intragenerational inequalities, fintech has the potential to influence the

[10]Using survey data from Japan, she directly identifies children who have dropped out of school for financial reasons and hypothesizes that their parents faced credit constraints.

[11]See also Braxton et al. (2024).

[12]A nascent literature, however, warns of the risks of exclusion associated with the fintech ecosystem (Jones and Maynard, 2023; Mogaji and Nguyen, 2022).

[13]However, we found a paper (Yang et al., shed), not peer-reviewed and accessible online as of August 30, 2024, that relates digital financial inclusion to income IM in China, with entrepreneurship among younger generations as the main transmission channel.

intergenerational transmission of economic outcomes. Therefore, our primary contribution lies in bridging these two strands of literature by empirically investigating the effect of fintech on educational IM through the mediation of credit constraints in Cameroon. This contribution is particularly significant as it offers novel perspectives for policies aimed at achieving equal opportunities in the Global South. Indeed, the interrelationship among these three concepts implies that, in addition to traditional state interventions, market-driven private solutions may also be viable options for mitigating unequal opportunities.

2.2 Conceptual framework: The fintech → IM causal chain

In this work, IM refers to the absolute educational position of a child in relation to that of their parents (Alesina et al., 2021). A child experiences upward mobility if they achieve better academic results than their parents. Conversely, if they attain the same results, it is referred to as reproduction, while downward mobility occurs if their performance is inferior to that of their parents. Based on the literature, we propose the conceptual framework illustrated in Figure 2, which depicts the transmission of the fintech effect on IM through the mediating role of credit constraints.

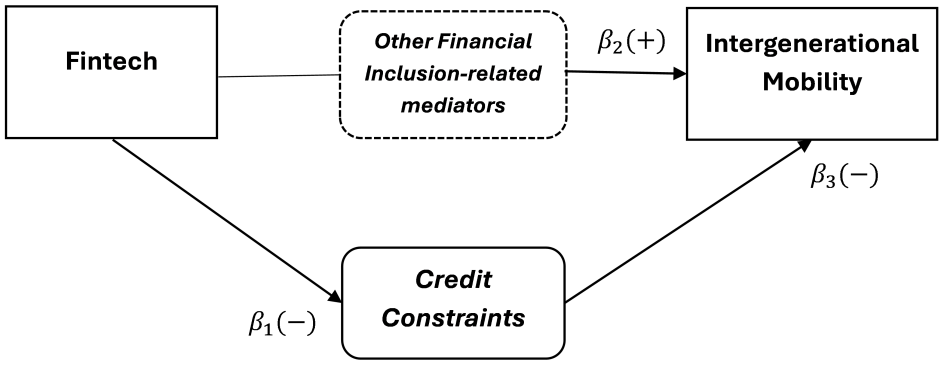


Figure 2: Indirect relationship between fintech and IM. Source: Author's proposal. Note: $\beta_1 * \beta_3$ = Indirect effect through credit constraints; β_2 = Indirect effect through other financial inclusion-related mediators.

In accordance with the Becker and Tomes (1979, 1986) model, parents are altruistic and allocate their limited resources among various household needs, specifically between consumption expenditures and investments in their children's human capital. When household resources are insufficient, parents must resort to borrowing if they wish to optimally invest in their children's education. However, poor households often face significant barriers to accessing formal credit due to a lack of collateral or proof of stable income

(Fafchamps, 2014). As for informal borrowing mechanisms, although they require less collateral, they are frequently more expensive and entail significant credit rationing (Ghosh et al., 2000). Consequently, households find themselves financially constrained and unable to meet their educational expenses, which can hinder children's enrollment and, in turn, impede IM. This leads to a negative sign in the relationship, denoted as β_3.

Fintech facilitates intermediation and enhances financial inclusion (Thakor, 2020), which is a channel through which this innovation is likely to influence IM. Indeed, fintech increases households' ability to effectively manage their finances through savings and to mobilize additional resources via money transfers from relatives or the state. For instance, it has been shown that in SSA, particularly in Kenya, fintech boosts household income, with a substantial portion of this income increase being allocated to education (Fourmy, 2020; Juma, 2020; Kanga et al., 2022). Through this channel, parents, regardless of their status, can better invest in their children's education, thereby increasing their chances of upward mobility (which implies a reduction in downward mobility). This is reflected in the positive sign of the relationship β_2, which indicates the portion of the indirect effect of fintech on IM that does not operates through credit constraints, but rather through other mediators related to financial inclusion, such as savings and money transfers.

Specifically, fintech can reduce households' credit constraints. This is reflected in the negative sign of the relationship β_1, which, when combined with β_3, measures the portion of the fintech's indirect effect on IM that operates through credit constraints. Indeed, even without collateral, households that utilize fintech are more likely to receive credit than others, as formal financial institutions can leverage their transactional history to predict their repayment capacity (Berg et al., 2022; Björkegren and Grissen, 2020). For instance, through artificial intelligence, fintech reduces credit rationing by 33% to 60% in Latin America, even when algorithms discriminate against disadvantaged groups (Tantri, 2021). Similarly, fintech facilitates and lowers the cost of informal borrowing (Ahmed and Cowan, 2021). This is exemplified in Cameroon, where mobile money helps in mobilizing resources from friends and family members (Atangana Ondoa et al., 2023). In summary, fintech exerts an indirect effect on IM through financial inclusion in general, and particularly through the reduction of credit constraints faced by families in financing their children's human capital.

3 Data

3.1 Source

The data used in this paper come from the Cameroonian household survey (ECAM). ECAM is a nationally representative multi-purpose survey conducted by the National Institute of Statistics of Cameroon (INS), with technical and financial assistance from the World Bank. ECAM uses stratified sampling, with households and the individuals within them serving as the units of observation. These co-residence data enable the reconstruction of parent-child pairs necessary for analyzing IM. The ECAM waves were conducted in 1996, 2001, 2007, and 2014[14], covering 1,731, 10,992, 11,534, and 12,847 households, respectively, representing nearly 170,000 individuals. Due to methodological differences between ECAM1 and the subsequent waves, as well as the absence of variables of interest in ECAM2, only ECAM3 and ECAM4 are used here.

3.2 Sample selection

Given the nature of ECAM, we carefully select the study sample to avoid co-residence bias. This bias arises because the intergenerational transmission of educational outcomes can differ between children still dependent on their parents and others who are generally not surveyed (Emran et al., 2018). Therefore, we focus on children aged 14 to 20, who mostly still live under parental supervision in Cameroon. Indeed, even though they may work or marry from the age of 15, Cameroonians only reach legal adulthood at 21, the age at which they can break free from parental control. Additionally, primary school is typically completed between the ages of six and 11, so even those who repeated grades should have completed primary school by age 14. The selected sample consists of 8,871 children.

However, previous studies indicate that in developing countries, co-residence bias is negligible for children up to age 25 (Alesina et al., 2021; Narayan et al., 2018), as most remain dependent on their parents, especially for education. Following these studies, we extend our analysis to children up to age 25, increasing the sample size to 11,555 observations. From this group, we exclude children still attending primary school (1,281), as it is impossible to determine whether they will experience upward mobility in the

[14]ECAM5 (2021) is not yet accessible, as it is still being processed by the INS.

future. Ultimately, the study focuses on 10,274 children born between the 1980s and 2000s.

3.3 Variables

Table 1 summarizes the key variables in the study, while Appendix A provides details on their construction and additional descriptive statistics. The educational IM indicators (IM_up and IM_down) are constructed using the absolute approach proposed by Alesina et al. (2021). Credit constraints (CC) are identified directly, following Grawe (2004) recommendations, inspired by Niimi (2018). In line with the literature (Kedir and Kouame, 2022; Senyo et al., 2023, 2022), we measure fintech through mobile money, which is the most widespread fintech innovation in SSA, particularly in Cameroon.

Overall, 61% of children born to illiterate parents managed to complete primary school, while only 5% of their counterparts born to literate parents failed to do so. During their primary education, 6% of the children in the study sample faced credit constraints, and 17% potentially benefited from fintech. Although gender disparities in IM appear insignificant, differences do exist in the prevalence of credit constraints and potential exposure to fintech. Indeed, daughters seem more likely than sons to have faced credit constraints and to have benefited from fintech.

Table 1: Key variables of the study

			Percent			
Variable	Definition	Obs	Child	Son	Daughter	S - D
IM_up	Takes 1 if the child born to illiterate parents has completed at least primary school and 0 otherwise	3,889	60.86	61.51	60.08	0.014
IM_down	Takes 1 if the child born to literate parents has not completed primary school and 0 otherwise	6,385	5.04	5.09	5	0.001
CC	Takes 1 if the child was credit constrained at primary school and 0 otherwise	10,274	5.95	5.42	6.52	-0.011*
Fintech	Takes 1 if the child potentially benefited from fintech during primary school and 0 otherwise	10,274	16.54	15.74	17.4	-0.017*

Source: Based on ECAM data. Note: *Significance of at least 5% in the equality of proportions test.

In addition to key variables of the study, we have several indicators to control for the child and household characteristics, as well as institutional, historical, and geographic factors (see Table A.1 in appendices). According to the literature (Alesina et al., 2021; Becker and Tomes, 1979, 1986; Funjika and Getachew, 2022; Huang, 2013; Kedir and Ibrahim, 2011; Niimi, 2018; Nimubona and Vencatachellum, 2007; Razzu and Wambile, 2022), it is crucial to consider these factors when analyzing credit constraints and IM.

Indeed, child characteristics such as age, gender, and birth order determine cognitive abilities, school performance, and the ability to benefit from family resources for education. Similarly, household characteristics, such as size, number of children, presence of both parents, and ownership of savings, land, and/or a home, determine its resources and, therefore, its ability to influence the future, particularly the education, of the children. Finally, institutional, historical, and geographic factors are also important. Educational policies, such as the free primary education introduced in Cameroon, are essential in reducing educational access inequalities by easing parents' financial burdens. Moreover, the colonial legacy shaped educational systems in SSA, particularly in Cameroon, where the Anglophone subsystem, inherited from British rule, coexists with the Francophone subsystem from the French occupation. Additionally, urban or rural residence matters due to disparities in educational provision and financial access.

4 Empirical strategy

This article aims to examine the interrelationship between fintech, credit constraints, and educational IM in Cameroon. Our conceptual framework posits a mediating effect of credit constraints in the relationship between fintech and IM, leading us to choose mediation analysis as the primary empirical strategy. Additionally, we also adopt quasi-experimental impact evaluation methods for robustness to establish causation in the mediation chain. However, before detailing these methods, we first present the approach adopted to measure educational IM.

4.1 Measurement of educational IM

To measure educational IM, we adopt the approach proposed by Alesina et al. (2021). This involves estimating, for child i born during decade d, surveyed during wave w of

ECAM, in region r, the linear probability model specified as follows:

$$IM_up/down_{idwr} = \alpha_r^c + [\gamma_d^p + \delta_d^c + \theta_w] + \varepsilon_{iwr} \quad (1)$$

Where the regional fixed effect α_r^c indicates the conditional probability for a child of illiterate parents (or literate parents) to complete (or not complete) primary school, correcting for the fixed effects associated with the parents' 20 years birth cohort (γ_d^p), the children's birth decade (δ_d^c), and the wave of ECAM (θ_w), with ε_{iwr} being the residual. Equation 1 can be estimated using ordinary least squares or logistic regression, with White correction for heteroskedasticity.

4.2 The mediation analysis

Mediation analysis has emerged in social sciences, particularly in social psychology, where understanding the relationship between two phenomena often requires considering the influence of a third phenomenon (Agler and De Boeck, 2017; MacKinnon et al., 2007). Thus, mediation analysis highlights the mediating effect of a third variable M in the causal chain between two other variables X and Y (Baron and Kenny, 1986). In our case, we want to verify whether fintech affects IM (fintech → IM) and whether credit constraints (CC) intervene in this relationship as a transmission channel, carrying part of the fintech's effect (fintech → CC), which they then transmit to IM (CC → IM). This leads to the fintech → CC → IM mediation chain.

Analytically, this mediation chain requires writing three equations. Omitting control variables for simplicity, the first equation can be expressed as follows:

$$IM_up/down_{idwr} = \alpha_r^c + [\gamma_d^p + \delta_d^c + \theta_w] + \beta fintech_{iwr} + \varepsilon_{iwr} \quad (2)$$

Where β measures the difference in the conditional probability of experiencing upward or downward mobility between children who potentially benefited from fintech during their primary school and those who did not, all else being equal. This represents the total indirect effect (TIE) of fintech on educational IM through all mediators combined.

The second equation captures the relationship between fintech and credit constraints:

$$CC_{idwr} = \alpha_r^c + [\gamma_d^p + \delta_d^c + \theta_w] + \beta_1 fintech_{iwr} + \varepsilon_{iwr} \quad (3)$$

Where β_1 represents the change in the probability of encountering credit constraints when transitioning from an ordinary child to a child who potentially benefited from fintech during primary school, all else being equal.

Finally, the third equation analyzes the relationship between fintech and educational IM while incorporating CC, the mediating variable:

$$IM_up/down_{idwr} = \alpha_r^c + [\gamma_d^p + \delta_d^c + \theta_w] + \beta_2 fintech_{iwr} + \beta_3 CC_{iwr} + \varepsilon_{iwr} \tag{4}$$

Here, β_3 measures the difference in the probability of experiencing upward or downward mobility between credit constrained children and their counterparts who are not, all else being equal. β_2 measures the portion of the TIE of fintech on IM that does not go through CC but rather through other financial inclusion-related mediators not accounted for. The indirect effect of fintech that operates through CC can then be calculated from Equation 3 and Equation 4 by taking the product $\beta_1 * \beta_3$, with the statistical significance tested using various Sobel scores proposed in the literature. Thus, the portion of TIE that transits through CC (IE) is given by:

$$IE = [(\beta_1 * \beta_3)/TIE] * 100 \quad \text{with} \quad TIE = \beta = \beta_2 + (\beta_1 * \beta_3)$$

For upward mobility, in line with the conceptual framework, we expect to have:

$$\beta > 0, \quad \beta_1 < 0, \quad \beta_2 > 0, \quad \beta_3 < 0, \quad \text{and} \quad \beta_2 < \beta \tag{5}$$

The signs of coefficients reverse for downward mobility, except for β_1.

4.3 Causation in the mediation chain

The mediation analysis presented above allows us to describe the transmission mechanism between fintech and educational IM. However, it does not ascertain whether the fintech $\rightarrow$ CC $\rightarrow$ IM mediation chain is truly causal. Therefore, additional analyses are needed to verify that fintech has a causal effect on credit constraints, on the one hand, and that credit constraints have a causal effect on IM, on the other. To this end, some authors have employed randomized evaluations, while others have used quasi-experimental impact evaluation methods (see Celli, 2022; MacKinnon et al., 2007, for a review). Using

secondary data, we follow the latter approach and apply instrumental variables techniques and a counterfactual experiment to test the causality of paths fintech → CC and CC → IM, respectively.

4.3.1 The instrumental variables approach

A simple comparison of the prevalence of credit constraints (outcome variable) between children who potentially benefited from fintech and those who did not may yield a biased estimate of the effect of fintech (treatment variable). Indeed, unaccounted factors, such as household resources and characteristics of the financial market, may influence both exposure to credit constraints and access to and/or use of fintech. Given the binary nature of the outcome and treatment variables, there are two instrumental variable approaches to address this endogeneity issue (Chiburis et al., 2012): linear regression with instrumental variables (IV) and bivariate probit regression (Biprobit). We explore both approaches, with one serving as a robustness check for the other.

Indeed, IV estimates the local average treatment effect (LATE)[15] of fintech on credit constraints, while Biprobit estimates the average treatment effect (ATE) of fintech and its average effect on children who potentially benefited from it (ATT)[16] (Chiburis et al., 2012). Therefore, IV and Biprobit can yield different results, especially when the sample size is small (n<5000), Biprobit being more robust than IV. However, when n is sufficiently large and the probability of being treated is low (<0.5), LATE and ATT are comparable. Following the literature (e.g. Sakyi-Nyarko et al., 2022), we use the regional coverage of the mobile network[17] as an instrument (Z) for fintech, our endogenous treatment variable. Indeed, the regional mobile network coverage determines access to and use of fintech but is not related to households' exposure to credit constraints. Thus, we define treatment effects as follows:

$$ATE = E(CC = 1) - E(CC = 0) \tag{6}$$

$$ATT = E(CC = 1|fintech = 1) - E(CC = 0|fintech = 1) \tag{7}$$

$$LATE = \frac{E(CC = 1|Z) - E(CC = 0|Z)}{E(fintech = 1|Z) - E(fintech = 0|Z)} \tag{8}$$

[15]Effect of the treatment in the subpopulation where the value of the treatment variable corresponds to the value of the instrumental variable.

[16]In absence of endogeneity bias, OLS = LATE = ATE = ATT.

[17]The data come from the SCAN-ICT survey, conducted since 2006 by the Cameroon Telecommunications Regulatory Agency with technical support from INS.

We estimate these in two stages, knowing that:

$$\begin{aligned} fintech^* &= \kappa_{01} + \kappa_{11} Z + \epsilon_1 \\ fintech &= 1\{fintech^* > 0\} \\ CC^* &= \kappa_{02} + \kappa_{12} fintech + \epsilon_2 \\ CC &= 1\{CC^* > 0\} \end{aligned} \tag{9}$$

Where κ_i are the coefficients to estimate and ϵ_i are residuals.

4.3.2 The counterfactual experiment

To evaluate the impact of credit constraints (treatment variable) on educational IM (outcome variable), the ideal scenario would be to compare the IM in current Cameroon ($\alpha|CC = 1$) to its counterfactual value, that is, the IM in an ideal Cameroon without credit constraints ($\alpha|CC = 0$). While it is not possible to observe the counterfactual situation, it can be "artificially" recreated by making some realistic assumptions: this is the principle of counterfactual experimentation (Keane and Wolpin, 2001).

In the case of Cameroon, let's assume that the government successfully implemented a policy to eliminate household credit constraints. Thus, children who interrupted their schooling or who were never enrolled due to financial constraints would have at least completed primary school[18] (Niimi, 2018). Based on this assumption, we re-estimate Equation 1 to find $\alpha|CC = 0$. We then compare the two situations according to Equation 10:

$$ATE = \Delta\alpha = (\alpha|CC = 1) - (\alpha|CC = 0) \tag{10}$$

The two states being identical except for the presence or absence of credit constraints, any statistically significant difference in IM ($\Delta\alpha$) can only be attributed to the causal effect of credit constraints on educational IM (ATE).

5 Results and discussion

This section presents and discusses the results obtained through the empirical strategy outlined in section 4. We begin with preliminary analyses that provide an overview of

[18] This assumption is both realistic and cautious. Indeed, in real life, it is very likely that these children would progress beyond primary school in their education.

the state of educational IM in Cameroon. Then, we present econometric results, particularly the mediation analysis, causation in the fintech → CC → IM mediation chain, heterogeneity analyses, and sensitivity check.

5.1 The state of educational IM in Cameroon

We measured educational IM in Cameroon (Table 2). Overall, Cameroonian children born to illiterate parents have a 63% chance of completing at least primary school. For children born to literate parents, the probability of not completing primary school is 10%, reflecting a certain privilege for the latter, who are almost guaranteed (90%) to complete primary school.

Table 2: Regional estimates of educational IM in Cameroon

		Upward mobility		Downward mobility	
Region	Obs.	Coef.	Stder.	Coef.	Stder.
Sud	510	0.878	(0.0356)	0.0733	(0.0132)
Sud-Ouest	781	0.835	(0.0251)	0.0581	(0.0111)
Douala	1,010	0.807	(0.0313)	0.0707	(0.0120)
Yaoundé	1,030	0.795	(0.0315)	0.0734	(0.0121)
Littoral	602	0.747	(0.0322)	0.0858	(0.0149)
Nord-Ouest	1,080	0.723	(0.0248)	0.0670	(0.0123)
Ouest	1,099	0.690	(0.0278)	0.0678	(0.0117)
Centre	789	0.649	(0.0371)	0.0989	(0.0143)
Adamaoua	638	0.422	(0.0283)	0.133	(0.0238)
Est	555	0.418	(0.0376)	0.129	(0.0187)
Nord	861	0.411	(0.0262)	0.143	(0.0206)
Extrême-Nord	1,319	0.325	(0.0205)	0.167	(0.0228)
Mean (Stdev.)	10,274	0.634	(0.1878)	0.098	(0.0373)
Observations		3,889		6,385	
R-squared		0.669		0.072	

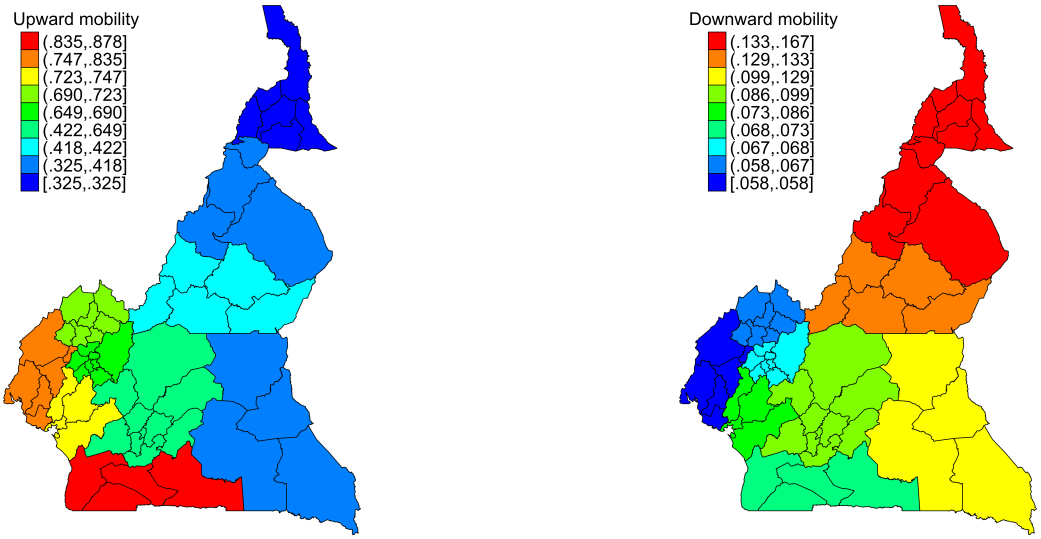
Note: Estimated only for children born to illiterate parents, upward mobility measures the likelihood of completing at least primary school. Similarly, downward mobility is estimated only for children born to literate parents and indicates the likelihood of not completing primary school. Regions are ranked in descending order of upward mobility. OLS estimates adjusted for fixed effects associated with the 20 years parents' birth cohort, the children's birth decade, and the wave of the ECAM survey.

These figures place Cameroon ahead of countries like Kenya, Rwanda, and Senegal, but behind Nigeria, Botswana, and South Africa[19]. However, national averages mask significant differences between regions of the country. Upward mobility ranges from 33% in Extrême-Nord to 88% in Sud. Similarly, downward mobility varies from 6% in Sud-

[19]See comparable estimates in Alesina et al. (2021).

Ouest to 17% in Extrême-Nord. This aligns with previous studies in SSA, which document significant heterogeneity between countries (Azomahou and Yitbarek, 2020; Dendir, 2023) and within countries (Alesina et al., 2021). We also find a strong negative correlation (-0.96) between the two forms of IM, with regions that have high upward mobility tending to also have low downward mobility.

To better account for the heterogeneity observed across the country, we mapped educational IM in Cameroon (Figure 3). It deteriorates as one moves from the coast toward the northern regions, a finding that holds true for both upward mobility (Figure 3a) and downward mobility (Figure 3b). This is a well-documented phenomenon (Alesina et al., 2021). Indeed, as in most SSA countries, the current educational system in Cameroon is influenced by educational practices established during colonization (Bekkouche and Dupraz, 2023). Consequently, the territories close to the coast, being the first exposed to colonizers, benefited more quickly from educational opportunities than the inland regions, both quantitatively and qualitatively.



(a) Upward mobility ↑ IM ↑ (b) Downward mobility ↑ IM ↓

Figure 3: Regional heterogeneity in educational IM in Cameroon. Note: The regions of Centre and Littoral do not include the capitals Yaoundé and Douala.

The educational map of Cameroon (MINEDUB, 2016) reveals that disparities in access to education persist between regions and explain the differences in IM observed across the country. For instance, the supply of primary education is more abundant in coastal regions (Sud, Littoral, and Sud-Ouest), with an average of six schools per 1,000 students, compared to only four in Grand-Nord (Extrême-Nord, Nord, and Adamaoua). This trend

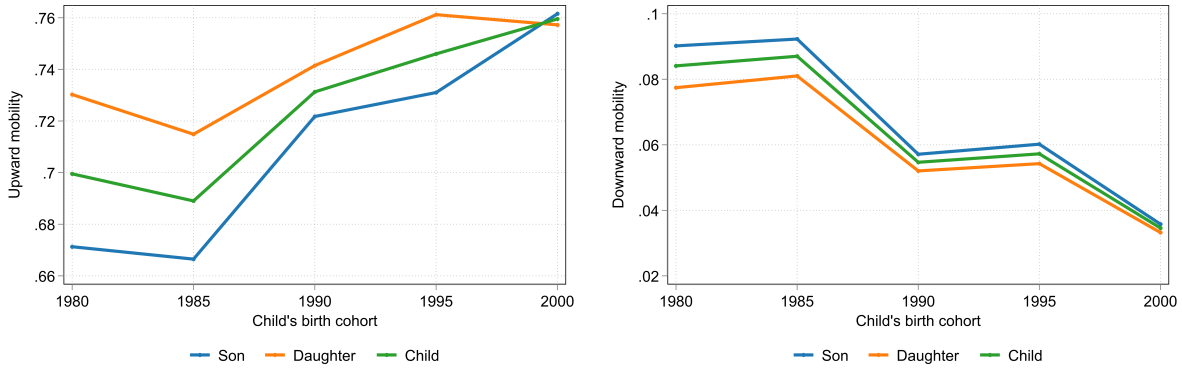
also appears in the quality of education, with an average pupil-teacher ratio of 32 students per teacher in coastal regions, compared to 68 in Grand-Nord. We represented the adjusted scatter plot between the indicators of educational IM and those of access to primary education in Cameroon (see Figure A.3 in appendices). Upward mobility (and downward mobility) is positively (and negatively) correlated with the number of primary schools per 1,000 students and negatively (and positively) correlated with the pupil-teacher ratio. Azomahou and Yitbarek (2020) found similar results across nine SSA countries regarding public education spending and the marginal returns to education.

Furthermore, children from the predominantly English-speaking regions (Nord-Ouest and Sud-Ouest) perform better on average than their counterparts from the predominantly French-speaking regions. This result may be surprising given that, in Cameroon, the Francophone educational subsystem has the best school facilities (Bekkouche and Dupraz, 2023). However, in a study of 34 SSA countries, including Cameroon, Razzu and Wambile (2022) showed that in terms of educational IM, the Anglophone educational system outperforms the Francophone and Lusophone systems but is less effective than the Arab educational system. They attribute this to the colonial legacy of educational practices and the primary language of instruction.

Our results also reveal an urban-rural gap in IM and gender disparities unfavorable to sons, which are pronounced in Francophone regions but nearly non-existent in Anglophone regions. As for the dynamics of educational IM in Cameroon (Figure 4), trends show a marked improvement between the 1980s and 2000s, particularly from 1985 onward. This improvement is evident for both upward mobility (Figure 4a) and downward mobility (Figure 4b). The slowdown between 1990 and 1995 can be explained by the economic crisis following the devaluation of the CFA Franc in 1994, which adversely affected the educational system (Njiale, 2017). The progress observed in 2000 suggests that the free primary education policy implemented by the government in 2000-2001 began to reduce educational inequalities as expected. This mitigates the criticisms directed at how this policy has been implemented in Cameroon[20]. The evolution of gender disparities is another notable aspect of these three decades. Initially unfavorable to sons until 1995, these disparities have gradually diminished and appear to have reversed in 2000 against

[20] According to the criticisms raised, this policy appears to primarily redistributes the burden of education financing by compensating for the reduction in public funding with additional costs for households (Fozing, 2009). Notably, this includes parent-teacher association fees in addition to expenses for school supplies and other related costs (clothing, nutrition, transportation, etc.).

daughters.



(a) Upward mobility

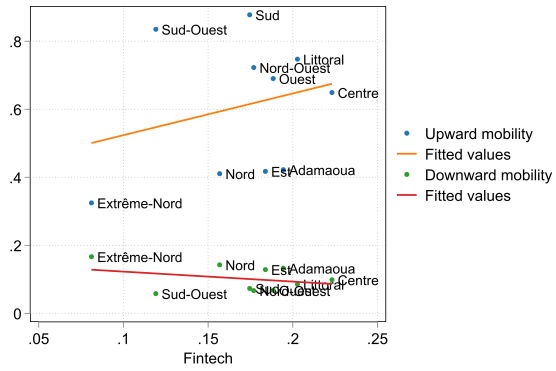
(b) Downward mobility

Figure 4: Dynamics of educational IM in Cameroon (1980-2000). Note: The graphs represent the predicted values after estimating Equation 1.

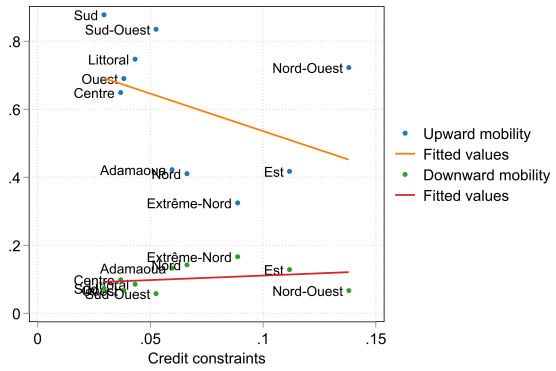
To gain an initial understanding of the relationship between fintech, credit constraints, and educational IM in Cameroon, we plotted adjusted scatter plots between these variables at the regional level (Figure 5). It can be seen that fintech is positively correlated with upward mobility and negatively correlated with downward mobility (Figure 5a), with Centre and Littoral regions being where children have potentially benefited the most from this innovation. Furthermore, credit constraints are negatively correlated with upward mobility and positively correlated with downward mobility (Figure 5b), with their prevalence being higher in Nord-Ouest and Est regions. Additionally, fintech is negatively correlated with credit constraints (Figure 5c), which appears to support the hypothesis of the mediating role of the latter in the relationship between fintech and educational IM. The econometric results in the following sections will allow for a more precise analysis.

5.2 Baseline results: The simple mediation analysis

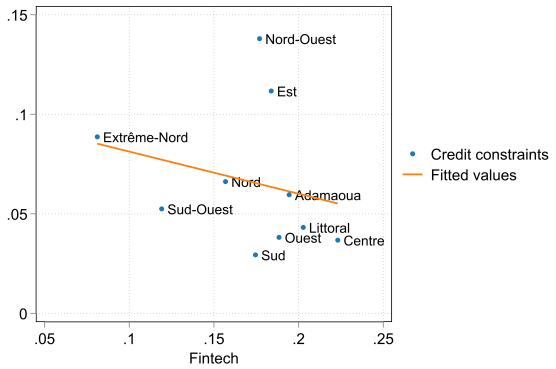
We examine the interrelationship between fintech, credit constraints, and educational IM through mediation analysis, as outlined in section 4, with results presented in Table 3. Equations 2, 3, and 4 are estimated using ordinary least squares (OLS) and logistic regression (Logit), with White's correction for heteroscedasticity applied each time. Our interpretations focus on the OLS estimates (columns 1 to 3), while the Logit results (columns 4 to 6) serve as robustness check. As can be seen, the estimated coefficients have the expected signs, consistent with our conceptual framework summarized in Equation 5.



(a) Fintech vs educational IM



(b) Credit constraints vs educational IM



(c) Fintech vs Credit constraints

Figure 5: The interrelationship between fintech, credit constraints, and educational IM at regional Level. Note: Fintech is measured by the proportion of children in the region who potentially benefited from this innovation during primary school. Similarly, credit constraints are measured by the proportion of children in the region who faced such constraints during primary school.

Additionally, both estimation methods yield similar results.

Column 1 of Table 3 presents the indirect effect of fintech on upward mobility (Panel A) and downward mobility (Panel B), accounting for all potential mediators. As expected, fintech enhances educational IM, regardless of the indicator considered. Previous studies have shown that, through the financial inclusion channel, fintech indirectly influences intragenerational economic outcomes such as poverty, income, education, and inequality. The results obtained here enrich the literature by demonstrating that, in addition to its intragenerational effects, fintech also influences the intergenerational transmission of economic outcomes within the same family, particularly regarding educational IM.

We then estimated the effect of fintech on credit constraints (Column 2) for children of illiterate parents (Panel A) and their counterparts born to literate parents (Panel B). The results show that within both groups of children, the likelihood of facing credit constraints is significantly lower among those who potentially benefited from fintech. This result

Table 3: Mediation analysis: OLS and Logit estimates

	OLS			Logit (marginal effects)		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	IM	CC	IM	IM	CC	IM
Panel A. Upward mobility						
Fintech	0.0980***	-0.0352**	0.0853***	0.0989***	-0.0473***	0.0863***
	-0.0264	(0.0143)	(0.0258)	(0.0262)	(0.0171)	(0.0258)
CC			-0.360***			-0.356***
			(0.0208)			(0.0206)
Observations	3,889	3,889	3,889	3,889	3,889	3,889
R-squared	0.670	0.150	0.690			
F/chi2	607.5***	29.13***	655.3***	591.3***	1511***	698.7***
Panel B. Downward mobility						
Fintech	-0.0147*	-0.00237	-0.0141*	-0.0160**	-0.00476	-0.0148*
	(0.00791)	(0.00478)	(0.00770)	(0.00802)	(0.00842)	(0.00776)
CC			0.249***			0.247***
			(0.0349)			(0.0377)
Observations	6,385	6,385	6,385	6,385	6,385	6,385
R-squared	0.073	0.062	0.103			
F/chi2	19.28***	10.02***	19.31***	2407***	1639***	2300***

Note: Robust standard errors are in parentheses. ***p<0.01, **p<0.05, *p<0.1. Panel A is estimated only for children of illiterate parents. Similarly, Panel B includes only children of literate parents. All regressions include fixed effects for the region of residence, the most educated parent's 20 years birth cohort, the child's birth decade, and the ECAM survey wave.

suggests that alleviating credit constraints may be a channel through which part of the indirect effect of fintech on educational IM operates, especially for children of illiterate parents, where the reduction in credit constraints is more pronounced and significant compared to their counterparts born to literate parents.

To verify this, we re-estimated the effect of fintech on educational IM, this time accounting for the influence of credit constraints (Column 3). Again, fintech significantly increases educational IM, regardless of the indicator considered. Moreover, the coefficient associated with fintech has significantly decreased, indicating that part of the indirect effect of fintech on educational IM indeed operates through credit constraints.

Table 4 summarizes the mediation analysis from Table 3 and presents the Sobel, Aroian, and Goodman statistics, which test the statistical significance of the indirect effect of fintech on educational IM via credit constraints. This indirect effect accounts for 13% of the total effect for upward mobility, with all three tests being statistically significant at the 5% level. In contrast, it accounts for only 7% for downward mobility, with

the three tests being insignificant. In summary, fintech indirectly enhances educational mobility through financial inclusion in general, particularly by reducing households' credit constraints. However, the mediation of credit constraints appears to be insignificant for children of literate parents. For now, we cannot conclude definitively, as we suspect the existence of an endogeneity bias between fintech and educational IM on one hand, and credit constraints on the other. The subsequent causal mediation analysis will address this issue.

Table 4: Summary of the mediation analysis

	Panel A. Upward mobility		Panel B. Downward mobility	
Mediation test	Statistic	P-value	Statistic	P-value
IE through CC	0.013		-0.001	
% of TIE	13%		7%	
Sobel test	2.474	0.013	-0.495	0.621
Aroian test	2.470	0.014	-0.490	0.624
Goodman test	2.478	0.013	-0.500	0.617

Note: TIE = total indirect effect; IE = indirect effect; CC = credit constraints.

5.3 Causation in the fintech → CC → IM mediation chain

After revealing the mediating role of credit constraints in the indirect relationship between fintech and IM, we now examine the causality of this mediation chain. Indeed, unaccounted factors, such as household resources and financial market characteristics that influence fintech, may also affect educational IM and household exposure to credit constraints, leading to an endogeneity bias. Furthermore, it is important to verify the causality of the effect of credit constraints on educational IM to ensure that it is not merely a correlation. We address these issues through the instrumental variables approach and counterfactual experimentation.

5.3.1 Endogeneity of fintech: Instrumental variables results

To disentangle unobserved confounding factors from the causal effect of fintech on the two other variables of interest, we use the regional coverage of mobile telecommunications network as an exogenous source of variation and re-estimate the mediation equations using the instrumental variables approach. Specifically, the treatment effects are calculated using bivariate Probit (Biprobit) and two-stage least squares (IV-2sls), as presented in

the method section. Both methods yield similar results (see Table 5), demonstrating their robustness.

Table 5: Mediation analysis: IV estimates

	Biprobit			IV-2sls		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	IM	CC	IM	IM	CC	IM
Panel A. Upward mobility						
Fintech	0.648***	-0.399***	0.635***	1.189***	-0.336***	1.094***
	(0.0365)	(0.0687)	(0.0517)	(0.109)	(0.0705)	(0.102)
CC			-0.296***			-0.283***
			(0.0221)			(0.0269)
Constant				0.488***	0.148***	0.530***
				(0.0121)	(0.00964)	(0.0137)
Observations	3,889	3,889	3,889	3,889	3,889	3,889
Wald chi2				118.2***	22.68***	343.6***
Modified Murphy[a]	45.82***	32.43***	38.04***	134.663***	20.016***	118.913***
Hosmer-Lemeshow[b]	426.47***	246.33***	348.40***	139.385***	20.104***	122.538***
Panel B. Downward mobility						
Fintech	-0.0719***	-0.147***	-0.0476**	-0.0889***	-0.117***	-0.0604**
	(0.0235)	(0.0280)	(0.0213)	(0.0249)	(0.0207)	(0.0253)
CC			0.239***			0.244***
			(0.0341)			(0.0377)
Constant				0.0686***	0.0503***	0.0563***
				(0.00599)	(0.00559)	(0.00642)
Observations	6,385	6,385	6,385	6,385	6,385	6,385
Wald chi2				12.70***	31.77***	53.66***
Modified Murphy[a]	51.16***	40.90***	35.45***	11.3095***	45.8663***	4.69817**
Hosmer-Lemeshow[b]	610.97***	664.01***	891.63***	11.3242***	46.1765***	4.69868**

Note: Bootstrapped (199 replications) standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1. Panel A is estimated only for children of illiterate parents, while Panel B includes only children of literate parents. The regional coverage of the mobile network serves as an instrument for fintech. a: or Durbin. b: or Wu-Hausman.

The first stage (not reported) shows that a 1% increase in the regional coverage of the mobile network significantly increases the probability of benefiting from fintech, by 31% for children born to illiterate parents and by 70% for those born to literate parents. After the second stage, the various tests (Murphy and Hosmer-Lemeshow for Biprobit and Durbin and Wu-Hausman for IV-2sls) are statistically significant at 1%, confirming the endogeneity of fintech. Once again, the estimated coefficients for the mediation analysis

have the predicted sign according to theory and are statistically significant. The following interpretations focus on Biprobit estimates.

Column 1 in Table 5 confirms that fintech has a causal effect on educational IM. Indeed, among children born to illiterate parents, upward mobility is 65% higher for those who potentially benefited from this innovation. Similarly, among children born to literate parents, the probability of experiencing downward mobility is 7% lower for those who potentially benefited from fintech. The fact that the effect of fintech on IM is more significant for children from households led by illiterate parents is an interesting finding. Because, these households are often poorer, with limited educational opportunities and lower access to fintech (10% compared to 20% for households with a literate parent). Thus, in terms of educational IM, fintech is more beneficial to the most disadvantaged households, promoting equal opportunities. This new result corroborates previous evidence showing that the impact of fintech, particularly mobile money, is substantial in developing countries and primarily focuses on the poorest populations (Suri, 2017; Suri and Jack, 2016).

In our study sample, 72% of children who never attended school or dropped out in primary school due to financial constraints come from illiterate parents. Column 2 shows that despite their lower exposure to fintech, this innovation decreases the likelihood of experiencing credit constraints by 40% among them, compared to 15% among their counterparts born to literate parents. Indeed, fintech enhances access to credit by increasing interactions between lenders and borrowers, as well as profiling and monitoring applicants (Berg et al., 2022). For instance, in Côte d'Ivoire and Cameroon, the telecom operator MTN launched the MoMoKach service in 2018, which provides microloans to households using MTN Mobile Money. Furthermore, fintech reduces transaction costs by allowing for a better sharing of risks associated with credit activities, particularly between individuals (Jack and Suri, 2014). This is how, in Kenya, the fintech M-Pesa increased reciprocal lending among user households by 15%, with some living miles apart (Jack et al., 2013).

Finally, column 3 confirms that credit constraints hinder educational IM. This effect is statistically significant regardless of the indicator considered. Indeed, among children born to illiterate parents, those who faced credit constraints are 30% less likely to achieve upward mobility than their peers. On the other hand, among children born to literate parents, the risk of downward mobility is 24% higher for those who encountered credit

constraints.

Table 6 summarizes the analysis from Table 5, showing that the mediation of credit constraints in the relationship between fintech and IM is statistically significant at 1%, according to the Sobel, Aroian, and Goodman tests. Thus, by reducing credit constraints, fintech increases upward mobility by 12%, which represents 18% of its total effect on this variable. Through the same channel, fintech also reduces downward mobility by 4%, accounting for 49% of its total effect on this variable.

Table 6: Summary of the mediation analysis from Table 1.5

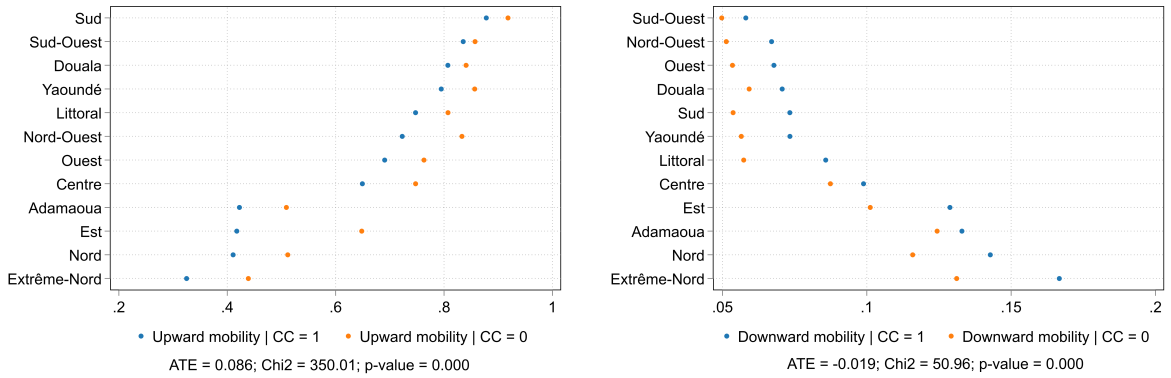
	Panel A. Upward mobility		Panel B. Downward mobility	
Mediation test	Statistic	P-value	Statistic	P-value
IE through CC	0.118		-0.035	
% of TIE	18%		49%	
Sobel	5.808	0.000	-4.202	0.000
Aroian	5.808	0.000	-4.175	0.000
Goodman	5.808	0.000	-4.230	0.000

Note: TIE = total indirect effect; IE = indirect effect; CC = credit constraints.

5.3.2 What gain in IM would Cameroon achieve by eliminating credit constraints?

To isolate the causal effect of credit constraints on educational IM, we conducted the counterfactual experiment detailed in the methods section. The results (see Figure 6) demonstrate that credit constraints have a significant detrimental effect on educational IM. Indeed, in Cameroon, eliminating these constraints would lead to an average increase of 9% in upward mobility while reducing downward mobility by 2%. In Japan, it was found that the removal of financial constraints would increase relative IM (Niimi, 2018), with the effect being significant for older cohorts of children but not for the youngest. In the case of Cameroon, despite a marked decrease in the prevalence of credit constraints between older cohorts of children and the youngest, their detrimental effect persists, particularly in Douala, the Est, and the Grand-Nord regions of the country. Furthermore, the gain in IM resulting from the elimination of credit constraints varies from region to region, tending to be higher in areas where IM is lower.

In summary, fintech has a causal effect on credit constraints, which in turn have a causal effect on educational IM. This confirms the causation in the mediation chain



(a) Upward mobility

(b) Downward mobility

Figure 6: Gains in IM following the elimination of credit constraints in Cameroon. Note: CC = credit constraints. The average treatment effect (ATE) corresponds to the simple mean of regional variations in educational IM.

among the three concepts. Specifically, credit constraints account for 18% of the indirect effect of fintech on upward mobility and 49% of its indirect effect on downward mobility.

5.4 Heterogeneity analyses: Gender and intersectionality

Having identified gender disparities in educational IM and exposure to credit constraints, we adopt an intersectional gender approach to examine how the indirect effect of fintech via credit constraints on educational IM (IE) varies between sons and daughters in different contexts. The results (see Figure 7) indicate that, overall, IE varies with gender. Specifically, for both upward and downward mobility, it is higher for sons compared to daughters. However, the gender bias in IE changes according to the context in which the child is raised. For instance, in households led by a single mother, IE is higher for sons, while it is higher for daughters in households led by both parents. Gender bias in IE also vary between regions with low IM (East and the Grand North) and other regions with higher IM, as well as between predominantly English-speaking and predominantly French-speaking areas, and between urban and rural settings.

5.5 Sensitivity check

We conducted sensitivity check by controlling for a range of factors in the mediation analysis, including child and household characteristics, as well as institutional, historical, and geographic factors. The results (see Table 7) indicate that the effects described above are not sensitive to the inclusion of these variables and remain statistically significant.

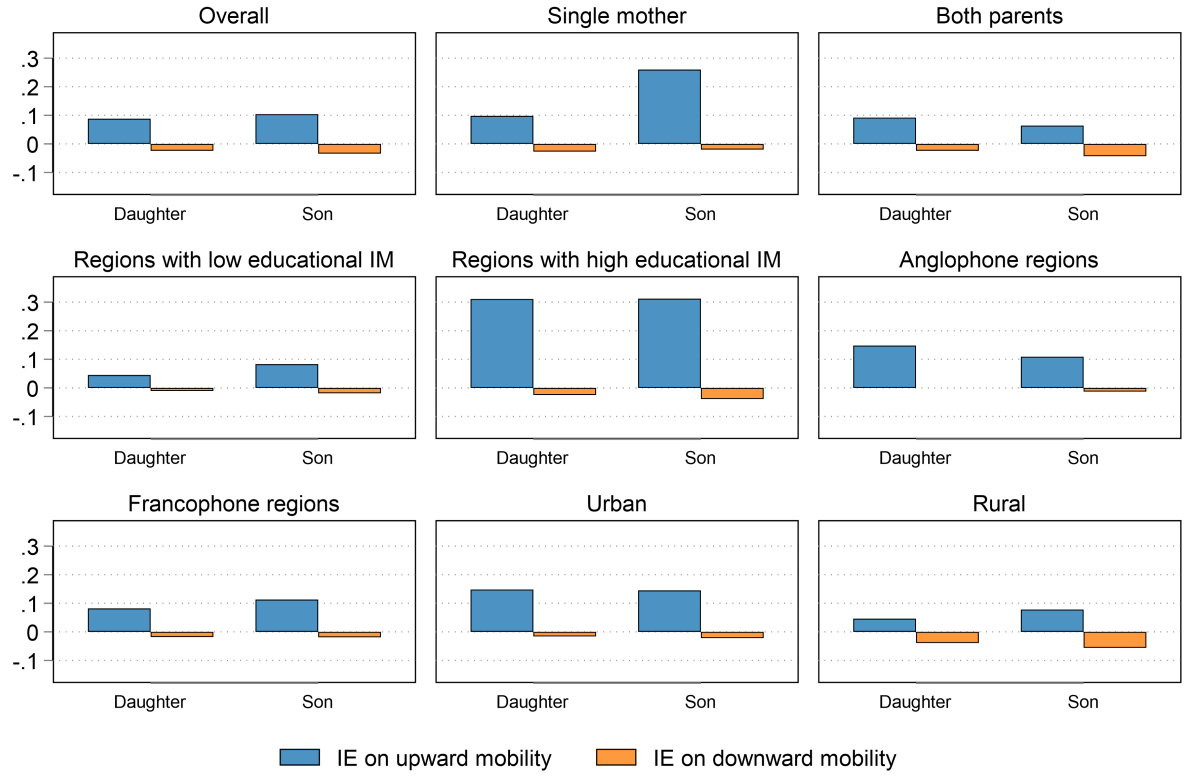


Figure 7: Gender bias in the indirect effect of fintech via credit constraints on educational IM (IE) for different sub-populations. Note: IE is obtained from IV-2sls estimates of mediation equations. Regions with low educational IM include Extrême-Nord, Nord, Adamaoua and Est.

This analysis provides additional insights into the determinants of credit constraints and educational IM in Cameroon, corroborating and complementing findings from the existing literature.

Child characteristics. All else being equal, each additional year reduces the prevalence of credit constraints by 0.6% for children born to illiterate parents and by 0.2% for those born to literate parents. This confirms that financial constraints are particularly severe among younger, highlighting the need to invest early in their education. Furthermore, each additional year increases the chances of upward mobility by 2%. Gender also significantly influences these outcomes, with daughters being nearly 4% more exposed to credit constraints than sons and having a 7% lower chance of achieving upward mobility. This may indicate that daughters' education is not as valued as that of sons. Additionally, birth order matters, as the occurrence of credit constraints is 2% less likely for first-born children, although they are more at risk of experiencing downward mobility.

Table 7: Sensitivity of mediation analysis to the inclusion of control variables (IV-2sls)

	Upward mobility		Downward mobility	
	(1)	(2)	(3)	(4)
VARIABLES	CC	IM	CC	IM
Fintech	-0.244***	0.934***	-0.0658***	-0.0673***
	(0.0601)	(0.0957)	(0.0168)	(0.0227)
CC		-0.325***		0.243***
		(0.0245)		(0.0356)
Child's characteristics				
Age	-0.00647***	0.0247***	-0.00249**	-0.00175
	(0.00249)	(0.00360)	(0.00105)	(0.00152)
Daughter	0.0355***	-0.0583***	0.00264	-0.000111
	(0.0102)	(0.0150)	(0.00395)	(0.00532)
First born	-0.0191*	-0.0109	0.00755	0.0144***
	(0.0115)	(0.0168)	(0.00464)	(0.00551)
Household's characteristics				
Household size	-0.00126	0.00367	-0.000775	0.000614
	(0.00183)	(0.00356)	(0.00123)	(0.00160)
Nomber of children	9.09e-05	-0.0173***	0.00265	0.00480**
	(0.00251)	(0.00439)	(0.00186)	(0.00220)
Single father	-0.0244	0.0727	0.00567	-0.0240**
	(0.0311)	(0.0463)	(0.0101)	(0.0107)
Single mother	-0.00496	0.121***	0.0156***	0.00175
	(0.0104)	(0.0199)	(0.00576)	(0.00678)
Home ownership	-0.0374***	0.103***	-0.0165***	-0.0117*
	(0.0139)	(0.0229)	(0.00446)	(0.00658)
Land ownership	0.0442***	-0.0925***	-0.00194	0.00697
	(0.0152)	(0.0258)	(0.00396)	(0.00621)
Institutional, historical and geographical factors				
Free primary education policy	-0.0504***	0.00311	-0.0327***	-0.0144*
	(0.0145)	(0.0220)	(0.00638)	(0.00822)
Anglophone region	0.0676***	0.297***	0.0384***	-0.0403***
	(0.0167)	(0.0188)	(0.00698)	(0.00590)
Rural residence	0.0205*	-0.0985***	0.0191***	0.0323***
	(0.0119)	(0.0197)	(0.00503)	(0.00667)
Constant	0.282***	0.132	0.0918***	0.0703**
	(0.0581)	(0.0809)	(0.0216)	(0.0336)
Observations	3,889	3,889	6,385	6,385

Note: Bootstrapped (199 replications) standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Household characteristics. Holding all else constant, the number of children in a household significantly influences educational IM. Specifically, each additional child reduces upward mobility by 2% and increases downward mobility by 0.5%. This is explained by the limited resources available to households, where an additional child reduces the amount allocated to each child (Becker & Tomes, 1986). The presence of both parents in the household also matters. Paradoxically, compared to households with both parents, children raised by single fathers face a 2% lower risk of downward mobility, while those raised by single mothers have a 12% higher chance of upward mobility. However, the occurrence of credit constraints is 2% more likely for children raised by single mothers, particularly when the mother is literate. Further analysis are needed to better understand this.

Ownership of a house and/or land plays a significant role as well. The risk of credit constraints is 2% to 4% lower when the household owns a house. These households also enjoy a 10% higher upward mobility and a 1% lower downward mobility. Conversely, the occurrence of credit constraints is 4% more likely among households with illiterate parents who own land, with upward mobility being 9% lower in such cases. Intuitively, this result can be explained by the fact that these households, while they may own land, often do not hold legal titles allowing them to use the land as collateral for borrowing. Additionally, being dependent on agricultural activities, they are often more inclined to pull children out of school to assist in the farm.

Institutional, historical, and geographic factors. As expected, the free primary education policy implemented in Cameroon in 2000-2001 significantly reduces household credit constraints, by an average of 5% when parents are illiterate and by 3% when at least one parent is literate. However, while it significantly reduces the risk of downward mobility by 1%, the free primary education policy has no significant direct effect on upward mobility, suggesting that this policy benefits more affluent households. The colonial origins of the main educational subsystem also matter. Compared to predominantly Francophone regions, upward mobility is 30% higher and downward mobility is 4% lower in predominantly Anglophone regions, despite a 4% to 7% higher risk of credit constraints in these areas. Lastly, the living environment plays an important role, as households residing in rural areas are 2% more exposed to credit constraints compared to urban residents, and they exhibit 10% lower upward mobility and 3% higher downward mobility.

5.6 Other mediators between fintech and educational IM

Beyond the mediation of credit constraints, we explored the savings channel. The literature has shown that households, particularly the poorest, use fintech products like mobile money as a means of saving. The estimation using bivariate probit indicates that within our sample, households exposed to fintech are 13% more likely to hold savings compared to others. However, this effect is not statistically significant for households led by an educated parent. Moreover, holding savings increases upward mobility by 15% and reduces downward mobility by 2%. The mediation analysis (see Table A.2 in appendices) indicates that, through the increase in household savings, fintech raises upward mobility by 2%, which constitutes 3% of its total effect on this variable. However, the mediation of savings is not statistically significant for downward mobility.

Unfortunately, the available data do not allow for the exploration of other mediators related to financial inclusion, particularly remittances, a financial product that has been most revolutionized by fintech in SSA. This will be the subject of future research.

6 Conclusion

In this paper, we posited that fintech indirectly enhances educational IM through financial inclusion in general, and particularly by reducing household credit constraints. This hypothesis was empirically tested through a mediation analysis, using a sample of 10,274 children drawn from Cameroon's ECAM surveys. The application of various econometric techniques highlighted several key findings.

First, absolute educational IM in Cameroon is moderate. Children born to illiterate parents have a 63% chance of completing at least primary school, while their counterparts from literate parents have a 10% risk of not finishing primary education. However, these national averages mask significant regional heterogeneity, gender disparities, and urban-rural gaps. As for the dynamics of educational IM in Cameroon, trends show a marked improvement between the 1980s and 2000s, particularly from 1985 onward. Second, credit constraints hinder educational IM in Cameroon, as they are responsible for a 30% decrease in the chances of upward mobility and a 25% increase in the risk of downward mobility among children who face them. Fortunately, fintech indirectly boosts educational IM in Cameroon. Indeed, among children who potentially benefited from this innovation,

upward mobility is 65% higher and downward mobility is 7% lower. Fintech also reduces the likelihood of encountering credit constraints by 40% for children born to illiterate parents and by 15% for those from literate parents. This channel accounts for 18% of its total effect on upward mobility and 49% of its total effect on downward mobility. Finally, these results are not significantly sensitive to the inclusion of other determinant factors. However, the indirect effect of fintech on educational IM via credit constraints varies with gender, depending on the context in which the child grows up.

Our new findings are rich in implications for policymakers responsible for promoting equal opportunities in Cameroon and throughout the Global South. Indeed, the credit constraints that poor households encounter in their children's education impede educational IM. Eliminating these constraints is, therefore, a crucial policy goal. Indeed, the counterfactual experiment conducted here shows that eliminating credit constraints could increase upward mobility by an average of 9% and reduce downward mobility by 2%. In addition to traditional government interventions like the free primary education policy in Cameroon, fintech emerges as a private solution that could help achieve this objective through market mechanisms. To fully leverage this potential, the government must collaborate with fintech stakeholders, particularly to create necessary incentives for developing innovative financial products, including education loans targeted at disadvantaged households. Part of this effort also involves investing in information technologies and eradicating disparities of all kinds in access to and use of fintech.

We encountered some limitations in this work. First, in addition to the credit channel examined here, it would have been interesting to analyze other potential mediators between fintech and educational IM. We explored the savings channel, but the available data did not allow to explore other potential financial inclusion-related mediators. Second, it would have been valuable to analyze how fintech and credit constraints influence educational IM by distinguishing between children attending private and public schools. We leave these questions for future research.

References

Agler, R. and De Boeck, P. (2017). On the interpretation and use of mediation: Multiple perspectives on mediation analysis. *Frontiers in Psychology*, 8:1984.

Ahmed, H. and Cowan, B. (2021). Mobile money and healthcare use: Evidence from East Africa. *World Development*, 141:105392.

Alesina, A., Hohmann, S., Michalopoulos, S., and E, P. (2021). Intergenerational mobility in Africa. *Econometrica*, 86(1):1–35.

Asiedu, E., Azomahou, T. T., Getachew, Y., and Yitbarek, E. (2021). Share the love: Parental bias, women empowerment and intergenerational mobility. *Journal of Economic Behavior & Organization*, 191:846–867.

Asongu, S. A., Ngoungou, Y. E., and Nnanna, J. (2023). Mobile money innovations and health performance in sub-Saharan Africa. *Technology in Society*, 74:102312.

Atangana Ondoa, H., Ambombo Bella, G. L., and Mbenga Bindop, K. M. (2023). Mobile money, family assistance and welfare in Cameroon. *Telecommunications Policy*, 47(1):102457.

Avom, D., Bangaké, C., and Ndoya, H. (2023). Do financial innovations improve financial inclusion? Evidence from mobile money adoption in Africa. *Technological Forecasting and Social Change*, 190:122451.

Azomahou, T. T. and Yitbarek, E. A. (2020). Intergenerational mobility in education: Is Africa different? *Contemporary Economic Policy*, 2020:1–21.

Baron, R. M. and Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6):1173–1182.

Becker, G. B. and Tomes, N. (1979). An equilibrium theory of the distribution of income and intergenerational mobility. *Journal of Political Economy*, 87(6):1153–1189.

Becker, G. B. and Tomes, N. (1986). Human capital and the rise and fall of families. *Journal of Labor Economics*, 4(3 Part 2):S1–S39.

Bekkouche, Y. and Dupraz, Y. (2023). Colonial origins and quality of education evidence from cameroon. *World Development*, 170:106245.

Berg, T., Fuster, A., and Puri, M. (2022). FinTech lending. *Annual Review of Financial Economics*, 14(1):187–207.

Björkegren, D. and Grissen, D. (2020). Behavior Revealed in Mobile Phone Usage Predicts Credit Repayment. *The World Bank Economic Review*, 34(3):618–634.

Black, S. E. and Devereux, P. J. (2011). Recent developments in intergenerational mobility. Amsterdam and Oxford: Elsevier.

Branson, N., Hofmeyr, C., and Lam, D. (2014). Progress through school and the determinants of school dropout in South Africa. *Development Southern Africa*, 31(1):106–126.

Braxton, J. C., Chikhale, N., Herkenhoff, K., and Phillips, G. (2024). Intergenerational mobility and credit. Technical Report w32031, National Bureau of Economic Research, Cambridge, MA.

Carneiro, P. and Heckman, J. J. (2002). The evidence on credit constraints in post-secondary schooling. *Economic Journal*, 112(October):705–734.

Caucutt, E. M. and Lochner, L. (2020). Early and late human capital investments, borrowing constraints, and the family. *journal of political economy*, 128(3):1065–1147.

Caucutt, E. M., Lochner, L., and Park, Y. (2017). Correlation, consumption, confusion, or constraints: Why do poor children perform so poorly? *Scandinavian Journal of Economics*, 119(1):102–147.

Celli, V. (2022). Causal mediation analysis in economics: Objectives, assumptions, models. *Journal of Economic Surveys*, 36(1):214–234. _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/joes.12452.

Chiburis, R. C., Das, J., and Lokshin, M. (2012). A practical comparison of the bivariate probit and linear IV estimators. *Economics Letters*, 117(3):762–766.

Davis, J. and Mazumder, B. (2018). Racial and ethnic differences in the geography of intergenerational mobility. *SSRN Electronic Journal*.

Demir, A., Pesqué-Cela, V., Altunbas, Y., and Murinde, V. (2022). Fintech, financial inclusion and income inequality: a quantile regression approach. *European Journal of Finance*, 28(1):86–107.

Demirgüç-Kunt, A., Klapper, L., Singer, D., and Ansar, S. (2022). *Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19*. Washington, DC: World Bank.

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., and Hess, J. (2018). *The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution*. Washington, DC: World Bank.

Dendir, S. (2023). Intergenerational educational mobility in Sub-Saharan Africa. *World Development Sustainability*, 2:100072. Publisher: Elsevier.

Ebeke, C. H. (2023). Intergenerational mobility and the growth–inequality–poverty nexus in Africa. *Journal of African Economies*, 32:ii99–ii112.

Emran, M. S., Greene, W., and Shilpi, F. (2018). When measure matters: Coresidency, truncation bias, and intergenerational mobility in developing countries. *Journal of Human Resources*, 53(3):589–607. Publisher: University of Wisconsin Press Section: Article.

Emran, M. S. and Shilpi, F. (2015). Gender, geography, and generations: Intergenerational educational mobility in post-reform India. *World Development*, 72:362–380.

Emran, M. S., Shilpi, F., and UNU-WIDER (2019). *Economic approach to intergenerational mobility: Measures, methods, and challenges in developing countries*, volume 2019 of *WIDER Working Paper*. UNU-WIDER, 98 edition.

Fafchamps, M. (2014). Credit constraints, collateral and lending to the poor. *Revue d'économie du développement*, Vol. 22(HS01):71–89.

Fontep, R. and Sen, K. (2020). *Is there a gender bias in intergenerational mobility? Evidence from Cameroon*. Number 2020/111. WIDER Working Paper.

Fourmy, R. (2020). The impact of mobile money on remittance recipients' household welfare and education: Evidence from Kenya. In *Migration, Remittances, and Sustainable Development in Africa*. Routledge. Num Pages: 20.

Fozing, I. (2009). Gratuité de l'enseignement fondamental au Cameroun : réalité, implication budgétaire et impact sur le développement de l'éducation. *La Recherche en Education*, (2):3–20.

Funjika, P. and Getachew, Y. Y. (2022). Colonial origin, ethnicity and intergenerational mobility in Africa. *World Development*, 153:105841. Publisher: Elsevier.

Gaviria, A. (2002). Intergenerational mobility, sibling inequality and borrowing constraints. *Economics of Education Review*, 78(9-91):331–340.

GDIM (2018). Global Database on intergenerational mobility. *Development Research Group, World Bank. Washington, D.C.: World Bank Group.*

Ghosh, P., Mookherjee, D., and Ray, D. (2000). Credit rationing in developing countries: An overview of the theory. In *A Reader in Development Economics*. Blackwell, London, dilip mookherjee and debraj ray edition.

Goldberger, A. S. (1989). Economic and mechanical models of intergenerational transmission. *American Economic Review*, 79(3):504–513.

Grawe, N. D. (2004). Reconsidering the use of nonlinearities in intergenerational earnings mobility as a test for credit constraints. *Journal of Human Resources*, XXXIX(3):813–827.

Gurgand, M., Mélonio, T., and Lorenceau, A. (2023). Student loans: Credit constraints and higher education in South Africa. *Journal of Development Economics*, 161:103031.

Haile, G. A. (2018). Intergenerational mobility in socio-economic status in Ethiopia. *Journal of International Development*, 30(8):1392–1413.

Han, S. and Mulligan, C. B. (2001). Human capital, heterogeneity and estimated degrees of intergenerational mobility. *Economic Journal*, 111(470):207–43.

Hertz, T., Jayasundera, T., Piraino, P., Selcuk, S., Smith, N., and Verashchagina (2007). The inheritance of educational inequality: International comparisons and fifty-year trends. *The BE Journal of Economic Analysis & Policy*, 7(2).

Huang, J. (2013). Intergenerational transmission of educational attainment: The role of household assets. *Economics of Education Review*, 33:112–123.

Iversen, V., Krishna, A., and Sen, K. (2021). Social mobility in developing countries: Directions for research practice, knowledge gaps, and policy support. Oxford University Press. UNU-WIDER. Section: 18.

Jack, W., Ray, A., and Suri, T. (2013). Transaction networks: Evidence from mobile money in Kenya. *American Economic Review*, 103(3):356–361.

Jack, W. and Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *American Economic Review*, 104(1):183–223.

Jones, L. S. and Maynard, G. P. J. (2023). Unfulfilled promises of the fintech revolution. *California Law Review*, 111:801.

Juma, A. (2020). Impact of mobile money transfer on the education sector in Sub-Saharan Africa: A review. In *Impact of Mobile Payment Applications and Transfers on Business*, pages 71–95. IGI Global.

Kanga, D., Oughton, C., Harris, L., and Murinde, V. (2022). The diffusion of fintech, financial inclusion and income per capita. *The European Journal of Finance*, 28(1):108–136.

Keane, M. P. and Wolpin, K. I. (2001). The effect of parental transfers and borrowing constraints on educational attainment. *International Economic Review*, 42(4):1051–1103.

Kedir, A. M. and Ibrahim, G. (2011). Household-level credit constraints in urban Ethiopia. *Ethiopian Journal of Economics*, XX(1).

Kedir, A. M. and Kouame, E. (2022). FinTech and women's entrepreneurship in Africa: the case of Burkina Faso and Cameroon. *Journal of Cultural Economy*.

Lafortune, J. and Lee, S. (2014). All for one? family size and children's educational distribution under credit constraints. *American Economic Review*, 104(5):365–369.

Lambert, S., Ravallion, M., and Van De Walle, D. (2014). Intergenerational mobility and interpersonal inequality in an African economy. *Journal of Development Economics*, 110:327–344.

Lee, S. Y. T. and Seshadri, A. (2019). On the intergenerational transmission of economic status. *Journal of Political Economy*, 127:855–921.

MacKinnon, D. P., Fairchild, A. J., and Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology*, 58(1):593–614.

Mazumder, B. (2005). Fortunate sons: New estimates of intergenerational mobility in the United States using social security earnings data. *Review of Economics and Statistics*, 87(2):235–255.

Mbenga Bindop, K. M. (2019). Les inégalités d'accès au marché du travail au Cameroun: le rôle de l'école. *Revue d'économie du développement*, 27(2):45–86. Publisher: Cairn/Softwin.

MINEDUB (2016). Rapport d'analyse des données de la carte scolaire 2013-2014.

Mogaji, E. and Nguyen, N. P. (2022). The dark side of mobile money: Perspectives from an emerging economy. *Technological Forecasting and Social Change*, 185:122045.

Mulligan, C. B. (1999). Galton versus the human capital approach to inheritance. *Journal of Political Economy*, 107(6, pt. 2):S184–S224.

Narayan, A., Van der Weide, R., Cojocaru, A., Lakner, C., Redaelli, S., Mahler, D. G., Ramasubbaiah, R. G. N., and Thewissen, S. (2018). *Fair Progress? Economic Mobility across Generations around the World*. Washington, DC: World Bank.

Ndung'u, N. (2022). Fintech in sub-Saharan Africa. WIDER Working Paper 2022, UNU-WIDER. ISBN: 9789292672355 Series: WIDER Working Paper Volume: 2022.

Neidhöfer, G., Serrano, J., and Gasparini, L. (2018). Educational inequality and intergenerational mobility in Latin America: A new database. *Journal of Development Economics*, 134:329–349.

Niimi, Y. (2018). Do borrowing constraints matter for intergenerational educational mobility? Evidence from Japan. *Journal of the Asia Pacific Economy*, 23(4):628–656.

Nimubona, A.-D. and Vencatachellum, D. (2007). Intergenerational education mobility of black and white South Africans'. *Journal of Population Economics*, 20:149–182.

Njiale, P. M. (2017). Entre héritage et globalisation : l'urgence d'une réforme de l'école au Cameroun. *Revue internationale d'éducation de Sèvres*.

Piraino, P. (2015). Intergenerational earnings mobility and equality of opportunity in South Africa. *World Development*, 67:396–405.

Piraino, P. (2021). Drivers of mobility in the Global South. Oxford University Press. UNU-WIDER. Section: 2.

Razzu, G. and Wambile, A. (2022). Four decades of intergenerational educational mobility in sub-Saharan Africa. *Journal of Development Studies*, 58(5):931–950.

Restuccia, D. and Urrutia, C. (2004). Intergenerational persistence of earnings: The role of early and college education. *American Economic Review*, 94(5):1354–1378.

Sakyi-Nyarko, C., Ahmad, A. H., and Green, C. (2022). Investigating the well-being implications of mobile money access and usage from a multidimensional perspective. *Review of Development Economics*, 26(2):985–1009.

Senyo, P. K., Gozman, D., Karanasios, S., Dacre, N., and Baba, M. (2023). Moving away from trading on the margins: Economic empowerment of informal businesses through FinTech. *Information Systems Journal*, 33(1):154–184.

Senyo, P. K., Karanasios, S., Gozman, D., and Baba, M. (2022). FinTech ecosystem practices shaping financial inclusion: the case of mobile money in Ghana. *European Journal of Information Systems*, 31(1):112–127.

Suri, T. (2017). Mobile money. *Annual Review of Economics*, 9(Volume 9, 2017):497–520. Publisher: Annual Reviews.

Suri, T. and Jack, W. (2016). The long-run poverty and gender impacts of mobile money. *Science*, 354(6317):1288–1292.

Tantri, P. (2021). Fintech for the poor: Financial intermediation without discrimination. *Review of Finance*, 25(2):561–593.

Thakor, A. V. (2020). Fintech and banking: What do we know? *Journal of Financial Intermediation*, 41:100833.

Vuković, D. B., Hassan, M. K., Kwakye, B., Febtinugraini, A., and Shakib, M. (2024). Does fintech matter for financial inclusion and financial stability in BRICS markets? *Emerging Markets Review*, 61:101164.

World Bank (2022). *The little data book on financial inclusion 2022*. Washington, DC: World Bank.

Yang, X., Zhang, L., Hong, X., and Li, W. (Unpublished). Can digital financial inclusion facilitate intergenerational income mobility? An empirical study.

Appendices

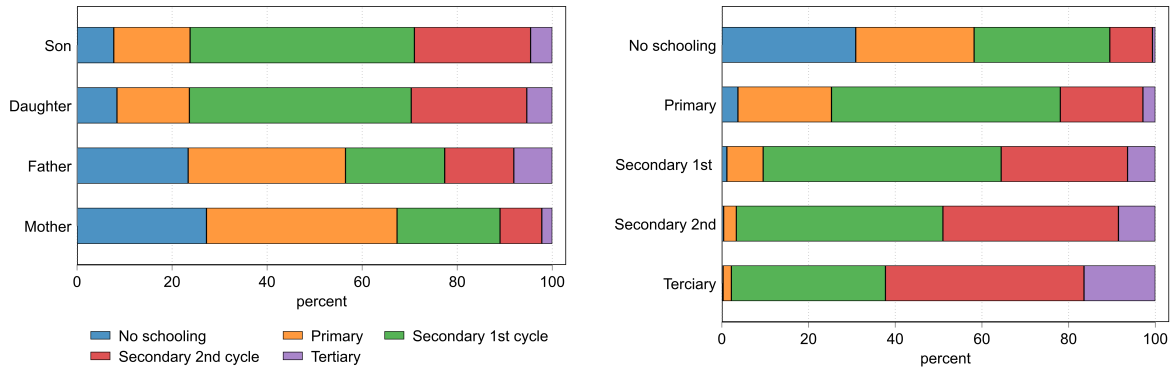
A Construction of key variables

Measuring educational IM requires reconstructing parent-child pairs. In this study, a father is any male individual identified in ECAM as either the head of the household or the spouse of the head. Similarly, a mother is a female head of household or spouse. For children, a son or daughter refers to any individual identified as the child of the head of household or spouse. Some authors associate each child with the education level of the father or the mother (Emran and Shilpi, 2015). Others use the average of the father's and mother's education levels (Hertz et al., 2007), while some consider the education level of the more educated parent (Neidhöfer et al., 2018). We choose the latter option[21], which optimizes the sample size and produces similar results to using the average of the father's and mother's education (Davis and Mazumder, 2018).

Observing the educational outcomes of household members (Figure A.1a), there is a noticeable improvement in children's access to education. Indeed, the number of children who have never attended school is significantly lower compared to their parents. Moreover, Figure A.1b shows the probabilities of transitioning between educational levels from the child to the most educated parent. Despite considerable reproduction of educational status, some upward and downward mobility exist. For instance, nearly 27% of children whose parents never attended school have completed primary education, and 31% of them have reached the first cycle of secondary school. However, the educational trajectories tend to be short, reflecting a disadvantage for children of parents with no schooling and a privilege for those with tertiary-educated parents. Indeed, the former often remain uneducated and rarely reach university, while those of the latter almost always reach secondary education.

However, these figures should be interpreted with caution. Indeed, given the sample selection, the children studied did not have the same educational opportunities for levels beyond primary school. Therefore, we adopt the absolute approach to IM proposed by (Alesina et al., 2021). This approach uses primary education as the reference point for

[21]Indeed, it is logical to think that within a household, the more educated parent will have a greater influence on decisions related to the children's education. Of course, in patriarchal societies like Cameroon, there may be concerns that the father's parental authority could diminish the mother's contribution. However, even in such cases, the mother continues to influence the child's education, particularly through psychological support and home academic assistance.



(a) Level of schooling

(b) Mobility matrix

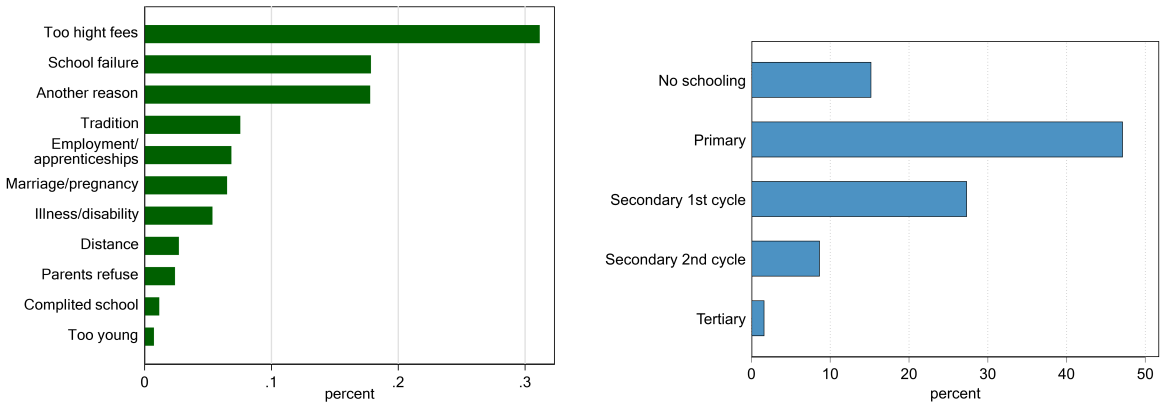
Figure A.1: Educational outcomes and mobility matrix in Cameroon. Source: ECAM data. Note: The mobility matrix indicates the proportion of children who have reached each educational level, given the educational level of their most educated parent.

measuring educational IM, which is more suitable for the co-residence data we are using here. Knowing the last successfully completed educational level, we classify individuals as illiterate (or literate) if they have not (or have) completed at least primary school. 38% of parents are illiterate compared to 18% of children. From this, we construct two binary variables indicating whether the child's education shows upward (IM_up) or downward (IM_down) progression relative to their most educated parent.

Regarding credit constraints, they are often captured and analyzed in the literature through indirect methods, as they are difficult to assess directly (Gurgand et al., 2023). However, (Grawe, 2004) critiques these methods and suggests direct approaches to better detect the presence of credit constraints and evaluate their impacts more robustly. Currently, very few authors in the literature propose such approaches. Nonetheless, (Niimi, 2018) in his study in Japan considers a child to experience credit constraints in education if they are forced to interrupt their schooling for financial reasons. This criterion is doubly interesting as it not only helps detect potentially constrained children but also determines the educational level they have missed, making it possible to conduct a counterfactual evaluation of the impact of credit constraints on educational IM.

However, this approach relies solely on the respondents' open-ended answers. Such responses may obscure the real underlying causes of a child's school dropout, which may have no connection to the parents' access to credit. For example, in our sample, aside from the high cost of schooling, households provide several other reasons for justifying a child's non-enrollment or school dropout (Figure A.2a). Therefore, relying solely on

this criterion might lead to an overestimation of the extent of credit constraints and their impact on IM. To avoid this bias, it is essential to additionally verify the household's access to credit. So, in this work, a child is considered to face credit constraints (CC) if (1) they have never been enrolled in school or have interrupted their schooling due to a lack of financial means, and (2) their parents have been unable to obtain a loan in the last 12 month. In our sample, 10% of children are credit constrained, 62% of them did so before or during their primary education (Figure A.2b).



(a) Reasons for school dropout

(b) Level of schooling at the occurrence of CC

Figure A.2: Credit constraints in Cameroon. Source: ECAM data.

Finally, fintech is understood as any technological innovation aimed at facilitating financial access, particularly for underserved or excluded groups from traditional formal finance. In the literature, individual-level fintech is often captured by binary variables indicating either access to and/or use of such innovations, notably mobile money, which is the most widespread fintech product in SSA (Kedir and Kouame, 2022; Senyo et al., 2023, 2022). We follow the same approach. Indeed, fintech has primarily been provided in Cameroon by mobile operators Orange and MTN since 2010 and 2011, respectively (Atangana Ondoa et al., 2023). However, the introduction of this innovation in the country dates back to 2008, with the creation of the EU mobile money service by Express Union, a local financial institution specialized in money transfers.

Unfortunately, ECAM does not provide information on the actual access to and/or use of mobile money by Cameroonian households. However, we can assess the situation before and after the arrival of fintech in Cameroon by identifying households that have potentially benefited from this innovation to mobilize resources for their children's education. After the arrival of fintech in Cameroon in 2008, 21% of children in our sample were still of

primary school age (between six to 11 years old). Furthermore, 72% of children belonged to a household with a mobile phone, the main channel for fintech services in Cameroon. Thus, a child is considered to have potentially benefited from fintech if they belong to both of these groups.

References

Alesina, A., Hohmann, S., Michalopoulos, S., and E, P. (2021). Intergenerational mobility in Africa. *Econometrica*, 86(1):1–35.

Atangana Ondoa, H., Ambombo Bella, G. L., and Mbenga Bindop, K. M. (2023). Mobile money, family assistance and welfare in Cameroon. *Telecommunications Policy*, 47(1):102457.

Davis, J. and Mazumder, B. (2018). Racial and ethnic differences in the geography of intergenerational mobility. *SSRN Electronic Journal*.

Emran, M. S. and Shilpi, F. (2015). Gender, geography, and generations: Intergenerational educational mobility in post-reform India. *World Development*, 72:362–380.

Grawe, N. D. (2004). Reconsidering the use of nonlinearities in intergenerational earnings mobility as a test for credit constraints. *Journal of Human Resources*, XXXIX(3):813–827.

Gurgand, M., Mélonio, T., and Lorenceau, A. (2023). Student loans: Credit constraints and higher education in South Africa. *Journal of Development Economics*, 161:103031.

Hertz, T., Jayasundera, T., Piraino, P., Selcuk, S., Smith, N., and Verashchagina (2007). The inheritance of educational inequality: International comparisons and fifty-year trends. *The BE Journal of Economic Analysis & Policy*, 7(2).

Kedir, A. M. and Kouame, E. (2022). FinTech and women's entrepreneurship in Africa: the case of Burkina Faso and Cameroon. *Journal of Cultural Economy*.

Neidhöfer, G., Serrano, J., and Gasparini, L. (2018). Educational inequality and intergenerational mobility in Latin America: A new database. *Journal of Development Economics*, 134:329–349.

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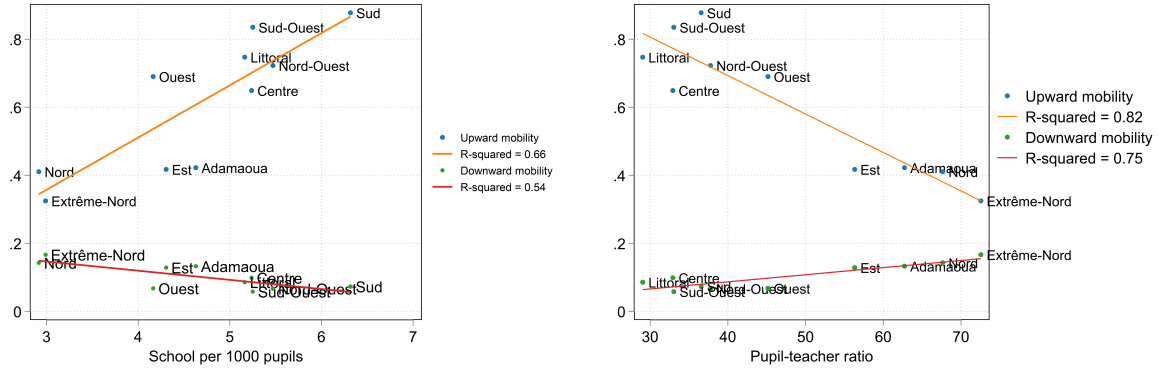
Senyo, P. K., Gozman, D., Karanasios, S., Dacre, N., and Baba, M. (2023). Moving away from trading on the margins: Economic empowerment of informal businesses through FinTech. *Information Systems Journal*, 33(1):154–184.

Senyo, P. K., Karanasios, S., Gozman, D., and Baba, M. (2022). FinTech ecosystem practices shaping financial inclusion: the case of mobile money in Ghana. *European Journal of Information Systems*, 31(1):112–127.

Table A.1: Control variables

Variable	Percent/mean
Child's caracteristics	
Age	18.40
Son	51.94
Daughter	48.06
First born	46.38
Household's caracteristics	
Size	7.87
Nomber of children	4.84
Single father	4.26
Single mother	30.81
Savings	30.66
Home owner	44.91
Land owner	33.86
Institutional, historic and geographic factors	
Benefited from the free primary education policy	76.7
In anglophone region	18.11
Rural residence	40.45

Source: ECAM data.



(a) Upward mobility

(b) Downward mobility

Figure A.3: Access to education and educational IM in Cameroon. Source: based on ECAM and *Ministère de l'éducation de base* (MINEDUB, 2016) data. Note: The figure represents the fitted scatterplot between upward mobility and downward mobility and primary education supply measured in number of schools per 1,000 pupils and education quality measured by pupil-teacher ratio.

Table A.2: Summary of the mediation analysis with savings as mediator

	Panel A. Upward mobility		Panel B. Downward mobility	
Mediation test	Statistic	P-value	Statistic	P-value
IE through Savings	0.019		-0.001	
% of TIE	3%		2%	
Sobel	4.764	0.000	-1.030	0.303
Aroian	4.741	0.000	-0.999	0.318
Goodman	4.788	0.000	-1.065	0.287

Note: TIE = total indirect effect; IE = indirect effect.