

Economic Studies 216



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Essays in Human Capital and Immigration

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ECONOMICS AT UPPSALA UNIVERSITY

The Department of Economics at Uppsala University has a long history. The first chair in Economics in the Nordic countries was instituted at Uppsala University in 1741.

The main focus of research at the department has varied over the years but has typically been oriented towards policy-relevant applied economics, including both theoretical and empirical studies. The currently most active areas of research can be grouped into six categories:

- * Labour economics
 - * Public economics
 - * Macroeconomics
 - * Microeconometrics
 - * Environmental economics
 - * Housing and urban economics
-

Akib Khan

Essays in Human Capital
and Immigration



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Abstract

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Essay I (with Johannes M. Bos, Saravana Ravindran, and Abu S. Shonchoy): Can governments leverage existing service-delivery platforms to scale early childhood development (ECD) interventions? We experimentally study a large-scale, low-cost home-visiting intervention --- providing materials and counseling --- integrated into Bangladesh's national nutrition program without extra financial incentives for service providers (SPs). We find SPs partially substitute away from nutritional to ECD counseling. Intent-to-treat estimates show positive impacts on child's cognition (0.17 SD), language (0.23 SD), and socio-emotional scores (0.12-0.14 SD). Wasting and underweight rates decline. Older siblings' primary school attendance increases as well. Improved maternal agency, complementary parental investments, and higher take-up of the pre-existing nutrition program are important mechanisms. We estimate a sizeable internal rate-of-return of 18.9%.

Essay II: This paper evaluates a 2011 Swedish reform that introduced tuition fees for international students applying to universities. For identification, I use two variations in a difference-in-differences design: the timing of the reform and the differences in the pre-reform share of international Master's students across the faculties as a proxy for reform exposure. I find that, for the exposed faculties, the cohort size decreases sharply, driven by a decline in international students and partially mitigated by higher enrolment of natives. There are no effects on the composition of these native students in terms of age, gender, and academic ability. Native students who enroll in Master's programs under exposed faculties see higher labor earnings in the short run. These faculties also respond to the reform by offering a wider set of programs. Taken together, these results show how such reforms affect multiple inputs in the education production function and provide one of the first pieces of evidence on higher education policies related to international students.

Essay III (with Avenia Ghazarian): How does human capital investment respond to local economic opportunities? Income gains can increase the demand for schooling while new jobs raise the opportunity costs. We investigate this question in the context of rapid growth in artisanal gold mining in sub-Saharan Africa. We compile 45 waves of Demographic and Health Surveys covering 1.3 million individuals from 14 countries in this region. Identification comes from two sources of variation: one in the global gold price and the other in the exposure of households to places that are geologically suitable for artisanal gold mining. We find that a near-tripling of the global gold price -- reflecting changes between 2005 and 2010 -- leads to a decline in school attendance: by 3.1 pp for 11 to 15-year-olds and by 2.3 pp for 16 to 20-year-olds who live near gold-suitable areas. These reductions are higher for boys. Taken together, these results highlight the potential costs of economic development driven by natural resources.

Essay IV (with Erika Forsberg and Olof Rosenqvist): Family background shapes individual outcomes across the life cycle. While the literature documents how the importance of family background, measured often by the degree of sibling correlation in socioeconomic outcomes, varies across countries, less is known about heterogeneities across social groups within a country. Using Swedish register data, we compare sibling correlations in skills, schooling, and earnings across fine-grained groups defined by parental socioeconomic status (SES). We find that sibling correlations generally decline in parental SES. This pattern holds for skills, schooling, and earnings, and is robust to alternative definitions of parental SES. This result is consistent with theories on reinforcing parental investments but other mechanisms such as complementarities between parental investments and child ability could also be at play. While the exact mechanisms behind the observed socioeconomic gradient in sibling similarity are hard to identify, the results suggest that life is more formed by individual endowments and considerations for children from high SES backgrounds as compared to their low SES counterparts.

Essay V (with Erik Lundberg): Aging populations and labor shortages in skill-intensive sectors have led many countries to pursue targeted policies to attract international talent. We study a migration reform in Sweden that offered international doctoral students from outside the EU an easier path to permanent residency. Implemented in 2014, the reform shortened the required period of residence from eight to four years, allowed these students to obtain permanent residency immediately after graduation, and granted their spouses a work permit during their doctoral studies. Using the European students as a comparison group in a difference-in-differences design, we find that the treated international students are 13.5 pp (23%) more likely to stay in Sweden three years after graduation. Higher settlement prospects also increase their language investments and marriage rates during the PhD. These effects are larger for cohorts that have longer exposure to the reform and for those who carry out their doctoral research in STEM. In addition, the reform raises both employment and language investments among the partners of the treated international students. Taken together, the policy increases permanent residency among international graduates as well as leads them and their families to make long-term choices conducive to integration.

Keywords: Human Capital, Parental Investment, Immigration, International Students

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*To Laila,
My partner in crime and kindness.*

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It takes more than a village

I have been looking forward to writing this part of the thesis. Whatever the end product of this academic journey turns out to be, I am glad – with the benefit of hindsight, of course – that I embarked on this journey. A key reason for this appreciation is the wonderful people I have met along the way and the incredibly kind support I have received from them. I will certainly miss many of them in the incoherent train of thought that is about to go off the rails in what follows.

Before we let this train wreak some sentimental havoc, a few cautionary notes are in order. Unlike the essays in this thesis, the following text will not attempt to economize on adjectives and adverbs. Neither will I try to be objective. One paragraph will not contain one ‘idea’ (if any at all) and they will often be devoid of a topic sentence. With the readers responsibly primed for these flaws, let me start.

Niklas, thanks for taking on an unruly supervisee who starts a new project every other Monday without any regard for time or resource constraints. I definitely needed the many reality checks that kept me in line (more or less – mostly less). At the same time, I deeply appreciate the independence I had to explore questions that interested me. I do not take for granted the delicate balance you had to maintain between these two, often conflicting objectives. The numerous candid conversations we have had on a wide range of topics, economic or otherwise, were also valuable, to say the least.

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There are a few who have now bravely spanned both the academic and the personal, graciously neglecting the costs that have come with that role. Mounir, what you have done to help Laila and me find a new home, is beyond my vocabulary to express how we feel about it. Olle, the one and only Culture Guru, and you have been extraordinary mentors and friends. The (too) many productive mornings the three of us have spent on Slack are almost surely the true memories Akin¹ and I have made along the way. You two have also

¹ Akin was a typo that came to life around ASWEDE 2023. He is believed to live somewhere on the Stockholm archipelago.

been instrumental in helping me build a portfolio on immigration, a topic that, although constituting a small part of this thesis, will possibly feature centrally in what I do in the next few years. Lastly, I wish I could channel my inner Torben to properly articulate how blessed we have been to have Torben, our friend (first) and neighbor (second), in our lives. You smiled at us the moment you first met us on the streets when you had no clue who we were and that smile, along with our many conversations, have left an indelible mark on our lives.

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² More appropriately, *Sir* Ali, yo. Again, we have not met in person; hence, I can not confirm whether you are real, not the least because your friendliness often appears too good to be true. Regardless, given our now-7-years-long collaboration, endless Zoom calls, and WhatsApp tirades against academia, I have an eerie feeling that I know you. You are to be held responsible for this feeling.

³ The latter, admittedly, is a figment of my imagination.

⁴ We can probably write an entire thesis on what happened – or did not happen – in our Pakistan trial.

⁵ Better known as Khalid Imran in the Anglo-Saxon world.

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Akib

Uppsala

⁶ You are now a friend and co-author, which, however, makes me question your judgment.

⁷ Answer: not that much.

⁸ Brace yourself for the upcoming rants.

⁹ For full disclosure, elaborating on some of the aforementioned first names: Niklas Bengtsson, Mounir Karadja, Laila Firdaus, Olle Hammar, Torben Mideksa, Alayne M Adams, Jed Friedman, Abu S Shonchoy, Agha Ali Akram, Avenia Ghazarian, Erik Lundberg, Gabriella Fleischman, Reshmaan Hussam, Erika Forsberg, Olof Rosenqvist, Saravana Ravindran, Takashi Kurosaki, Linna Martén, Jimena Romero Pinto, Steve Berggreen, Zeynep Atabay, Lucas Tilley, Raoul van Maarseveen, Ulrika Öjdeby, Madeleine Lindblad, Ali Rehan, Fatimeh Munawar, Gustav Lundström, Ibadullah Channa, Abhijeet Singh, Martina Björkman Nyqvist, Anna Tompsett, Douglas Almond, Chris Chibwana, Esther Wang.

¹⁰ For the uninitiated: My father, mother, elder brother, his wife, and the latter two's young kid, respectively.

¹¹ Paternal uncle, aunt, and their younger son.

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Introduction

Human capital, defined in the economic literature as the knowledge, skills, and health of individuals, plays a pivotal role in economic development. In both developing and developed countries, human capital is a major determinant of productivity and growth, as it influences both the capacity to produce goods and services and the innovation potential within an economy (Mankiw et al., 1992; Lucas Jr, 1988; Angrist et al., 2021). Gary Becker's seminal work on human capital theory underscores its value, proposing that investments in education and health are crucial for enhancing an individual's productivity and, subsequently, their potential earnings (Becker, 2009).

The formation of human capital is shaped by an array of socio-economic factors, among which the role of parents, the economic environment, and public policies are critical. Parental investment in the form of education and health for their children has long been recognized as a foundation of human capital development, as noted by Schultz in his discussions on investing in the 'human agent' (Schultz, 1961). These investments are highly responsive to the economic environment, which includes factors such as family income, job opportunities, and broader economic stability, influencing both the ability and the incentives for such investments.

Human capital investment during early childhood is crucial for setting the foundation for lifelong learning and economic productivity (Almond and Currie, 2011; Black et al., 2017). Research by James Heckman and others emphasizes that the earliest years of a child's life are when they are most receptive to learning, both cognitively and non-cognitively (Heckman and Mosso, 2014). Heckman argues that investments made during these formative years yield the highest returns compared to later educational interventions, a concept supported by his further analysis of the dynamics of skill formation (Cunha et al., 2010). This early investment not only boosts individual capabilities but also enhances societal welfare by improving economic outcomes and reducing social disparities. This is especially important for developing countries since missing investments in early childhood can lead to lower human capital accumulation and intergenerational transmission of poverty (Lu et al., 2016).

How do we design public policies to facilitate skill development during these early years? A series of small-scale efficacy trials from around the world have demonstrated the promise of home-visiting interventions that offer targeted support to families during the critical early years of a child's life (Grantham-McGregor et al., 1991; Heckman et al., 2010). These programs

typically involve trained professionals, such as nurses or social workers, visiting the homes of new and expectant parents to offer guidance on health, parenting practices, and child development. While the existing research can guide the design of such programs, the question remains as to how to sustainably scale these programs in low-income contexts, where 250 million under-five children suffer from sub-optimal physical and mental growth (Lu et al., 2016).

One pragmatic approach to address this issue is integrating early childhood development (ECD) programs into the existing public service infrastructure (Richter et al., 2017). While this model can exploit economies of scale and scope, challenges regarding at-scale implementation and unintended consequences such as crowd-out of resources from other public services can dilute program impacts (Araujo et al., 2021; List, 2022).

In the first essay, titled "*Early Childhood Human Capital Formation at Scale*", we design and administer a *natural* field experiment to evaluate a large-scale early childhood development (ECD) intervention that was integrated into Bangladesh's existing national nutrition program (Harrison and List, 2004). The ECD intervention, focusing on low-cost home-visiting interventions for over 18,000 children aged 3-18 months, provided materials and counseling on age-appropriate stimulation practices, without any extra financial incentives for service providers. This integration aimed to leverage the existing infrastructure to enhance the scalability and reach of ECD interventions in low- and middle-income countries.

Our results reveal that service providers in treatment areas partially shifted their focus from nutrition to ECD counseling, demonstrating an unintended substitution effect. The intervention also faced scale-up challenges owing to compliance and delivery. Only half of the households in the treatment group, for instance, received the program materials.

Despite these challenges in delivery and provider compliance, we find significant improvements in child cognition (0.17 SD), language (0.23 SD), and socio-emotional skills (0.12-0.14 SD), indicating the program's efficacy in fostering early human capital formation. Moreover, there were positive intra-household spillovers: older siblings (3-5 years old at baseline) were more likely to be attending school in the treatment communities. Driven by scale economies and these sizeable impacts, we estimate an internal rate of return of 18.9%, suggesting that the integration of ECD into existing public services could be a cost-effective strategy for human capital development in similar contexts.

Furthermore, we find that the reallocation of service-provider time away from child nutrition and towards ECD did not lead to adverse effects. We see better nutritional outcomes, with the intervention reducing wasting and underweight rates by 4.8 and 2.9 percentage points, respectively. This is consistent with models of multiple investment inputs in the production function for skills formation, where inputs exhibit diminishing marginal returns (Cunha et al.,

2010). We also find evidence of complementary parental investments, especially by mothers. The intervention led to greater involvement of mothers in household decision-making around child health and stimulation. Parents in the treatment communities increased their take-up of the preexisting nutrition program as well, with more visits to growth monitoring sessions. Lastly, we find larger gains for children in communities where service providers were more educated but less experienced (and thereby possibly more open to changing their interactions with parents).

By highlighting the potential for integrated services to produce substantial developmental gains, the chapter sets a precedent for the design of future public health and education programs. It suggests that careful planning and execution of integrated programs can overcome the typical challenges of scale, such as dilution of program impact and logistical complexities (List, 2022), thereby providing a model for other developing countries struggling with similar issues in early childhood development.

While human capital formation in the early years is shaped by parental investments at home (Knudsen et al., 2006; Andrew et al., 2024), educational institutions such as schools and universities play a critical role in adolescence and early adulthood (Mountjoy and Hickman, 2021; Beuermann et al., 2023). Skill acquisition at these institutions depends on the resources available (Jackson and Mackevicius, 2021) as well as on the organization of the educational environment (e.g., the design of the courses, class size, and peer composition) (Fredriksson et al., 2013; Figlio et al., 2024).

Across the world, international students have become an integral feature of higher education, contributing to both academic diversity and economic vitality (Kamm et al., 2022). The second essay, titled *"Introducing Tuition Fees for International Students in Sweden: Effects on Universities and Native Students"*, delves into the consequences of introducing tuition fees for these students on Swedish higher education institutions and native students. The policy shift in 2011 marked a significant transition aimed at balancing university budgets and modifying international student demographics.

For a causal evaluation of the reform, I use two variations in a difference-in-differences design: the timing of the reform and the differences in the pre-reform share of international students across the faculties, a proxy for the potential exposure of a faculty to the reform. I find that the reform led to a significant, lasting reduction in cohort size and change in composition due to a decline in international students, partially offset by increased native enrollments. I do not find any compositional changes – in terms of age, gender, or pre-enrollment academic performance – for natives who enrolled in the exposed faculties after the reform.

The study further evaluated the reform's impact on academic and labor outcomes of native students, revealing no significant changes in graduation or employment rates. However, the labor earnings of native students enrolling in

affected faculties rose by over 8% four to five years post-registration, particularly among those with higher academic achievements at entry.

Faculties previously attracting more international students also responded, offering more Master's programs. These shifts in cohort dynamics and program offerings, coupled with possible reductions in class sizes, likely contributed to the observed increase in the labor income of native students.

During a time when numerous countries are implementing policies concerning the admission of international students, this study provides empirical evidence of how such policies might impact both universities and domestic students. The findings suggest that while the introduction of tuition fees presents challenges, it might also offer opportunities for universities to enhance educational offerings. The long-term effects on internationalization and academic quality remain areas for further research, as institutions continue to adapt to these financial changes.

The educational choice of adolescents and young adults is shaped not only by what the schools and universities offer but also by opportunities in the labor market. For low-income settings in particular, the schooling responses to new job opportunities depend on the prevalence of child labor (Bau et al., 2020) as well as the nature of the jobs in terms of the returns they offer to education (Adukia et al., 2020). Income from these new jobs may increase the demand for schooling, especially for liquidity or credit-constrained households. On the other hand, better labor market opportunities raise the opportunity cost of staying in school. The third essay, titled "*Economic Opportunities and Human Capital Investments: Evidence from Artisanal Gold Mining in Africa*", presents an empirical investigation of this potential trade-off.

In this essay, we study whether the emergence of job opportunities in artisanal and small-scale mining, induced by the rise in the global gold price, affects the schooling decisions of children and young individuals in sub-Saharan Africa. Over the past two decades, surging gold prices have significantly expanded the industry, now employing 60 million people and indirectly supporting 130 million more. While the increased income from these jobs might boost parental interest in educating their children, the heightened labor demand could also raise the opportunity costs of schooling, making the overall impact a subject for empirical analysis.

Our empirical approach leverages two types of plausibly exogenous variation. Rather than focusing on the actual locations of mining sites, we use data on the suitability of a given location for artisanal gold mining. This provides spatial variation in households' access to potential mining activities. Additionally, since artisanal gold miners generally are price-takers, we also use the temporal changes in the global gold price, which directly affect revenues from mining activities. Conceptually, this resembles a difference-in-differences methodology, comparing households in areas of high versus low potential for mining and during times of high versus low gold prices. For data on school-

ing and demographics, we pool 45 waves of Demographic and Health Surveys (DHS) covering close to 1.4 million individuals across 14 countries in sub-Saharan Africa and spanning the period 2000-2018.

We find that rising global gold prices leads to a decline in the school attendance of children residing in regions conducive to gold mining. This impact is more pronounced among youths aged 11 to 20. Specifically, during periods when gold prices nearly triple, such as that from 2005 to 2010, there is a notable decrease in school attendance by 3.1 percentage points among children aged 11 to 15. Furthermore, our findings highlight the gender-specific effects of labor demand shocks, with a more pronounced decline in school attendance among boys, possibly due to their suitability for physically demanding mining work.

Our results suggest that the income benefits from artisanal and small-scale mining may not be sufficient to outweigh the increased opportunity costs. Inadequate regulation and a lack of formal child labor laws likely exacerbate this impact on children's educational investments. This study contributes to the broader discourse on the resource curse and its implications for human capital development in developing economies (Sachs and Warner, 2001). Our results could guide policy development aimed at boosting school attendance, such as reducing the opportunity costs of education through conditional cash transfers or stricter enforcement of child labor laws.

Both at school and in the labor market, an individual's (perceived) options, and thereby the possibilities of differentiating him/herself from their siblings, are potentially affected by their family's resources, preferences, and expectations, all of which may vary by socioeconomic status (SES). In Essay IV, titled *"Do Sibling Correlations in Skills, Schooling, and Earnings Vary by Socioeconomic Background? Insights from Sweden"*, we shift our attention back to Swedish society to document and understand variations in sibling similarity across the socioeconomic spectrum.

In this essay, we present a detailed analysis of sibling similarities in skills, schooling, and earnings across granular groups defined by parental SES. Our findings indicate a consistent pattern where sibling correlations typically diminish with increases in parental SES. This trend is evident in educational attainment, mid-life earnings, and cognitive abilities, influenced by both higher income and educational levels of parents, whereas correlations in non-cognitive abilities decline only with higher parental income.

The observed patterns in sibling similarities can be shaped by both between-family and within-family variations. We find that increases in within-family variation with parental SES lead to lower sibling correlations in income and education, while a relative decrease in between-family variation drives the decreasing correlations in skills. This nuanced outcome suggests that the higher disparities in education and earnings among siblings from higher SES backgrounds are not primarily driven by differences in skills. It appears that high-

ability children from lower SES backgrounds are unable to fully realize their potential, aligning closely with their less-able siblings, as highlighted by prior research.

Moreover, our study underscores that individuals from high SES backgrounds are more influenced by personal abilities and resources, whereas those from low SES backgrounds face constrained opportunities for personal development. This distinction is crucial for understanding socioeconomic inequalities, particularly in Sweden—a welfare state where sibling correlations are generally lower than in other industrialized nations. Further research from different countries, employing similarly granular data, will be essential for deeper insights.

Finally, skilled immigration plays a crucial role in enhancing the human capital base of host countries. This inflow of skilled labor through immigration can help mitigate demographic challenges such as aging populations and labor shortages in critical sectors. Moreover, Stuen et al. (2012) show that skilled immigrants contribute to technological advancement and innovation in their host countries, which are key drivers of economic growth. These contributions are significant in that they not only increase the direct productivity of industries but can also enhance the overall human capital stock through knowledge transfer and diversification.

The role of international students is particularly significant in the context of human capital accumulation through immigration. Many developed countries leverage their higher education systems as a means to attract young talent from around the world, who often choose to remain after their studies. This phenomenon, often referred to as "brain gain", benefits the host country by integrating highly educated individuals into the workforce.¹

However, the integration of immigrants, including international students, into the labor market is not devoid of challenges. Issues such as recognition of foreign qualifications and restrictive rules around settlement can hinder the full utilization of immigrant skills. In Essay V, titled "*Permanent Residency Policy and Skilled Immigration: Evidence from a Swedish Reform*", we examine the effects of a Swedish policy reform in 2014, which offered an easier pathway to permanent residency, on the long-term residency decisions of skilled immigrants. We also assess how such changes in permanent residency requirements influence immigrants' integration measures such as language acquisition as well as family formation. The reform, aimed at making Sweden more attractive to skilled foreign workers, appears to have positive implications for both integration and long-term residency intentions.

¹Theoretically, it is plausible that this may result in "brain drain" in the countries of origin (Bhagwati and Rodriguez, 1975). However, by raising the expected returns to schooling, migration opportunities can also motivate educational investment in the home country. Since not everyone will get the opportunity to migrate, this can increase the aggregate skill levels in the origin country (Abarcar and Theoharides, 2024; Shrestha, 2017).

Using a difference-in-differences approach with Swedish and European students as the comparison group, we find that the reform boosts long-term residency rates among international doctoral graduates by 23%. This emphasizes the critical role of residency policies in skilled immigration, in line with host countries' objectives to attract and retain global talent essential for maintaining a competitive advantage in the knowledge economy.

Applying a shift-share instrumental variable design, we also examine the impact of international students' post-graduation entry into the local labor market on Swedish and European peers. Combining the pre-reform variation in the share of international peers across different research fields and the shift offered by the reform, we do not find any evidence of displacement. Instead, we observe a suggestive increase in European students choosing to stay in Sweden, potentially indicating that our estimates of the reform's effects on international students' residency decisions might be conservative.

Furthermore, the reform enhances language skills acquisition among international students during their PhD, highlighting how long-term residency incentives promote integration and acquisition of host-country-specific skills. We also note significant impacts on family formation: the reform encourages marriage and reduces separation rates among international doctoral students, illustrating how migration policies extend beyond economic outcomes.

These effects are more pronounced in cohorts aware of the reform early in their doctoral studies, underscoring the importance of timely information about long-term residency prospects. These individuals make proactive decisions about settlement, skill acquisition, and family matters. Our study also finds that the reform's impacts on long-term residency and language skills are higher among male students and those undertaking their doctoral research in STEM fields.

Additionally, the reform facilitates labor market entry for international students' partners and allows joint applications for permanent residency. Our analysis confirms a significant increase in both language program enrollment and employment among these partners.

In sum, this study enriches the discourse on skilled migration by highlighting the strategic importance of long-term residency prospects. While existing literature often focuses on economic incentives such as tax benefits, our results underline the potential of immigration policies that provide greater residency certainty. We also extend the discussion to the linkage between permanent residency and language acquisition, areas previously dominated by research on refugees and lower-skilled workers. Finally, our findings reveal the broad societal impacts of residency policies, including on family dynamics and partner effects, demonstrating the comprehensive influence of such policies on the immigrant community.

Collectively, the five essays examine how different economic and policy environments influence human behavior and development. From early child-

hood interventions in Bangladesh to economic opportunities in artisanal mines in Africa, and from education economics in Sweden to immigration policies, each chapter contributes unique insights into the complex interplay between policy environments and human capital development around the globe. A recurring theme across the chapters is the significant impact of policy decisions on educational and economic outcomes, highlighting the need for policies that are informed by comprehensive empirical research.

The essays in this thesis also highlight the role of rigorous causal inference in identifying the factors that shape human capital investments and skilled immigration. This entails two key components: the use of micro-data and the application of state-of-the-art tools of causal inference to isolate cause and effect. The essays use data collected through primary household surveys in low-income contexts along with full-population administrative data from Sweden. These detailed, representative datasets, combined with experimental and quasi-experimental methods, help us better understand how individuals make critical choices in the areas of human capital investment and migration as well as the external factors that influence these choices (such as economic environment, family background, and public policies). This is crucial for policymakers who rely on empirical evidence to craft interventions that effectively enhance educational outcomes and optimize immigration systems to attract global talent. Such clarity ensures that investments in human capital are directed and implemented effectively, maximizing their impact on both individual and economic growth.

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