DISSERTATION

ESSAYS ON MIGRATION AND TOURISM IN GEORGIA

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ABSTRACT

ESSAYS ON MIGRATION AND TOURISM IN GEORGIA

In the context of the Georgian economy, migration, tourism, and agriculture are fundamental sectors, each significantly influencing the country's socio-economic structure. Migration, driven by economic opportunities and geopolitical factors, impacts labor markets, remittance flows, and cultural diversity. Although emigration has historically led to challenges such as brain drain, remittances from Georgian migrants support household incomes and contribute to GDP. Tourism leverages Georgia's cultural heritage, scenic landscapes, and urban attractions to draw international visitors, creating jobs and generating foreign exchange. Agriculture, with its deep historical and geographical roots, remains crucial for food security, export earnings, and rural livelihoods, benefiting from the diverse crops grown in Georgia's fertile soils.

As Georgia progresses economically, understanding and leveraging the interactions between migration, tourism, and agriculture is essential. This requires thorough examination and expansion of existing research to gain deeper insights into their socio-economic impacts. Only through such detailed analysis can policymakers develop strategic policies and make informed decisions. This dissertation aims to represent one small step towards this goal.

Since 1990, over one million individuals, comprising about 25% of the country's population, have emigrated from Georgia due to political instability, security concerns, and socioeconomic challenges. Among the 25 East European and former Soviet countries, only Albania and Kazakhstan have experienced a greater proportion of population loss through emigration. Women constitute over half of all migrants, 39% of Georgian children reside in households with at least one migrant family member, and 19% of children live in households that receive remittances. Public discussions surrounding migration have subtly evolved: the stigma attached to independent female

migrants for "abandoning" their families has gradually given way to an acknowledgment of their role in ensuring household survival.

The first chapter of this dissertation examines the relationship between remittances and the education outcomes of children left behind. We use the 2012 household survey collected by Maastricht University and the International Centre for Social Research and Policy Analysis and measure the impacts on education outcomes of children between 11 and 18 years old. We estimate results for being a high academic performer (probit model), and average academic scores (OLS model). Our findings show that remittances do not impact children's school performance. When we control for migrant characteristics, we find that the migration of a female household member negatively impacts the child's school performance. To further investigate the impact of migrant gender on school performance, we analyze the child's current caregiver arrangements. The results show that a child's education outcomes are negatively impacted when mother is abroad and father is a caregiver. The impact is larger for girls than for boys. We do not find statistically significant evidence of adverse effects when fathers migrate and mothers are caregivers, or when both parents migrate and grandparents are caregivers. Remittances do not have a statistically significant impact in any of our specifications (in rural or urban settings, for daughters or sons).

The dissolution of the Soviet Union drastically transformed the Georgian economy. High rates of unemployment and poverty, prompted the government to reconsider its economic strategies. Recognizing the need to diversify the economy, particular emphasis was placed on boosting the tourism sector. From 2009 to 2016, Georgia had one of the fastest-growing tourism sectors in the world. The number of international visitors quadrupled, and the tourism revenue as a share of GDP increased eight-fold. Despite the pivotal role played by tourism development in Georgia's economic landscape and policy formulation, its effects have not been extensively studied. There is no research indicating that the development of tourism in Georgia leads to sustainable economic growth.

The second chapter investigates the impact of tourism development on economic growth. We utilize the autoregressive distributed lag bounds testing (ARDLBT) model, examining both annual data spanning from 1997 to 2019 and quarterly data from 2011 to 2019. The annual data results for the trivariate model (real GDP, tourism, real effective exchange rate) confirm Aliyev and Ahmadova's (2020) findings. Cointegration tests indicate the relationship between tourism and economicyali growth, a 1% increase in tourism arrivals is associated with a 0.14% decrease in real GDP. However, once we add agriculture (AGR) and foreign direct investments (FDI) as additional controls we do not find the long-run relationship between tourism and real GDP to be statistically significant. These conclusions are consistent across various model specifications and are further supported by our analysis of quarterly data. In terms of other tourism impacts, we find tourism to have a positive impact on the real effective exchange rate (REER), a 1% increase in tourism development is associated with a 0.08-0.19% increase in REER in the long-run. Additionally, tourism demonstrates short-term correlations with agriculture (AGR) and foreign direct investment (FDI), with a 1% increase in tourism development corresponding to increases of 0.11-0.49% in AGR and 1.07-1.46% in FDI.

The third chapter evaluates the effects of protected areas on land use and income distribution, focusing on changes in tourism and agricultural production in a theoretical framework. Our findings show that conservation policy has economic and environmental consequences even when it does not directly intersect the agricultural frontier. The establishment or expansion of the protected area tends to attract more visitors. The growth of tourism and agricultural sectors will raise nominal wages and agricultural prices. The extent of these changes will determine whether inequality increases or decreases.

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Impact of Remittances on Education Outcomes of Children in Georgia

1.1 Introduction

According to the World Bank, around 1.1 million Georgian migrants were living abroad in 2010 (24.9% of the population). Among the 25 East European and former Soviet countries, only Albania and Kazakhstan lost a larger percentage of their populations to emigration. It is estimated that 39% of Georgian children live in households with at least one migrant family member, and 18.9% of children live in migrant remittance-receiving households (Vanore, 2015). The empirical literature investigating the effects of migration on children's education outcomes in Georgia is limited. Moreover, the studies show mixed results (Chappell et al., 2010; Gugushvili, 2013; Cebotari et al., 2016).

This study investigates the impact of remittances on education outcomes and examines conditions under which children's education benefits or suffers. Cebotari et al. (2016) find that remittances do not correspond to significant differences when it comes to children's education in Georgia. In addition, they find that fathers' migration when mothers are caregivers worsens education outcomes. They do not find similar adverse effects on children's school performance when mothers migrate, and fathers are caregivers, or when both parents migrate, and grandparents are caregivers. Intrigued and inspired by Cebotari et al. (2016)'s study, this paper aims to test the robustness of their findings by (1) utilizing average academic scores as dependent variables, and including additional controls, (2) incorporating Ordinary Least Squares (OLS) regressions to compare binary results of being high performing student with impacts on actual academic scores, (3) estimating impacts within migrant households, in addition to all households, and (4) comparing variations across rural-urban settings, and between daughters and sons.

To estimate the impact of remittances on children's education outcomes, we use a binary variable for being a high academic performer and actual average academic scores. We find that girls are more likely to perform better in school. We also find a positive correlation between the mean education level of adults and a child's school performance. Older children and children living in urban areas are less likely to have high academic scores. The variable of interest, remittance receipt, does not have a significant impact in any of our specifications, even when we control for parental migration and different caregiver arrangements. These findings are consistent with Cebotari et al. (2016)'s findings, where the authors find child's age and child's gender to have significant impacts on child's school performance in Georgia and do not find any significant impact for the remittances. However, Cebotari et al. (2016) find father's migration to have a negative impact, while we find the opposite effect. Our results suggest that the child is less likely to perform well in school when mother migrates and father is a caregiver. We do not find statistically significant evidence of adverse effects when fathers migrate and mothers are caregivers, or when both parents migrate and grandparents are caregivers. The results across studies might be different due to variations in model specification: 1) to measure education outcomes we use actual academic scores instead of self-reported or caregiver-reported education performance, 2) we include migrant characteristics as additional controls, and 3) we estimate impacts within migrant households.

1.2 Migration and Remittances in Georgia

Georgia provides a relevant context for exploring the influence of migration on child's education outcomes, given its recent history of substantial emigration and the significant role of the extended family, particularly grandmothers, in child-raising. Women represent more than half of all new migrants (Labadze and Tukhashvili, 2013), including a growing number of mature women who migrate to support their children and grandchildren financially. Over the past decade, public discourse around migration in Georgia has shifted subtly: while there was once a stigma attached to independent female migrants for "abandoning" their families, there is now a growing recognition of their role in ensuring household survival (Hofmann and Buckley, 2013).

Despite the increasing involvement of women in international migration and the sustained rates of emigration, there has been limited research on the potential impacts of migration on families in Georgia. Multigenerational households are common, reflecting traditional practices of marriage mobility and caregiving. Traditionally, the youngest son would remain in the parental home to care for aging parents, while women were expected to move to their husbands' households. Although attitudes and practices related to co-residence have evolved, elderly individuals often still live with their children's families, resulting in multigenerational households where childcare responsibilities are shared among extended family members (Badurashvili et al., 2008). Maternal grandmothers often play a vital role in childcare, which may facilitate the transition of mothers into international migration. According to Hofmann and Buckley (2012), the delegation of childcare duties to grandmothers allows migrant women to pursue migration without feeling as though they are abandoning their children.

Although teachers in Georgia perceived left-behind children to have a good relationship with their caregivers, they primarily considered parental migration to have a negative impact, leading to problems in a child's mental health, well-being, and academic performance (Antia et al., 2022). Teachers often attribute lower school grades to parental absence. However, some argue that children from disciplined families with supportive, relatively young caregivers still manage to perform well academically. In Antia et al.'s (2022) study, most interviewed school principals and class tutors described children of migrant mothers as more vulnerable than children of migrant fathers. In their view, children see mothers as role models; after migratory separation, mothers sometimes become an inspiration for children, they even paint mothers' portraits in art classes. Caregivers, usually grandparents, are seen as supportive, but the age of the caregivers is considered an important factor in the quality of care provided. Older grandparents may face challenges in fully engaging in a child's upbringing due to chronic illnesses, increased workload, and other difficulties. This highlights the importance of examining how children's educational outcomes correlate with various forms of family migration.

1.2.1 Migration Profile of Georgia

Political instability, security threats, and socioeconomic problems have been the key push factors of migration from Georgia. Emigration as a percentage of the total population increased from 13% in 1980 to 26% in 2000 (OECD, 2017). The out-migration was largest during the years following the dissolution of the Soviet Union. It is difficult to identify the main driving factor of migration from Georgia. During the total, political, and economic stagnation period (1991-1994) factors ranged from economic and societal to political and personal reasons.

According to the World Bank, there were 1.1 million Georgian emigrants (24.9% of the population) in 2010.[1] Although the estimates of total Georgian emigration vary significantly, the UNDESA estimate for the same year is only 734,065 (17.3%) (OECD, 2017). Figure 1.1 shows that the numbers provided by the Georgian Statistical Institute (GeoStat) are also different. Despite improving migration statistics, data on annual migration flows in Georgia remain incomplete for three reasons (OECD, 2017):

1. Data are not collected on the countries of destination; emigrants' level of education and the length of time emigrants have spent abroad.

2. Using host country statistics is challenging as many Georgian migrants are not registered in their destination countries.

3. Before 2012, the data collected by the Georgian Statistical Institute (GeoStat) was not consistent with international standards, notably defined by the United Nations, and therefore was not comparable to other countries.

Migration of Ethnic Minorities

Under Soviet rule, emigration from Georgia within the USSR was possible but beyond the USSR borders was largely controlled and limited. In the first years following the dissolution of

[1] According to the UN, in 2005-2010 Georgia had the highest negative average rate of external migration among all post-Soviet countries (-11.5 per 1,000 persons). Based on the most recent data from the World Bank, Georgia ranked 22^{nd} in terms of remittances as a percent of GDP (15.6%). Georgia was also among the top 20 origin countries of asylum applicants in OECD countries in 2021-2022.

the Soviet Union, migration among Georgia's ethnic minorities grew. In the late 1980s, Greece offered residency rights to anyone proving Greek descent, leading about one-third of Georgia's 95,000 ethnic Greeks to emigrate by 1993 (De Waal, 1994). Many Georgian Jews migrated to Israel. The ethnically motivated migration flows formed the social networks linking Georgians to former compatriots in Israel, Greece, and other countries. The share of ethnic minorities in Georgia decreased from 29.9% in 1989 to 16.2% in 2002. As Badurashvili and Nadareishvili (2012, pg. 6) stated, "by 2002, Greeks, Ukrainians, and Jews had all disappeared, while 80% of ethnic Russians and more than half of the substantial ethnic Armenian population had departed from Georgia" .

> ...on the eve of dissolution of USSR, Georgia was being led by political newcomers, inexperienced elite who tried to establish themselves at the helm using the easiest possible way – political slogans. But some influential representatives of political elite managed to use the slogans so that patriotism became perceived as unrestrained nationalism. In those days several statements made by political figures concerning ethnic non-native population, which influenced mass consciousness, caused the feeling that a sharp rise in intolerance was happened. Uncertain and anxious, the people of different ethnic groups who did not feel themselves as "native" decided to emigrate.
>
> (Gachechiladze (1997, pg. 27))

The number of ethnic minorities continued to decline during the 2002-2014 period. The number of ethnic Azeris living in Georgia declined from 285,000 to 233,000, the number of Armenians from 249,000 to 168,000, and the number of Russians from 68,000 to 26,000, while the number of Ossetians fell from 38,000 to 14,000 (SCMI, 2017).

Economic Migrants

Georgia was the first non-Baltic Soviet republic to declare its secession from the Soviet Union in 1991. The breakdown of the USSR was vastly peaceful, but the transformation of the command economy into a market economy was troublesome. Among the post-Soviet Union countries, Georgia experienced the largest, 44.9% drop in GDP in 1992. Industry output fell by over 80%, and by 1994 Georgia's nominal GDP shrank to one-third of its 1990 value (from $7.8 billion to $2.5 billion).

After the Rose Revolution in 2003, the Georgian government implemented various social, political, and economic reforms, and was recognized as one of the world's fastest-reforming economies by the World Bank. Georgia ranked 7^{th} in the 2020 World Bank's Ease of Doing Business, 12^{th} in the 2020 Economic Freedom Index, and 45^{th} out of 180 countries in the 2020 Corruption Perceptions Index reported by Transparency International.

> Economic reforms, along with increased political stability and security, have fostered an increase in immigration flows, however, have not reduced emigration levels, since compared to the main destination countries of Georgian migrants, the Georgian economy can only provide limited opportunities for employment, social assistance, and quality of life.
>
> (SCMI (2017, pg. 10))

Internally Displaced Persons (IDPs)

The economic stagnation was accompanied by political turmoil and territorial conflicts in two regions of Georgia, South Ossetia (1991-92) and Abkhazia (1992-93). According to United Nations High Commissioner for Refugees (UNCHR) over 300,000 persons or about 6% of Georgia's total population were internally displaced during these conflicts. Based on the 2002 population census, a significant share of migrants, around 35%, were internally displaced persons (Badurashvili and Nadareishvili, 2012). After the war with Russia in 2008, Georgia lost the last areas it controlled in South Ossetia and Abkhazia, and Russia subsequently recognized the independence of both regions. Hundreds of people were killed, thousands were injured, and more than 138,000 persons were internally displaced to and within Georgia. IDPs currently residing in Georgia are comprised of two major groups: the first wave of IDPs that were displaced in 1990-1993 during the conflicts in occupied Georgian regions of Abkhazia and South Ossetia ("old" caseloads); and the second wave of IDPs, displaced during the Russia-Georgia war ("new" caseloads). The number of registered IDPs in 2016 was around 268,000 (7% of the population). As of 2016, 56% of IDPs from Abkhazia and 27% of IDPs from South Ossetia continued to live in collective housing centers.

Migrant Characteristics

Based on the 2014 population census results, 75% of emigrants are 20-54 years old. On average, migrants are younger than non-migrant adult household members (OECD, 2017). In terms of labor efficiency, emigrants are at their prime working age, and the outflow of this cohort group hurts the economic and demographic situation of the country.

Around 43% of Georgian migrants are women (SCMI, 2019). The gender ratio varies significantly across the destination countries. Young, well-educated Georgian women migrate to Western Europe and the US. Figure 1.2 shows that 64% of women migrate to Greece, Italy, and Turkey, compared to only 16% of men, who primarily emigrate to Russia and Ukraine (OECD, 2017).

Seven to eight of ten migrants from Georgia have a secondary or higher education degree; half of the Georgian migrants hold a university degree (Badurashvili and Nadareishvili, 2012). People with higher education in Georgia are up to four times more likely to emigrate to a high-income country (Dermendzhieva, 2011). For a large portion of Georgian migrants, emigration triggers de-qualification and harms the retention and growth of skills. In most cases, migrants are underemployed as they often perform labor that does not require such high education. Women are predominantly employed as caregivers for the elderly, and as auxiliary workers in the service sector, while men mainly work in the construction sector.

The main reasons why Georgian nationals left Georgia were to search for a job, take a job, or financially support their families (80% of responses) (OECD, 2017). Emigrants leaving to pursue their education abroad went to Russia (29%), Germany (29%), the United States (9%), and the United Kingdom (9%). Two-thirds of Georgian migrants have settled in the territory of the Commonwealth of Independent States (CIS). The introduction of visa-free travel with the EU in 2017 rapidly increased migration to Europe. Around 60% of Georgian nationals with valid residence permits live in Greece, Italy, and Germany (SCMI, 2019).

1.2.2 Remittances

Migration can have both positive and negative impacts on a sending country. From a macroeconomic perspective, it affects labor markets, remittances, and economic growth. Where labor markets are congested, such as those in Georgia (World Bank, 2013), the emigration of workers can open up job opportunities for the unemployed or underemployed. In addition, as emigration decreases the labor pool in the sending country and might lead to increases in wages and incomes of the remaining workers. It can also lead to a shortage of skilled labor, affecting productivity and economic growth. Based on the State Commission on Migration Issues of Georgia (SCMI, 2015) report, Georgian emigration results in the aging of the population, a decrease in the size of the female population, a decrease in the size of the rural population, threatening depopulation of certain areas due to internal and international migrations. In addition, emigration from Georgia has led to a "brain drain", with many skilled professionals leaving the country.

Remittances from migrants can be a substation source of income for families left behind, contributing to increased consumption and poverty reduction. In the case of Georgia, remittances also mitigate high negative current account balances. From microeconomic impacts, remittances provide important financial resources for education, healthcare, and entrepreneurship, which are crucial for human capital development.

For many developing countries remittances represent an important source of foreign funds, both in terms of absolute numbers and as a share of GDP. During 1998-2004, the inflow of remittances to Georgia remained stable. In the following decade, the inflows increased more than fivefold, from \$300 million in 2004 to \$2 billion in 2014 (OECD, 2017). Figure 1.3 shows that during 2009-2014 and starting in 2017 the annual volume of remittances exceeded the annual inflow of FDI. In 2013 FDI amounted to \$942 million, while the remittances transferred through the formal channels were at \$1,477 million (SCMI, 2015). The share of remittances fell slightly in 2009, mainly due to the global financial crisis, and in 2015 due to the financial crisis in Russia. Russia, Italy, and Greece were the biggest remittance-sending countries in 2019. The share of remittances from Russia has been decreasing and in 2016 it reached its lowest level of 34% (SCMI, 2017).

The other major remittance-sending countries include the United States, Israel, Turkey, Germany, Ukraine, and Spain.

Although the Georgian economy is not over-dependent on remittances, these transfers play a major role in its economy. According to SCMI, 71% of migrants send remittances to their families. For half of the remittance-receiving families, remittances are the main source of household income. Remittances in Georgia are primarily spent on consumables, and investment of remittances in so-called productive activities is rather low. The shares of remittances spent on healthcare-related and educational expenses are also low.

1.3 Literature Review

Migration can affect children's education through several channels. Remittances might help free up savings to invest in children's education (Edwards and Ureta, 2003; Hanson and Woodruff, 2003; Yang, 2008), and may also reduce the need for children to work within or outside the household. However, the absence of emigrant parents or adult members from a household might reduce the level of child supervision and education support. The empirical literature investigating the effects of migration on the education outcomes of children in Georgia is limited. Moreover, previous findings show mixed results.

Using 2005 cross-sectional household surveys, Dermendzhieva (2011) analyzes the impact of migration on education spending and on the presence of a family business in Armenia, Azerbaijan, and Georgia. Logit estimation results show that migration of a household member is associated with a higher probability of running a business in the capital cities of Armenia and Azerbaijan, but not in the capital city of Georgia. Dermendzhieva's (2011) findings also show that higher incomes from abroad are not associated with a higher probability of spending on education in Georgia.

Gugushvili (2013) and Chappell et al. (2010) on the contrary, indicate a positive relationship between remittances and expenditures on education. Gugushvili (2013) argues that remittance-receiving households spend more on education and report higher educational enrollments in urban areas. Similarly, Chappell et al. (2010) find that remittance-receiving households increase their expenditures on education by $39 per year (2.9% of average annual remittance receipts, 1.7% of average annual household income in Georgia). The larger shares of remittances are spent on immediate consumption goods, therefore remittances overall have only a marginal effect on human capital formation. It has been argued that remittances are much more strongly and positively correlated with spending on education and healthcare in cities than in rural areas. (Gugushvili, 2013).

Cebotari et al. (2016) use large-scale household surveys from Moldova and Georgia and compare the education outcomes of children living in migrant households and non-migrant households. Their findings show that remittances do not correspond to significant differences in children's education outcomes. Cebotari et al. (2016) find that fathers' migration, when mothers are caregivers, worsens education outcomes. No such evidence of adverse effects on children's school performance is found when mothers migrate and fathers are caregivers, or when both parents migrate and grandparents are caregivers. Using the same dataset, Gassmann et al. (2018) define a multidimensional well-being index comprised of six dimensions of wellness: education, physical health, housing conditions, protection, communication access, and emotional health. Their findings indicate that children in families with migrant household members have higher probabilities of attaining well-being in the domains of communication access, housing, and combined well-being index, but are worse off in the dimensions of emotional well-being.

According to Zurabishvili and Zurabishvili (2010) to "(re-) gain respectability from the family left apart" Georgian female migrants try to send remittances more and more frequently. The female migrants themselves do not take any days off, limit all their private expenses, work extra hours, and end up with serious health problems. It also has been reported by both men and women in Georgia, and by migrants and non-migrants that "females are better migrants than males because they can earn and send home more money" (Lundkvist-Houndoumadi, 2010, p.51). Buckley et al. (2008) find that Georgian women suffer from the "local norms stigmatizing the absence of woman from the family and neglecting family responsibilities". Narratives of condemnation and admiration of the emigrated women exist alongside each other.

Torosyan et al. (2016) investigate the effects of migration on household tasks in Georgia. They find that male migration tends to exacerbate gender differences in the household while female migration tends to ameliorate them. Migration experience increases the probability of doing male tasks among female household members (the effect of more involvement of males in female tasks is not robust). In addition, migration lowers the probability of leisure activity for all household members (Torosyan et al., 2016). Male return migrants are less likely to perform female household tasks than otherwise similar males who have not migrated, but the male partners of female migrants are more likely to engage in "female" housework after their partners return.

The findings on the impacts of migration vary across other countries. Kroeger and Anderson (2014) analyze the effects of remittances on children's education and health outcomes in Kyrgyzstan. They utilize integrated household surveys for the 2005-2009 period and use fixed effects and instrumental variable estimation. Kroeger and Anderson (2014) do not find remittances to be correlated with the school enrollment of children 6-18 years of age, however, they find a negative correlation between remittances and the school enrollment of boys aged 14-18. For health outcomes, they find a higher likelihood of malnourishment of younger girls in remittance-receiving households.

In contrast, Acosta (2011) finds positive impacts for girls in El Salvador. Remittances increase school attendance of girls, while on average no such benefits are found for boys. Similarly, a greater fraction of resources is spent on girls relative to boys in Mexico when the head of household is away (Antman, 2011).

Research on parental migration indicates that children of migrant parents, especially migrant mothers, are less likely to be happy compared to children in non-migrant households (Jordan and Graham, 2012). The absence of both parents at some stage of children's life adversely affects children's school achievement. Exposure to mother's migration also negatively affects children's height-for-age and weight-for-age in China, whereas the effect of exposure to father's migration is negative but often not precisely estimated (Meng et al., 2015).

1.4 Data and Methodology

1.4.1 Data

This paper uses 2012 household surveys collected by Maastricht University and the International Centre for Social Research and Policy Analysis in Georgia. The data is cross-sectional and nationally representative. A total of 4,001 households were interviewed. 2,404 households had at least one child living in the household, and 969 households had a child and a family member living abroad at the time of the interview. The survey consists of multiple questionnaires and was administered to the head of the household, the main caregiver of the indexed child (in some cases, this is the head of the household), a child (11-18 years old), and the elderly family member (60 years or older).

In our study, we refer to four main subgroups of the dataset. For the summary statistics and the remittance regression analysis, we use household observations. By "All Households" we refer to all families regardless of having children or migrant members. By "Migrant Households" we refer to families that currently have a migrant family member. For measuring impacts on education outcomes, we use individual observations for children 11-18 years old. By "All Children" we refer to children enrolled in school. By "Children in Migrant Households" we refer to children enrolled in school, who live in families with a migrant family member.

To identify variables that can explain selection into migration, we first estimate the marginal effects for the likelihood of being a remittance-recipient household. The likelihood of being a remittance-recipient family is influenced by both household characteristics and migrant/sender characteristics, hence we include these variables as regressors in our analysis. For constructing the dependent variable, remittance receipt, we use two questions from the survey: 1. Have household members received monetary remittances from [migrant] in the past 12 months? 2. In the last 12 months, did your household receive remittances from anyone we have not talked about yet? The second question captures remittances sent by non-household members.

After identifying the determinants of the remittance receipt we estimate the impact of remittances on the children's education outcomes. Using the average school grades we construct a binary variable, where 1 indicates an average score of 9 or 10.[2] We then estimate the impacts of migration on actual average scores.

1.4.2 Empirical Strategy

The main purpose of the study is to find robust estimates of the impact of remittances on children's education outcomes. The equation of interest is a treatment effect of remittances:

$$Y_{ij} = \alpha R_j + \beta X'_{ij} + \gamma Z'_j + \omega M'_j + \mu_{ij} \tag{1.1}$$

where Y_{ij} is a measure of education outcome for child i in a household j and is related to the variable of interest remittance receipts, R_j. The dependent variable is also related to a set of characteristics (X_{ij}) for child i, a set of household characteristics (Z_j), a set of migrant characteristics (M_j), and a term associated with unobserved heterogeneity for the individual (μ_{ij}).

Given the binary expression of the dependent variable, high academic performance, we first estimate a probit model. We then estimate the Ordinary Least Square (OLS) model to measure impacts on actual scores. For the control variables, we include the child's characteristics: child's age, child's gender, child being oldest, and child disability. We use two questions from the survey to code child disability variable: 1. Does [child] have a registered disability? and 2. Does [child] have any long-term health problems that affect his/her daily life?

To control for the variation in the household characteristics we include household head age, gender, marital status and education level, household size, number of elderly (65 years and above), number of children (under 5 years), number of children (11-14 years old), mean education level of adults (19-64 years old), share of unemployed adults, and asset index. We also include geographic variables for urban locations and regions. The measures of household size, number of elderly, and number of children only include members living in Georgia. The mean education level of adults includes migrant's education level, who does not reside in Georgia.

[2] Schools in Georgia use a 10-point grading scale. We first measure the impact of remittances on the likelihood of being a high-performing student. A score of 4 is equivalent to a grade F in the US education system, a score of 10 indicates outstanding performance and is equivalent to a grade A+ in the US education system.

We also add migrant characteristics as additional controls for the households that have a family member abroad. We include migrant's age, gender, marital status, and education level. We also add a dummy variable to control for the migrant's destination country (1 if the migrant resides in Europe or North America, 0 if the migrant lives in a post-Soviet Union, Romania, or Turkey.)

The OLS and probit estimations of the impact of remittances might still have two fundamental problems commonly discussed in the literature. First, the results might be biased if some unobserved shock induces parents to migrate or send remittances and at the same time impacts child's school enrollment. In such a case, remittances would be correlated with the error term. Second, remittance receipts may be related to some other household characteristics not captured in Z_j. For example, if more able parents migrate, their more able children are more likely to stay in school (Antman, 2011). To address these issues the model should incorporate instrumental variables (IV) for identification. Additionally, it's important to note that since we have cross-sectional data, each observation represents a different household at a single point in time, and because remittances vary at the household level we couldn't utilize a fixed-effects model.

1.5 Results

1.5.1 Descriptive Statistics

Table 1.1 summarizes the average household characteristics by remittance recipient status. Approximately 30% of households received remittances within the past 12 months, with 90% of these remittance-receiving households having at least one family member residing abroad. The main reasons cited by migrants for leaving Georgia were the absence of job opportunities within the country (44.9%), higher wages abroad (17.9%), and an improved quality of life overseas (15.4%). In terms of migration patterns, 36.8% of migrants have not yet returned home, and 22.4% return home less than once a year.

Compared to non-recipient households, on average, remittance-receiving households have younger household heads, a higher proportion of adult female members, and fewer elderly members. Adults in remittance-receiving households have more years of education. While the total number of children is similar across groups, remittance-recipient households have more children under 5 years old and more daughters.

Elderly health outcomes are better in remittance-receiving households. The share of unemployed persons is similar across the groups. The higher share of remittance-receiving households report having debt. Remittance-receiving households also have a higher ownership of assets, particularly in terms of access to the internet, access to clean cooking fuel, and the ownership of a washing machine. Annual household income is higher for remittance-receiving households, with an average remittance receipt of $2,281 during the past year.[3]

Descriptive statistics for education outcomes in Table 1.2 indicate that 93% of children aged 11-18 in non-remittance-receiving households are enrolled in school compared to around 90% in remittance-receiving households. Expenditures on education are lower in remittance-receiving households, averaging $812 compared to $949 in non-remittance-receiving households. The average academic scores are similar in both groups (8.57 vs 8.54). While children and caregivers in non-remittance-receiving households report "above-average school performance" more frequently, there is no significant difference in means.

Table 1.3 illustrates that the majority of remittance-receiving households allocate remittances towards consumables, with 72% spent on food, 56% spent on utility bills, and 20.6% on durable goods. Only 3.3% of households prioritize spending remittances on education.

Lastly, Table 1.4 provides descriptive statistics for migrant characteristics. On average, migrants are 42 years old, with 53% being female, 60% are married. The primary employment sectors for migrants include individual employers (19%) and the construction sector (11%), while 38% of migrants work in sectors that couldn't be identified.[4] Migrants, on average, have 12.96 years of education. 47% of Georgian migrants reside in Europe or North America.

[3]There is a significant difference in the means of all these variables.

[4]The majority of the respondents answered "Don't Know" (18.4%) and "Other Sector" (18%). "No Answer" (2%).

1.5.2 Decision to Remit

Before analyzing the effects of remittances on children's education outcomes, we first examine the family characteristics that might impact the decision to remit. Table 1.5 presents probit results, specifically marginal effects for the likelihood of a household being a remittance recipient.

Column (1) estimates results for all households - regardless of the presence of a migrant family member. Our findings show that having a family member abroad increases the probability of receiving remittances (0.439, significant at 1%). An increase in the share of unemployed persons is negatively associated with the likelihood of remittance receipt (-0.028, significant at 10%). Increases in the asset index and debt are positively associated with the likelihood of remittance receipt (0.014 and 0.037, significant at 5%). The number of children does not have a statistically significant impact while having more elderly members decreases the likelihood of being a remittance-receiving household (-0.042, significant at 1%).

Columns (2) and (3) employ the same estimation approach but focus only on households with family members residing abroad. In Column (3), we include migrant characteristics. In all three specifications, the marital status of the household head and the asset index are positively correlated with remittance receipt. For households with migrant family members - household size, the number of children under 5, and the number of children between 11 and 14 years old also have a statistically significant impact. A negative association is observed between household size and the likelihood of being a remittance recipient household (-0.036, significant at 1%). Conversely, increases in the number of children under 5 and between 11-14 are correlated with an increase in the likelihood of being a remittance recipient household (0.047 and 0.055, significant at 10%). When migrant characteristics are considered in Column (3), the migrant's age and marital status also emerge as significant factors.

1.5.3 Remittances and Education Outcomes

To estimate the impact of remittances on children's education outcomes, we use a binary indicator for high academic performance and average academic scores. Table 1.6 presents probit results (marginal effects) for the likelihood of being a high-performing student. Column (1) presents findings for children in all households. Columns (2) and (3) focus on children residing in households with a family member abroad. The comparison groups differ across the columns. In Column (1), the coefficient for remittance receipt compares children in households receiving remittances with children in households not receiving remittances. The same coefficient in Column (2), measures the impact on children with a migrant family member receiving remittances with children with a migrant family member not receiving remittances.

Across all children (Column 1, Table 1.6), we observe a statistically significant association between child's age (-0.052), child's gender (0.225), mean education of adults (0.056), urban area (-0.112) and the probability of being a high-performing student. Girls tend to demonstrate better academic performance than boys, with gender having the largest impact across the variables examined. However, we do not find evidence to suggest that remittance receipt or having a family member abroad affects the likelihood of being a high-performing student. The results for children living in households with migrant family members are similar. Child's gender, mean education level of adults, and residing in urban area have coefficients significant at 1% (Columns 2 and 3, Table 1.6). The receipt of remittances is not associated with the likelihood of being a high-performing student (Column 2, Table 1.6). When we add migrant characteristics (migrant's age, gender, marital status, education, and living in Europe or North America), we find that the migration of a female member is negatively associated with the likelihood of being a high-performing student (-0.390, significant at 5%).

In addition to probit analyses, we estimate OLS regressions for actual academic scores (Columns 4-6, Table 1.6). The variable of interest, remittance receipt, does not have a statistically significant effect on academic scores across any of our OLS specifications. These results align with Cebotari et al.'s (2016) findings, where the authors similarly find child's age and child's gender to have a statistically significant impact on school performance but do not observe the impact of remittances to be statistically significant.

To further investigate the effect of migrant's gender on school performance, we examine current caregiver arrangements. We introduce five additional variables to measure the effects of parental absence due to migration: 1. Mother abroad - Father caregiver, 2. Mother abroad - Grandparent caregiver, 3. Mother abroad - Other caregivers (in some cases it is a sibling, aunt, or uncle), 4. Father abroad - Mother caregiver, and 5. Both parents abroad - Grandparent caregiver. There were only three cases where the father was abroad and the grandparent was the caregiver, therefore we did not include this group in our analyses. Additionally, we exclude observations where parental absence is due to separation or divorce, or where the parent is deceased. Table 1.8 presents these findings, incorporating all previously defined control variables.[5] The variable of interest, remittance receipt, is insignificant even after controlling for parental absence.

Across all four cases (Columns 1-4, Table 1.8), a consistent pattern emerges: there is a negative correlation between a child's school performance and the absence of mother due to migration, particularly when father assumes the caregiver role. Coefficients ranging between -0.231 and -0.555 suggest that a child's academic scores tend to decrease under these circumstances. Regardless of the caregiver, if mother is abroad, child's average scores are lower. Additionally, the likelihood of being a high-performing student decreases when mother is abroad and grandparents are caregivers (coefficient of -0.146 for all households and -0.296 for migrant households); the negative impact is most pronounced when mother is abroad and the father is a caregiver. The mean education level of adults is positively correlated with education outcomes in all specifications, with coefficients ranging from 0.048 to 0.143.

Table 1.9 and Table 1.10 present results for girls and boys, respectively. In Table 1.11 and Table 1.12 we examine urban/rural differences. We do not find a statistically significant correlation between remittances and educational outcomes in any of our specifications. The effects of caregiver arrangements vary across the subgroups.

[5] Child's characteristics: age, gender, oldest, disability. HH head: age, age squared, gender, and education. Household size, number of elderly, children 0-5, children 11-14, share of unemployed, asset index, urban, region. For migrant households, we exclude HH head gender and education and instead include migrant's gender and education level.

Focusing on OLS results for all households (Column (4) in Tables 1.9-1.12), there is a negative association between average academic scores and mothers being abroad and fathers being caregivers. This association is more pronounced for girls compared to boys, with coefficients of -0.508 (significant at 10%) and -0.496 (significant at 1%), respectively. In rural areas, the impact of mother being abroad and father acting as a caregiver is larger, -0.615 (significant at 5%). Furthermore, in rural areas we observe a positive correlation for father being abroad and mother being a caregiver, coefficient of 0.479 (significant at 5%).

To evaluate the effect size and economic significance of these coefficients, we normalize them using the standard deviations of the independent and dependent variables. The negative correlation is larger for girls compared to boys, with reductions of 11.0% and 7.3% respectively when mothers migrate and fathers take on caregiving roles. In rural settings, we observe a greater association in rural settings compared to urban settings: 12.6% versus 3.6%, respectively. The influence of the caregiver arrangement is comparable in magnitude to other factors such as child being the oldest or child having a disability. However, it appears to have a lesser impact than the mean education level of adults and child's age. For instance, a one standard deviation increase in the mean education level of adults corresponds to a 33.8% increase in average scores for girls and an 18.2% increase for boys. Similarly, a one standard deviation increase in child's age correlates with a 16.9% decrease in average scores for girls and a 32.6% decrease for boys.

OLS results for migrant households reveal similar findings. Remittances do not appear to demonstrate a statistically significant association with educational outcomes for children in migrant households. Among subgroups, we observe a statistically significant negative correlation between caregiving arrangements and educational outcomes for boys. Specifically, when mother migrates and father is a caregiver, boys' educational outcomes are negatively impacted, -0.738 (significant at 10%). When we examine the economic significance of this coefficient, we find that its effect is comparable to those of other factors. For instance, one standard deviation increase in caregiver arrangement is associated with a decrease in average scores for boys by 14.11%, a magnitude similar to that of the mean education level of adults (14.24%), and child's age (-14.24%).

In probit results for all households (Column (2) in Tables 1.9-1.12), we find that for boys, the probability of being a high-performing student decreases when mother is abroad and father is a caregiver (-0.235 significant at 5%). Similarly, this probability also decreases when mother is abroad and grandparent is a caregiver (-0.187 significant at 5%). A marginal effect of -0.235 indicates that a boy whose mother is abroad and father is a caregiver has a 23.5% lower probability of being a high-performing student compared to a boy whose mother is not abroad. For girls and children in rural areas, the likelihood of being a high-perfomring student is reduced by 20.1% and 33.7%, respectively, when mother is abroad and father is a caregiver.

Similarly, adverse effects on academic performance were observed for children with mothers abroad and grandparents as caregivers. Girls faced a 9.8% decrease, boys an 18.7% decrease, urban children a 12.8% decrease, and rural children an 18.9% decrease in their likelihood of being high-performing students across all households. In terms of economic significance, these effects are less pronounced than those of child's age, child's gender, and the mean education level of adults. However, they are comparable in magnitude to the effects of child being the oldest and having a disability.

In the probit analysis focusing on migrant households (Column (6) in Tables 1.9 - 1.12), we find that boys are less likely to be high-performing students when their mothers are abroad and grandparents are caregivers (-0.353, significant at 1%). This effect is also observed among children in urban areas (-0.293, significant at 5%). For children in rural areas, there's a negative association when mother is abroad and father takes on the caregiving role (-0.274, significant at 10%).

Compared to results for all households, when considering only migrant households, the negative association persists but at slightly diminished levels. Girls experience an 11.6% decrease, boys a 17.6% decrease, urban children a 4.4% decrease, and rural children a 27.4% decrease in their likelihood of high performance when mothers reside abroad and fathers are caregivers. Similarly, when grandparents are caregivers, girls face an 18.1% decrease, boys a 35.3% decrease, urban children a 29.3% decrease, and rural children a 12.5% decrease in their likelihood of being high performers.

In terms of effect size and economic significance, notably for boys the impact of mother being abroad and grandparent being a caregiver (-24.5%) appears to be more substantial than that of other factors such as child's age (-12.1%), child being oldest (1.4%), child's disability (-7.9%) and the mean education level of adults (8.6%). In the urban subgroup, this impact (-23.0%) is lower than the impact of child's gender (30.1%) and the mean education level of adults (31.9%), but is notably higher than the impact of other factors.

Discussing the results further, interviews with school principals and class tutors in Georgia (Antia et al., 2022) revealed perceptions that children of migrant mothers are more vulnerable than those of migrant fathers. The same study revealed that caregiving grandparents found it difficult to deal with adolescents and often called schools for support. Additionally, due to chronic diseases, increased workload, and other hardships grandparents struggled to fully engage in child-rearing. Other studies found that in women's absence, men might even reduce their housework relative to what they would do otherwise, "as if their migration signaled a gender deviant arrangement that must be compensated for" (Ashwin and Lytkina, 2004; Parreñas, 2005; Torosyan et al., 2016). This provides insight into why we observe the negative impact of mothers' migration on children's academic performance.

Furthermore, there are indications that children of migrant parents, particularly boys, have a greater propensity to drop out of school in Mexico compared to their peers with parents at home. Boys with a migrant mother, in particular, exhibit lower intentions to continue studying compared to those with a mother at home. On the other hand, girls tend to perform better academically, possibly motivated by aspirations for reunification with their mothers or expectations of material rewards (Oliveira, 2016). In our examination of the regression outcomes for boys and girls, we also utilized the t-statistic to explore potential disparities in effects between the two cohorts. Based on the t-test for the equality of the coefficients across the regression models we fail to reject the null hypothesis. Therefore there is not enough evidence to conclude that there is a statistically significant difference in the effects of mother's migration between the two groups (boys and girls).

In summary, our research suggests that various factors, including child's age, gender, being oldest, disability, mean education level of adults, and residing in an urban area, can influence the likelihood of being a high-performing student and average academic scores. While we do not find remittance receipt to have a statistically significant impact on education outcomes, we observe variations in educational outcomes when examining parental absence and different caregiving arrangements.

The analysis indicates that children with mothers abroad and fathers or grandparents as caregivers tend to experience lower academic performance. When examining all households, the presence of mothers abroad and fathers as caregivers results in noticeable decreases in the likelihood of high academic achievement for both genders and across urban and rural areas. When focusing solely on migrant households, the negative effect on academic performance persists but at slightly reduced levels. The analysis emphasizes that children with mothers abroad and grandparents as caregivers also demonstrate diminished academic performance.

We do not find statistically significant evidence of adverse effects on school performance when fathers migrate and mothers are caregivers, or when both parents migrate and grandparents are caregivers. This suggests that while parental migration patterns and caregiving arrangements play a role in children's academic performance, direct financial support through remittances does not seem to significantly influence educational outcomes in the contexts we examined.

1.6 Conclusion

Migration can influence children's education through various channels. On one hand, remittances may alleviate financial constraints, allowing for investment in children's education and reducing the need for children to engage in work within or outside the household. Conversely, the absence of emigrant parents or adult members from a household may decrease the level of child supervision and support for education.

To identify variables affecting migration selection, we initially examine the marginal effects for the likelihood of a household being remittance-recipient. We then assess the impact of remittances on the children's education outcomes. By utilizing average school grades, we create a binary variably indicating above-average academic performance and examine the influence of remittances on the likelihood of achieving high academic performance. Additionally, we evaluate the effects of migration on actual average scores, while controlling for various factors including child, household, and migrant characteristics.

Our findings suggest that a child's gender, mean education level of adults, and urban residence significantly influence both the likelihood of being a high-performing student and the actual scores. When considering migrant characteristics, we observe that the migration of a female member is negatively associated with child's school performance. However, the receipt of remittances does not appear to have a statistically significant effect on educational outcomes.

To further examine the impact of migrant's gender on school performance, we analyze child's current caregiver arrangements. Results indicate a negative effect on academic performance of children with mothers residing abroad and fathers or grandparents serving as caregivers. We do not find statistically significant evidence of adverse effects when fathers migrate and mothers are caregivers, or when both parents migrate and grandparents are caregivers. The effect size of the caregiver arrangement on academic scores is comparable in magnitude to other factors such as child being the oldest or child having a disability. However, for actual academic scores, it appears to have a lesser impact than the mean education level of adults and child's age. In migrant households, the effects of caregiver arrangements on the likelihood of being high-performing students surpass those of other determinants for boys and children in rural areas but have a lesser impact than the mean education level of adults for girls and children in urban areas.

Employing alternative methodologies can help verify the robustness of our conclusions. Overall, these findings highlight the complex interplay between various socioeconomic factors and family dynamics. Understanding these dynamics can inform policies and interventions aimed at improving educational outcomes for children, particularly those affected by parental migration or absence.

1.7 Figures and Tables

1.7.1 Figures

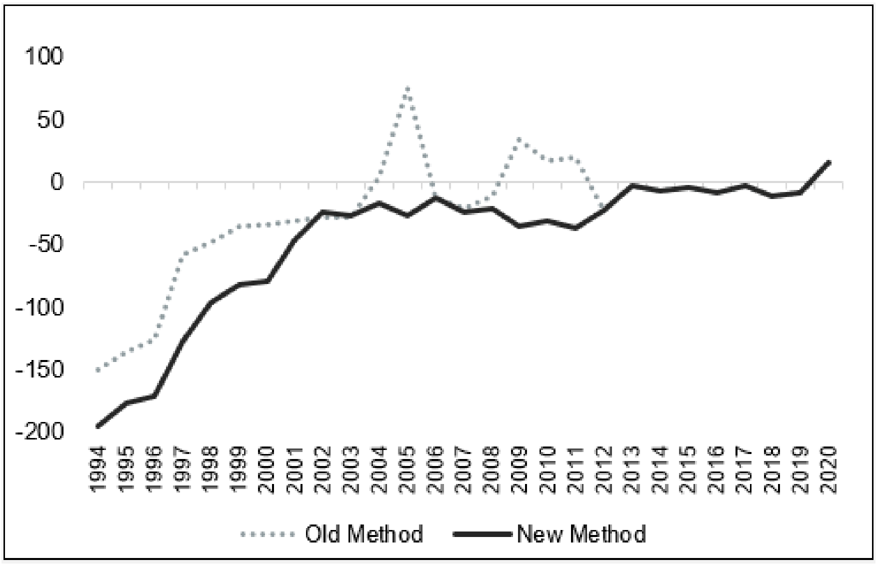


Figure 1.1: Net Migration Estimates in Georgia for 1994-2020 (in thousand persons)

Source: Georgian Statistical Institute and Ministry of International Affairs border police.

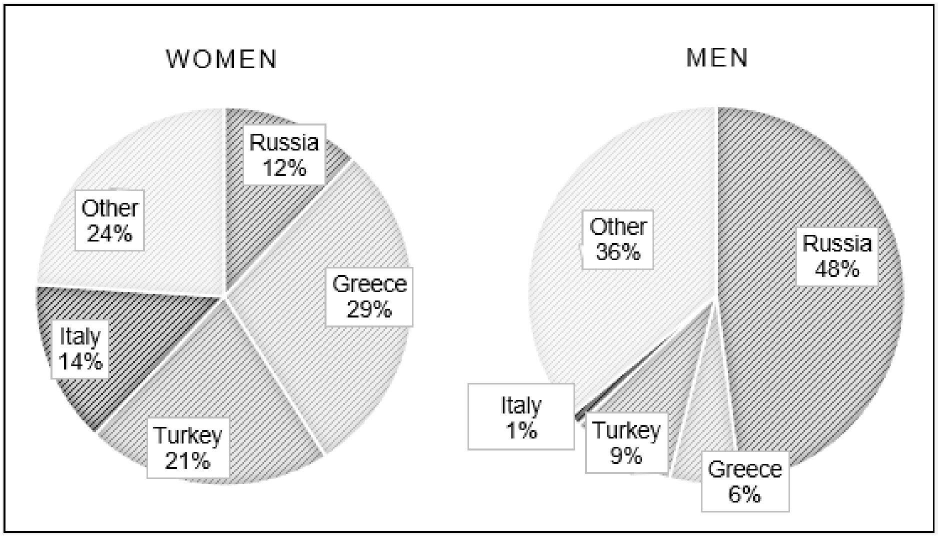


Figure 1.2: Distribution of Emigrants' Current Country of Residence by Gender

Source: OECD (2017)

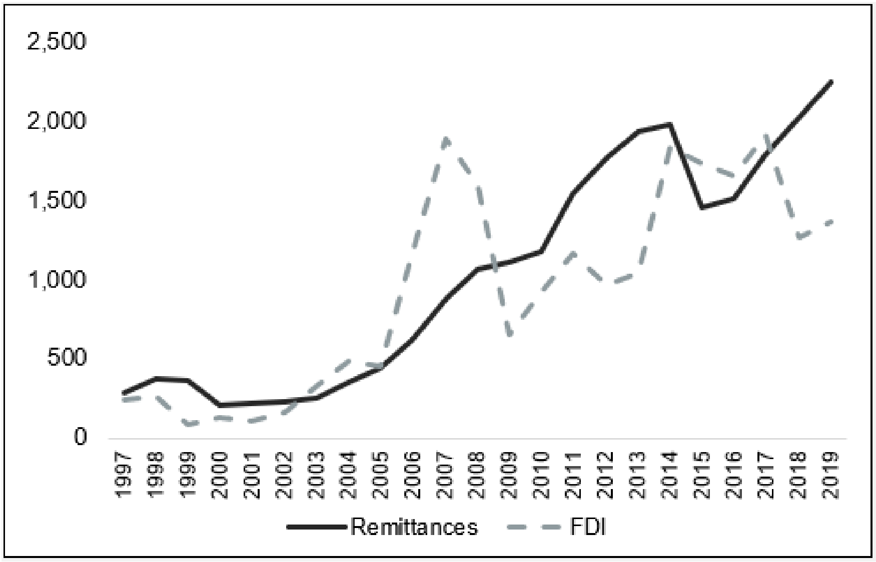


Figure 1.3: Net Inflow of Remittances and FDI (in million USD)

Source: The World Bank, 2022

1.7.2 Tables

Table 1.1: Summary Statistics - Household Level

	Remittances					
	Non recipients			Recipients		
Variables	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Number of households	2,790	69.9%		1,199	30.1%	
Family member abroad	638	22.9%		1,079	89.9%	
Age (HH head)	2,790	60.69***	16.11	1,199	57.87	15.01
Female (HH head)	1,266	45.4%		573	47.8%	
Education (HH head)	2,790	11.78	3.58	1,199	11.75	3.08
Internally Displaced (HH head)	89	3.2%		39	3.3%	
Ethnicity (HH head)						
Georgian	2,494	89.4%		1,090	90.9%	
Armenian	115	4.1%		34	2.8%	
Azerbaijani	95	3.4%		50	4.2%	
Other	86	3.1%		25	2.1%	
Marital status (HH head)						
Married	1,628	58.5%		681	56.8%	
Separated, Divorced	179	6.4%		88	7.4%	
Widowed	976	35.1%		429	35.8%	
Household size	2,790	3.58	1.80	1,199	3.43	1.58
Number of females	2,790	1.11**	0.82	1,199	1.16	0.77
Share of females	2,789	0.29***	0.22	1,199	0.35	0.23
Number of elderly	2,790	0.65***	0.70	1,199	0.45	0.63
Mean education of adults	2,790	10.60***	5.29	1,199	11.58	4.12
Number of children	2,790	0.93**	0.99	1,199	1.00	0.91
Households with children	1,581	56.7%		788	65.7%	
0-5 years old	775	27.8%		368	30.1%	
6-10 years old	565	20.3%		264	22.0%	
11-14 years old	405	14.6%		180	15.0%	
15-18 years old	389	13.9%		198	16.5%	
Boys 0-18 years old	1,019	39.1%		499	41.6%	
Boys 11-18 years old	424	13.2%		198	16.5%	
Girls 0-18 years old	958	34.3%		490	40.9%	
Girls 11-18 years old	373	13.4%		192	16.0%	
Child disability	93	3.3%		37	3.1%	
Elderly poor health	744	26.7%***		193	16.1%	
Urban area	1,543	55.3%		679	56.6%	
Share of unemployed	2,312	0.41	0.39	1,099	0.42	0.39
Debt	540	19.4%***		277	23.1%	
Asset index	2,745	-0.47**	0.04	1,199	0.24	0.05
House ownership	2,591	93.2%		1,113	93.4%	
Access to electricity	2,772	99.4%		1,194	99.7%	
Access to internet	864	31.1%		537	44.8%	
Access to piped water	1,933	69.3%		850	70.9%	
In-house toilet	1,572	56.6%		804	67.2%	
Clean cooking fuel	2,005	71.9%		965	80.5%	
Washing machine	1,532	54.9%		850	71.0%	
Refrigerator	2,082	74.6%		1,049	87.5%	
Cell phone	2,283	81.9%		1,108	92.5%	
Annual Remittances				1,199	2,281.85	2,403.44
Annual Household Income	2,790	3,684.84**	7,167.26	1,199	4,211.56	5,807.55

Table 1.2: Education Outcomes Summary Statistics - Children (11-18 years old)

	Non recipients			Recipients		
Variables	N	Mean	Std. Dev.	N	Mean	Std. Dev.
School enrollment (11-18 years old)	846	93.5%***		385	90.2%	
Total expenditure on education	846	949.3**	1,153.2	385	812.1	1,016.7
Academic performance						
Average academic score	625	8.57	1.13	277	8.54	1.21
Above-average score	355	56.8%		153	55.2%	
Score 10	144	23.0%		75	27.1%	
Score 9	211	33.8%		78	28.2%	
Score 8	166	26.6%		64	23.1%	
Score 7	66	10.6%		43	15.5%	
Score 6	38	6.1%		17	6.1%	
Child's report - above average[1]	331	54.1%		139	49.6%	
Caregiver's report - above average[2]	501	73.3%		217	70.9%	

[1]Child's self-reported school performance - "Would you say in your class you are one of the best students, above average, average, below average, or one of the worst students?"

[2]Caregiver's report - "How would you say [child] is performing in school? Very well, well, neither well nor poorly, poorly, very poorly".

Table 1.3: Main Use of Remittances Summary Statistics - Household Level

	Most important	Second most important	Third most important
Food	72.2%	13.0%	5.1%
Utility Bills	11.6%	56.3%	11.4%
Durable goods	3.2%	5.9%	20.6%
Housing	4.0%	4.0%	7.3%
Medical expenses for child/elderly	2.1%	6.7%	14.7%
Medical expenses for others	1.4%	3.8%	6.9%
Education	3.3%	3.2%	11.5%
Investment in business	0.0%	0.1%	0.2%
Agricultural activities	0.2%	1.5%	4.5%
Savings	0.1%	0.2%	1.1%
Transfers to others	0.1%	0.3%	0.2%
Other	1.7%	1.2%	1.4%
Not Applicable	0.0%	2.8%	11.4%
Don't know	0.0%	0.7%	2.5%
No answer	0.2%	0.6%	1.4%

Table 1.4: Migrant Characteristics Summary Statistics - Adults Only

	N	Mean
Age	1,901	42.26
Female	1,010	53.1%
Marital status		
Married	1,143	60.2%
Separated, Divorced, Never married	605	31.9%
Widowed	150	7.9%
Education	1,886	12.96
Lives in Europe or North America	880	47.4%
Has residence permit	1,1095	69.5%
Has work permit	1,151	77.5%
Industry sector		
Agriculture	38	2.1%
Fishing	6	0.3%
Mining & quarrying	4	0.2%
Manufacturing	125	6.9%
Utilities	6	0.3%
Construction	208	11.2%
Wholesale & retail trade	54	3.0%
Hotels & restaurants	77	4.2%
Transport & communications	39	2.1%
Finance	11	0.6%
Real estate	2	0.1%
Public administration	4	0.2%
Education	13	0.7%
Health & welfare	18	1.0%
Collective, social, personal services	19	1.0%
Activities of individual employers	337	18.5%
International organisations	3	0.2%
Art/entertainment	9	0.5%
Other	332	18.0%
Don't know	334	18.4%
No answer	37	2.0%
Not applicable	148	8.1%

Table 1.5: Probit Results (Marginal Effects) for Determinants of Remittance Receipts - Household Level

	All Households	Migrant HHs	
	(1)	(2)	(3)
Family member abroad	0.439***		
	(0.007)		
Age (HH head)	0.001	0.000	0.002
	(0.003)	(0.005)	(0.005)
Age squared x 1,000 (HH head)	0.009	-0.010	-0.022
	(0.025)	(0.052)	(0.049)
Female (HH head)	-0.003	-0.052	
	(0.018)	(0.36)	
Separated/Divorced (HH head)	0.043	0.066	0.081*
	(0.029)	(0.054)	(0.047)
Widowed (HH head)	0.039*	0.076*	0.066**
	(0.022)	(0.042)	(0.032)
Education (HH head)	-0.007**	-0.014***	-0.011**
	(0.003)	(0.006)	(0.005)
Household size	0.004	-0.036***	-0.030**
	(0.007)	(0.013)	(0.013)
Number of elderly (65 years and above)	-0.042***	-0.045	-0.060**
	(0.015)	(0.028)	(0.028)
Children 0-5 years old	-0.010	0.047*	0.030
	(0.014)	(0.027)	(0.027)
Children 6-10 years old	-0.015	0.027	0.005
	(0.014)	(0.028)	(0.026)
Children 11-14 years old	0.004	0.055*	0.024
	(0.016)	(0.032)	(0.032)
Children 15-18 years old	0.010	0.044	0.025
	(0.016)	(0.030)	(0.031)
Mean education of adults (19-64 years old)	-0.001**	0.004	0.004
	(0.004)	(0.008)	(0.011)
Share of unemployed persons	-0.028*	0.009	0.003
	(0.017)	(0.032)	(0.031)
Child disability	0.056	0.113	0.148*
	(0.035)	(0.077)	(0.078)
Elderly poor health	-0.021	-0.018	-0.009
	(0.019)	(0.037)	(0.035)
Asset Index	0.014***	0.029***	0.019**
	(0.005)	(0.009)	(0.009)
Debt	0.037**	0.026	0.011
	(0.016)	(0.030)	(0.029)
Urban Area	-0.021	0.010	0.012
	(0.016)	(0.031)	(0.031)
Migrant Characteristics			
Age			0.024***
			(0.007)
Age squared x 1,000			-0.247***
			(0.089)
Female			0.014
			(0.031)
Separated/Divorced			-0.105***
			(0.030)
Widowed			-0.100**
			(0.050)
Education			-0.001
			(0.008)
Western			0.001
			(0.027)
Industry indicators			Yes
Region indicators	Yes	Yes	Yes
Prob >chi-square	0.000	0.000	0.000
Pseudo R^2	0.362	0.051	0.134
Observations	3,346	1,486	1,387

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Summary statistics are reported in Appendix A.1. Assets include home ownership, number of rooms, access to electricity, internet, piped water, clean cooking fuel, sanitary services inside the house; car, computer, washing machine, fridge, TV, and cell phone.

Table 1.6: Probit Results (Marginal Effects) for Being a High-performing Student, and OLS Results for Average Academic Scores - Children (11-18 years old)

	High Academic Performance - Probit			Academic Scores - OLS		
	All HHs	Migrant HHs	Migrant HHs	All HHs	Migrant HHs	Migrant HHs
	(1)	(2)	(3)	(4)	(5)	(6)
HH receives remittances	-0.012	-0.027	0.035	-0.060	-0.122	-0.039
	(0.038)	(0.060)	(0.061)	(0.090)	(0.138)	(0.144)
Child's age	-0.052***	-0.015	-0.020	-0.136***	-0.049	-0.059
	(0.012)	(0.018)	(0.017)	(0.235)	(0.042)	(0.041)
Child is a girl	0.225***	0.225***	0.215***	0.620***	0.602***	0.607***
	(0.029)	(0.045)	(0.045)	(0.073)	(0.117)	(0.126)
Child is oldest	0.092***	0.049	0.049	0.258***	0.069	0.069
	(0.034)	(0.058)	(0.057)	(0.080)	(0.147)	(0.154)
Child disability	-0.038	-0.203*	-0.240*	-0.211	-0.575*	-0.637**
	(0.071)	(0.113)	(0.126)	(0.166)	(0.310)	(0.318)
Age (HH head)	-0.003	-0.015	-0.020	-0.009	-0.055	-0.063
	(0.009)	(0.018)	(0.017)	(0.022)	(0.046)	(0.047)
Age squared x 1,000 (HH head)	0.017	0.112	0.160	0.126	0.518	0.570
	(0.087)	(0.170)	(0.170)	(0.201)	(0.440)	(0.451)
Female (HH head)	-0.003	0.060		0.136	0.289	
	(0.051)	(0.090)		(0.119)	(0.214)	
Separated/Divorced (HH head)	-0.065	-0.054		-0.291*	-0.491*	
	(0.082)	(0.128)		(0.170)	(0.285)	
Widowed (HH head)	0.033	-0.003		-0.164	-0.324	
	(0.065)	(0.104)		(0.150)	(0.239)	
Education (HH head)	-0.001	-0.001		0.019	0.025	
	(0.009)	(0.017)		(0.019)	(0.044)	
Household size	-0.011	0.012	0.017	-0.067*	0.008	0.033
	(0.016)	(0.029)	(0.032)	(0.036)	(0.065)	(0.068)
Number of elderly	0.043	0.021	0.036	0.070	-0.063	0.241
	(0.038)	(0.065)	(0.064)	(0.088)	(0.154)	(0.173)
Children 0-5 years old	-0.009	-0.034	-0.023	0.090	-0.010	0.019
	(0.045)	(0.066)	(0.069)	(0.111)	(0.177)	(0.191)
Children 11-14 years old	-0.030	-0.003	0.008	-0.089	0.037	0.038
	(0.035)	(0.065)	(0.060)	(0.084)	(0.146)	(0.138)
Mean education of adults	0.056***	0.083***	0.063**	0.119***	0.169***	0.142**
	(0.011)	(0.021)	(0.023)	(0.029)	(0.058)	(0.065)
Share of unemployed	-0.064	-0.024	-0.074	-0.134	-0.032	-0.062
	(0.047)	(0.067)	(0.067)	(0.115)	(0.163)	(0.161)
Asset index	0.019	0.014	0.012	0.082***	0.083	0.065
	(0.013)	(0.021)	(0.022)	(0.030)	(0.053)	(0.055)
Urban area	-0.112***	-0.162**	-0.155**	-0.304***	-0.431***	-0.443***
	(0.042)	(0.070)	(0.065)	(0.097)	(0.160)	(0.164)
Migrant's age			-0.004			0.013
			(0.022)			(0.072)
Migrant's age squared x 1,000			0.105			-0.160
			(0.245)			(0.774)
Migrant is female			-0.135*			-0.390**
			(0.070)			(0.172)
Migrant separated/divorced			0.060			0.162
			(0.068)			(0.180)
Migrant widowed			-0.025			-0.065
			(0.115)			(0.249)
Migrant's education			0.008			0.036
			(0.019)			(0.049)
Lives in Europe/North America			0.039			0.106
			(0.061)			(0.161)
Industry indicators	No	No	Yes	No	No	Yes
Region indicators	Yes	Yes	Yes	Yes	Yes	Yes
Prob >chi-square	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R^2	0.143	0.182	0.257	0.233	0.265	0.334
Observations	879	325	306	879	325	306

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, clustered at the household level. For OLS regressions, in columns (4-6), Prob > chi-square and Pseudo R^2 values are Prob > F and R^2 values respectively. Summary statistics are reported in Appendix A.2

Table 1.7: Current Caregiver Arrangements Summary Statistics - Children (11-18 years old)

	All HHs		Migrant HHs	
	N	Mean	N	Mean
Both Parents Present	550	71.5%	108	39.7%
Mother Abroad - Father Caregiver	32	4.2%	22	8.2%
Mother Abroad - Grandparent Caregiver	57	7.4%	38	14.2%
Mother Abroad - Other Caregiver	13	1.7%	3	1.1%
Father Abroad - Mother Caregiver	98	12.7%	82	30.7%
Both Parents Abroad - Grandparent Caregiver	19	2.5%	14	5.2%

Table 1.8: Probit and OLS Estimation - Current Caregiver Arrangements

	All Households		Migrant Households	
	Probit	OLS	Probit	OLS
	(1)	(2)	(3)	(4)
HH receives remittances	0.059	-0.050	0.088	-0.009
	(0.047)	(0.111)	(0.067)	(0.156)
Child's age	-0.054***	-0.139***	-0.021	-0.049
	(0.011)	(0.025)	(0.020)	(0.047)
Child is a girl	0.237***	0.644***	0.219***	0.604***
	(0.030)	(0.078)	(0.046)	(0.136)
Child is oldest	0.085**	0.251***	0.047	0.078
	(0.035)	(0.084)	(0.059)	(0.156)
Child disability	-0.033	-0.265	-0.235	-0.680*
	(0.079)	(0.193)	(0.139)	(0.379)
Mother abroad - Father CG	-0.231**	-0.527**	-0.241*	-0.555**
	(0.102)	(0.211)	(0.131)	(0.280)
Mother abroad - Grandparents CG	-0.146**	-0.227	-0.296***	-0.373
	(0.074)	(0.176)	(0.103)	(0.303)
Mother abroad - Other CG	-0.099	-0.383	-0.002	-0.164
	(0.141)	(0.286)	(0.131)	(0.347)
Father abroad - Mother CG	0.029	0.184	0.006	0.194
	(0.061)	(0.148)	(0.075)	(0.208)
Both parents abroad - Grandparents CG	0.120	0.123	-0.006	0.094
	(0.106)	(0.270)	(0.129)	(0.331)
Household size	-0.017	-0.077*	-0.001	-0.025
	(0.017)	(0.040)	(0.031)	(0.077)
Number of elderly	0.037	0.096	0.105*	0.135
	(0.040)	(0.096)	(0.063)	(0.191)
Mean education of adults	0.064***	0.143***	0.048*	0.127*
	(0.012)	(0.031)	(0.025)	(0.069)
Asset index	0.009	0.060*	-0.020	0.014
	(0.014)	(0.033)	(0.023)	(0.060)
Urban area	-0.073	-0.249**	-0.088	-0.389**
	(0.045)	(0.103)	(0.068)	(0.184)
Other HH characteristics	Yes	Yes	Yes	Yes
Other migrant characteristics	No	No	Yes	Yes
Region indicators	Yes	Yes	Yes	Yes
Prob >chi-square | Prob >F	0.000	0.000	0.000	0.000
Pseudo R^2 | R^2	0.169	0.256	0.283	0.350
Observations	769	769	274	276

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, clustered at the household level. Based on the VIF values, variables are not correlated. For OLS regressions, in columns (2) and (4), Prob>chi-square and Pseudo R^2 values are Prob>F and R^2 values respectively. Summary statistics are reported in Appendix A.3.

Table 1.9: Probit and OLS Estimation - Girls (11-18 years old)

	Girls - All Households				Girls - Migrant Households			
	Probit		OLS		Probit		OLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances	-0.094	-0.018	-0.186	-0.053	0.004	0.040	-0.009	0.086
	(0.069)	(0.063)	(0.154)	(0.142)	(0.081)	(0.100)	(0.169)	(0.202)
Family member abroad	0.106		0.193					
	(0.069)		(0.136)					
Mother abroad - Father CG		-0.201		-0.508*		-0.116		-0.193
		(0.147)		(0.303)		(0.156)		(0.300)
Mother abroad - Grandparents CG		-0.098		-0.231		-0.181		-0.275
		(0.105)		(0.229)		(0.157)		(0.419)
Father abroad - Mother CG		0.033		0.135		-0.073		0.152
		(0.083)		(0.193)		(0.118)		(0.259)
Child's age	-0.039***	-0.043***	-0.072**	-0.084**	-0.027	-0.042	-0.024	-0.041
	(0.014)	(0.015)	(0.029)	(0.033)	(0.023)	(0.026)	(0.052)	(0.061)
Child is oldest	0.079	0.087	0.190*	0.244**	0.053	0.060	-0.027	0.016
	(0.051)	(0.055)	(0.105)	(0.116)	(0.084)	(0.081)	(0.187)	(0.226)
Child disability	0.216	0.163	0.269	0.249	0.024	-0.106	-0.063	-0.347
	(0.150)	(0.151)	(0.183)	(0.217)	(0.195)	(0.189)	(0.307)	(0.325)
Mean education of adults	0.060***	0.069***	0.148***	0.161***	0.122***	0.136***	0.265***	0.256***
	(0.016)	(0.017)	(0.036)	(0.039)	(0.028)	(0.029)	(0.063)	(0.061)
Asset index	0.017	0.008	0.069*	0.066	-0.007	-0.040	0.024	-0.067
	(0.018)	(0.019)	(0.039)	(0.043)	(0.030)	(0.027)	(0.066)	(0.061)
Urban area	-0.110*	-0.077	-0.274**	-0.214	-0.149**	-0.118	-0.289	-0.158
	(0.059)	(0.061)	(0.131)	(0.138)	(0.087)	(0.102)	(0.195)	(0.215)
Other HH characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other migrant characteristics	No	No	No	No	No	Yes	No	Yes
Region indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prob >chi-square	0.005	0.007	0.000	0.000	0.018	0.000	0.000	0.000
Pseudo R2	0.112	0.137	0.172	0.197	0.216	0.346	0.274	0.349
Observations	429	371	429	371	158	131	161	134

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, clustered at the household level. Based on the VIF values, variables are not correlated. For OLS regressions, in columns (3,4) and (7,8), Prob>chi-square and Pseudo R^2 values are Prob>F and R^2 values respectively. Summary statistics are reported in Appendix A.4.

Table 1.10: Probit and OLS Estimation - Boys (11-18 years old)

	Boys - All Households				Boys - Migrant Households			
	Probit		OLS		Probit		OLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances	-0.024	0.014	-0.226	-0.071	-0.080	-0.015	-0.310	-0.224
	(0.071)	(0.063)	(0.186)	(0.168)	(0.089)	(0.097)	(0.231)	(0.304)
Family member abroad	0.022		0.183					
	(0.069)		(0.170)					
Mother abroad - Father CG		-0.235**		-0.496*		-0.176		-0.738*
		(0.110)		(0.298)		(0.139)		(0.397)
Mother abroad - Grandparents CG		-0.187**		-0.218		-0.353***		-0.520
		(0.093)		(0.266)		(0.110)		(0.426)
Father abroad - Mother CG		0.031		0.191		0.158		0.438
		(0.083)		(0.210)		(0.119)		(0.348)
Child's age	-0.067***	-0.069***	-0.209***	-0.203***	-0.011	-0.031	-0.081	-0.092
	(0.014)	(0.014)	(0.034)	(0.038)	(0.026)	(0.028)	(0.064)	(0.075)
Child is oldest	0.098**	0.082*	0.306**	0.274**	0.014	0.014	0.053	0.038
	(0.047)	(0.049)	(0.122)	(0.129)	(0.089)	(0.089)	(0.247)	(0.263)
Child disability	-0.170*	-0.134	-0.455**	-0.572**	-0.349**	-0.178	-0.924*	-0.819
	(0.091)	(0.103)	(0.229)	(0.266)	(0.149)	(0.215)	(0.481)	(0.603)
Mean education of adults	0.055***	0.057***	0.081*	0.109***	0.046**	0.019	0.087	0.008
	(0.016)	(0.017)	(0.043)	(0.047)	(0.027)	(0.037)	(0.080)	(0.111)
Asset index	0.020	0.009	0.093	0.067	0.029	0.010	0.132	0.142
	(0.018)	(0.020)	(0.045)	(0.050)	(0.027)	(0.034)	(0.073)	(0.102)
Urban area	-0.134**	-0.075	-0.362**	-0.323**	-0.150	-0.060	-0.483	-0.417
	(0.058)	(0.062)	(0.14)	(0.152)	(0.095)	(0.104)	(0.240)	(0.312)
Other HH characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other migrant characteristics	No	No	No	No	No	Yes	No	Yes
Region indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prob >chi-square	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000
Pseudo R2	0.157	0.167	0.252	0.268	0.214	0.274	0.334	0.381
Observations	450	398	450	398	157	136	164	142

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, clustered at the household level. Based on the VIF values, variables are not correlated. For OLS regressions, in columns (3, 4) and (7, 8), Prob > chi-square and Pseudo R^2 values are Prob>F and R^2 values respectively. Summary statistics are reported in Appendix A.4.

Table 1.11: Probit and OLS Estimation - Urban Areas

	Urban - All Households				Urban - Migrant Households			
	Probit		OLS		Probit		OLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances	-0.049	-0.002	-0.172	-0.032	-0.049	-0.068	-0.170	-0.194
	(0.066)	(0.062)	(0.154)	(0.153)	(0.075)	(0.097)	(0.180)	(0.286)
Family member abroad	0.041		0.125					
	(0.063)		(0.145)					
Mother abroad - Father CG		-0.030		-0.251		-0.044		-0.304
		(0.153)		(0.308)		(0.205)		(0.542)
Mother abroad - Grandparents CG		-0.128		-0.162		-0.293**		-0.425
		(0.091)		(0.210)		(0.142)		(0.425)
Father abroad - Mother CG		-0.017		-0.038		0.035		0.049
		(0.081)		(0.196)		(0.112)		(0.323)
Child's age	-0.047***	-0.057***	-0.120***	-0.132***	0.007	-0.025	-0.049	-0.106
	(0.013)	(0.014)	(0.029)	(0.033)	(0.023)	(0.026)	(0.053)	(0.065)
Child is a girl	0.215***	0.239***	0.582***	0.630***	0.234***	0.300***	0.615***	0.752***
	(0.036)	(0.038)	(0.091)	(0.100)	(0.058)	(0.056)	(0.155)	(0.167)
Child is oldest	0.082**	0.069	0.222**	0.217**	0.079	0.045	0.235	0.258
	(0.043)	(0.046)	(0.097)	(0.104)	(0.074)	(0.078)	(0.176)	(0.222)
Child disability	-0.096	-0.122	-0.492**	-0.583**	-0.196	-0.174	-0.852*	-0.917*
	(0.09)	(0.096)	(0.219)	(0.251)	(0.131)	(0.135)	(0.465)	(0.473)
Mean education of adults	0.061***	0.072***	0.149***	0.181***	0.071***	0.077***	0.164**	0.174**
	(0.015)	(0.016)	(0.036)	(0.040)	(0.027)	(0.029)	(0.070)	(0.083)
Asset index	0.024	0.002	0.077	0.036	0.046*	-0.001	0.148**	0.079
	(0.016)	(0.018)	(0.037)	(0.041)	(0.026)	(0.033)	(0.067)	(0.094)
Other HH characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other migrant characteristics	No	No	No	No	No	Yes	No	Yes
Region indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prob >chi-square	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R2	0.138	0.159	0.228	0.257	0.214	0.292	0.298	0.339
Observations	545	459	545	459	191	150	191	150

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, clustered at the household level. Based on the VIF values, variables are not correlated. For OLS regressions, in columns (3, 4) and (7, 8), Prob>chi-square and Pseudo R^2 values are Prob>F and R^2 values respectively. Summary statistics are reported in Appendix A.4.

Table 1.12: Probit and OLS Estimation - Rural Areas

	Rural - All Households				Rural - Migrant Households			
	Probit		OLS		Probit		OLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances	-0.032	0.031	-0.078	0.096	-0.026	0.074	0.032	0.131
	(0.077)	(0.064)	(0.183)	(0.157)	(0.089)	(0.088)	(0.221)	(0.229)
Family member abroad	0.068		0.255					
	(0.081)		(0.175)					
Mother abroad - Father CG		-0.337		-0.615**		-0.274*		-0.490
		(0.101)		(0.295)		(0.162)		(0.446)
Mother abroad - Grandparents CG		-0.189		-0.361		-0.125		-0.288
		(0.142)		(0.378)		(0.188)		(0.467)
Father abroad - Mother CG		0.124		0.479**		0.076		0.523
		(0.097)		(0.232)		(0.128)		(0.327)
Child's age	-0.058***	-0.048***	-0.160***	-0.140***	-0.051*	-0.029	-0.117*	-0.064
	(0.016)	(0.017)	(0.040)	(0.042)	(0.029)	(0.026)	(0.064)	(0.065)
Child is a girl	0.211***	0.219***	0.618***	0.629***	0.240***	0.183**	0.580***	0.515**
	(0.049)	(0.049)	(0.128)	(0.129)	(0.072)	(0.077)	(0.184)	(0.206)
Child is oldest	0.091*	0.098*	0.273**	0.299**	-0.008	-0.004	-0.021	0.072
	(0.053)	(0.053)	(0.135)	(0.138)	(0.093)	(0.083)	(0.256)	(0.256)
Child disability	0.103	0.165	0.274	0.275	-0.129	-0.108	-0.059	-0.223
	(0.113)	(0.125)	(0.264)	(0.304)	(0.150)	(0.154)	(0.361)	(0.325)
Mean education of adults	0.057***	0.067***	0.110**	0.141***	0.075**	0.030	0.151	0.134
	(0.019)	(0.019)	(0.047)	(0.048)	(0.035)	(0.038)	(0.097)	(0.106)
Asset index	0.010	0.009	0.047	0.051	0.024	0.006	0.031	0.015
	(0.019)	(0.019)	(0.049)	(0.049)	(0.029)	(0.029)	(0.077)	(0.082)
Other HH characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other migrant characteristics	No	No	No	No	No	Yes	No	Yes
Region indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prob >chi-square | Prob>F	0.000	0.000	0.000	0.000	0.163	0.068	0.002	0.000
Pseudo R2 | R2	0.153	0.190	0.251	0.271	0.162	0.276	0.206	0.304
Observations	334	310	334	310	134	126	134	126

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, clustered at the household level. Based on the VIF values, variables are not correlated. For OLS regressions, in columns (3, 4) and (7, 8), Prob>chi-square and Pseudo R^2 values are Prob>F and R^2 values respectively. Summary statistics are reported in Appendix A.4.

Chapter 2

Tourism-Led Growth Hypothesis: A Case of Georgia

2.1 Introduction

Georgia has long been known for its remarkable natural beauty, rich history, vibrant culture, and biodiversity, attracting visitors from all corners of the globe. However, the recent influx in tourism can also be attributed to the government's strategic efforts to bolster the tourism industry and draw high-value tourists. Over the past 25 years, number of international visitors to Georgia increased 90-fold from 85 thousand in 1995 to 7.7 million in 2019 (World Bank, 2021). During the period from 2009 to 2016, Georgia had one of the fastest-growing tourism sectors globally, with a quadrupling of international visitors and an eight-fold increase in tourism revenue as a percentage of GDP (World Bank, 2019a).

To facilitate tourism, the government of Georgia implemented several measures, including liberalizing the visa regime for citizens of 98 countries, initiating extensive road rehabilitation projects, privatizing infrastructure and hotels, establishing free tourist zones, and offering tax incentives for tour operators. Furthermore, the government launched numerous marketing campaigns and extensively promoted Georgia's tourist attractions through various international media outlets such as CNN, The New York Times, National Geographic, and BBC.

According to "Georgia's Tourism Strategy 2025", the government aims to further enhance the tourism sector, by attracting 11 million tourists annually and increasing the average tourist spending from $328 over five days to $600 over a week (GNTA, 2016). Additionally, the government seeks to increase employment in the tourism and hospitality sectors by 85% and attract 63% more Foreign Direct Investment (FDI) into the tourism industry, increasing its value from a total of $559 million per year to $910 million (GNTA, 2016).

In 2015, the World Bank approved a $60 million International Bank for Reconstruction and Development (IBRD) loan to Georgia to improve infrastructure in the Samtskhe-Javakheti and

Mtskheta-Mtianeti regions (World Bank, 2015). This was the third regional development project approved by the World Bank to support the institutional capacity and performance of the Georgian National Tourism Administration (GNTA) (World Bank, 2015).

> Each region offers a variety of tourism products with the potential to offer high-quality tourism through preserving and enhancing cultural heritage, ecosystems, wildlife, winter-ski resorts, and summer-mountain adventure activities. Harnessing the tourism potential of both regions would help to provide job opportunities, particularly in boutique hotels and SMEs sectors.
>
> (World Bank, 2015)

Various stakeholders in Georgia, including current and past governments, opposition leaders, policymakers, and international organizations, have advocated for the development of the tourism sector, highlighting its potential to drive sustainable economic growth and prosperity. The primary motivation behind countries' efforts to attract more tourists lies in the anticipated positive economic outcomes. Research findings suggest that improvements in tourism generate additional government revenues (Andriotis, 2002) and foreign exchange earnings (Manzoor et al., 2019), while also fostering job creation and regional development (Andriotis, 2002). At the same time, tourism requires large direct expenditures by tourism businesses and significant government spending on infrastructure. Moreover, tourism can potentially contribute to inflation and carries a high opportunity cost due to resource over-consumption. Additionally, there are many hidden costs of tourism manifested in its environmental and sociocultural impacts.

Despite its pivotal role in the Georgian economy and policymaking, the impact of tourism and its effects have not been extensively studied. To our knowledge, only one study (Aliyev and Ahmadova, 2020) investigates the relationship between tourism development and economic growth in Georgia.

Our study examines the impact of tourism development on economic growth in Georgia, utilizing the number of international tourist arrivals as a proxy for tourism development. We employ the autoregressive distributed lag bounds testing (ARDLBT) model to analyze both annual (1997-2019) and quarterly (2011-2019) data. The annual data results of the trivariate model confirm Aliyev and Ahmadova (2020)'s findings. Cointegration tests indicate the long-run relationship between tourism and economic growth, a 1% increase in tourism arrivals is associated with a 0.135% decrease in real GDP. However, once we add agriculture (AGR) and foreign direct investments (FDI) as additional controls we do not find the long-run relationship between tourism and real GDP to be significant. These findings are corroborated by our analysis of quarterly data. Furthermore, our results remain robust across various model specifications, including different measures of tourism development and agriculture. Regarding other impacts of tourism, we find a positive correlation between tourism and the real effective exchange rate (REER) in the long-run, with a 1% increase in tourism development linked to a 0.08-0.19% increase in REER. Additionally, we observe short-term correlations between tourism and both agriculture (AGR) and foreign direct investments (FDI), with a 1% increase in tourism development corresponding to increases of 0.11-0.49% in AGR and 1.07-1.46% in FDI.

The remainder of the paper is organized as follows: the next section covers the relevant literature, section 2.3 describes the data and methodology, section 2.4 presents the findings and results, and section 2.5 concludes.

2.2 Literature Review

2.2.1 Georgia: A Brief Socioeconomic Overview

The dissolution of the Soviet Union (1988-1991) had many disastrous effects on its member countries. Among the post-Soviet Union countries, Georgia had one of the worst annual GDP growth declines of -44.9%. Industry output fell by over 80%, and by 1994, GDP had fallen by 72%. The economic stagnation was accompanied by the civil war in the two regions of the country. While dealing with these conflicts, the Georgian government (1995-2003) implemented political and economic reforms, which led to slow economic development. Overcoming the legacy of 70 years of Soviet rule was quite challenging and the reforms were unsustainable (UNDP, 2010).

The power had fragmented, and there was a deep public distrust of state institutions. With many political and economic driving forces of the revolution, the opposition united in the massive popular demonstrations in 2003. The protests culminated in the resignation of President Shevardnadze and marked the end of Soviet-era leadership in the country.

When the new government came into power in 2003, Georgia was a least-developed country with a GDP per capita of $922. The taxes were high compared to other countries in the region, but the government's budget revenue was less than 7% of the GDP. By 2012, Georgia doubled its GDP per capita and quadrupled its economy in nominal terms. The United National Movement government (2003-2012) implemented broad structural and liberal economic reforms. The most significant ones among them were the reforms addressing corruption, the police force, bureaucracy, the energy sector, customs, and the education system (Gilauri, 2017). The positive effects of the reforms have been reflected in various international rankings. In the World Bank's "Ease of Doing Business 2020" report, Georgia ranked 7^{th} among 190 countries. According to the 2017 Transparency International report, Georgia ranked 44^{th} in the Corruption Perception Index while maintaining its top position among the 19 countries of Eastern Europe and Central Asia (EECA).

Despite the spectacular economic growth after the Rose Revolution in 2003, the share of people living in poverty grew by 43% during 2007-2011 (Livny et al., 2016). One explanation is the neglect of the agricultural policy. Based on the World Bank statistics 50-55% of employed in Georgia worked in the agricultural sector (2003-2009), while agricultural production only accounted for 8% of GDP. By 2019, the employment in agriculture decreased to 38%, but this value is still above the world average of 26.7% (OECD members 5%, central Europe and Baltics 9%, middle-income countries 29%) (World Bank, 2019b).

Liberalization and simplification of regulations made business operations easier but did not solve the problem of job creation. As 20% of Georgians emigrated after the collapse of the Soviet Union during 1990-2002, the unemployment rates were expected to naturally decline (the majority of migrants were of working age), but instead of declining, unemployment rates increased further. With a smaller labor force and higher unemployment rates, it is difficult to argue that the Georgian government was successful in attracting new businesses which significantly contributed to job creation.

All these processes drastically changed the economic structure of Georgia throughout these years. As of 2021, Georgia still has not reached its 1989 GDP level. Currently, GDP consists mainly of services (60.45%), industry (19.96%), agriculture (6.22%), and construction (13.37%). High unemployment rates and high levels of poverty forced the government to outline a new strategy for economic development. Since the early 2000s, the government has focused on the development of tourism. In 2019, tourism accounted for approximately 71% of Georgia's service export revenues (GNTA, 2019). Revenues from international tourism displayed an increasing trend and reached 3.3 billion USD in 2019. Tourism made up 8.1% of the total GDP. These tourism trends might have had positive impacts on the Georgian economy, but researchers have also argued that as more tourists visit Georgia, the country has to import more as only 20% of the goods of the consumer basket are produced in Georgia and the remaining 80% are imported. As Papava (2018) states Georgian economy is in a "Tourist Trap" with the economy growing but not developing. These observations motivate the research question of this paper. The goal is to investigate whether the development of the tourism industry contributes to the long-term economic growth in Georgia.

2.2.2 Tourism and Economic Growth

The relationship between tourism development and economic growth has been extensively explored, although Georgia has been widely excluded from empirical research. The literature presents four main hypotheses:

1. Unidirectional Causality: Tourism-led Growth Hypothesis (TLGH).
2. Unidirectional Causality: Economic-growth driven Tourism Hypothesis (EGTH).
3. Bidirectional Causality: A Reciprocal Relationship Between Tourism and Economy. And,
4. No Causality: Neutrality Hypothesis.

The Tourism-led Economic Growth Hypothesis (TLGH) dominates the current tourism economics literature (Perles-Ribes et al., 2017; Badulescu et al., 2018). TLGH framework is derived from the export-led growth hypothesis, which suggests that economic growth can be achieved by stimulating exports as well as through increasing factors of production. Numerous empirical studies have provided findings supporting TLGH (Gunduz and Hatemi-J, 2005; Zhang and Gao, 2016; Hatemi-J, 2016; Manzoor et al., 2019; Aliyev and Ahmadova, 2020; Khan et al., 2020). The findings indicate that tourism encourages investment (Manzoor et al., 2019), creates jobs (Andriotis, 2002), increases public revenues (Andriotis, 2002), and expands exports (Brida et al., 2016).

The research findings on the direction of causality between tourism and economic development have been inconclusive and context-specific nevertheless. Oh (2005) shows that economic growth leads to tourism development, and a cointegration between tourism and economic growth does not exist in Korea (tourism does not lead to economic growth). Payne and Mervar (2010) employ Toda-Yamamoto long-run causality tests for quarterly data in Croatia. Their findings also reveal the economic-driven tourism growth hypothesis (EGTH). The Autoregressive Distributed Lag (ARDL) results provided by Kyophilavong et al. (2018) also indicate EGTH in Laos.

Some studies have rejected the unidirectional causality altogether. A bidirectional causality was evidenced for Turkey, Portugal, Estonia, and Hungary (Demiroz and Ongan, 2005; Chou, 2013; Aslan, 2014). Aslan (2014) and Chou (2013) identified no causality hypothesis for Malta, Egypt, Bulgaria, Romania, and Slovenia.

Khan et al. (2020) use the ARDL model to measure the causal relationship between international tourist arrivals, economic growth, net FDI inflows, energy consumption, agricultural development, and poverty in Pakistan. Their findings indicate positive unidirectional causality between tourism development and economic growth, a 1% increase in tourism development enhances economic growth by 0.05% in the long-run, and 0.02% in the short-run. Their study also reveals that tourism unidirectionally causes agricultural development (0.26%), energy development, (0.13%), and poverty reduction (-0.59%).

Aliyev and Ahmadova (2020) also use the ARDL testing approach to study the impacts of tourism in Georgia. They follow the trivariate system methodology of Katircioglu (2009) and confirm the validity of the TLGH hypothesis. The sign of causality from tourism development to economic growth is negative in the long-run, a 1% increase in the number of international tourist arrivals decreases real GDP by 0.125%. This paper aims to reevaluate Aliyev and Ahmadova (2020) findings and examine whether tourism has a negative long-run impact on the Georgian economy. Furthermore, following Khan et al. (2020)'s methodology, the paper extends the Aliyev and Ahmadova (2020)'s study to explore the influence of tourism on FDI and agriculture. Additionally, it examines bidirectional relationships and factors affecting tourism.

2.3 Data and Methodology

2.3.1 Data

To test the validity of the TLGH hypothesis, we use 1997-2019 annual data from the World Bank. We measure tourism development by international tourist arrivals (ITA), and economic growth using real GDP (RGDP). We also include the real effective exchange rate (REER) as the control variable. Initially, we start with the trivariate methodology. Based on the findings we then extend the study and include FDI and agricultural value added as additional controls. Some studies have identified unidirectional causality running from FDI to tourism in the short-run and bidirectional causality between tourism and FDI in the long-run. Findings on the relationship between tourism and agriculture are similar. The literature indicates that tourism increases the demand for local food products and therefore stimulates local agricultural production.

Table 2.1 provides the summary statistics for the annual data,[6] and Figure 2.1 plots the annual profile of the logarithmic transformations. *Real GDP (RGDP)* is the inflation-adjusted value of all goods and services produced in the country, measured in million constant 2010 USD. *International*

[6]Although the data sources are different across the two studies, the summary statistics do not vary substantially. In Aliyev and Ahmadova (2020)'s paper GDP is measured in million AZN, and GDP deflator is used to transform the values from nominal to real. Their ITA values are slightly higher, while the REER values are identical to the values presented in Table 2.1.

Tourist Arrivals (ITA) is the number of tourists who travel to the country during a year, measured in thousands of persons. *Real Effective Exchange Rate (REER)* is the nominal effective exchange rate divided by a price deflator or index of costs, Georgia's currency Lari (GEL) is compared to an index of other main currencies. REER is expressed on the base 2010 = 100. *Agriculture (AGR)* is the agriculture, forestry, and fishing, value added measured in current million USD. *Foreign Direct Investments, net inflow (FDI)* is a measure of direct investment equity flows in the reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital. To check the robustness of the results, we also use *International Tourism Receipts* measured in current million USD, and *Cereal Production* (metric tons) to substitute tourist arrivals and agriculture variables in our model. The annual data was obtained from the World Development Indicators.

To check the robustness of the results we also analyze the quarterly data for the 2011-2019 period. The quarterly data for RGDP, AGR, and FDI was obtained from the Georgian Statistical Institute (Geostat). The AGR data was only available in the local currency, Georgian Lari (GEL). We used average exchange rates to change its values into USD. The ITA data was obtained from the Georgian National Tourism Administration (GNTA). The data for REER was obtained from the IMF. Except for ITA data, sums of quarterly data do not match the annual data (Geostat data does not match World Development Indicators). The differences are minor for FDI and REER (on average less than 1% in levels). The differences are higher for RGDP and AGR values, the variation is larger in USD compared to GEL. The log transformations help lower these differences to below 1.5%. Summary statistics for quarterly data are presented in Table 2.9. We mainly use and discuss USD values, however, we also report results for values in GEL in the appendix.

2.3.2 Methodology

To investigate the impact of tourism on economic growth we use the time-series analysis and logarithmic transformations. The coefficients represent elasticities - a percentage change in the dependent variable given a 1% change in the independent variable.

$$ln(RGDP)_t = \alpha_0 + \alpha_1 ln(ITA)_t + \alpha_2 ln(REER)_t + u'_t \quad (2.1)$$

$$ln(ITA)_t = \beta_0 + \beta_1 ln(RGDP)_t + \beta_2 ln(REER)_t + u''_t \quad (2.2)$$

Both equations test the unidirectional hypothesis. Equation (2.1) tests the TLGH hypothesis, while equation (2.2) examines EGTH. α and β are regression coefficients, t denotes the time and u is the error term.

Due to the small sample size and non-linear correlation, we use the autoregressive distributed lag bounds testing (ARDLBT) model to estimate long-run and short-run relationships. This approach was developed by Pesaran et al. (1999) and further extended by Pesaran et al. (2001). Compared to other cointegration methods ARDLBT provides multiple advantages: variables do not need to have the same order of integration, and the long-term and short-term effects can be estimated simultaneously, and results can be obtained using ordinary least squares. The cointegration test is used to assess whether there exists a long-run relationship between variables.

We start the ARDLBT estimation by deriving the unrestricted error correction (EC) model, which integrates short-run and long-run relationships. In yearly data analysis, the short-run refers to changes occurring within a single year or a few years, reflecting immediate or temporary impacts of independent variable variations on the dependent variable, while for quarterly data, it may refer to changes observed within a single quarter or a few consecutive quarters. In ARDL and ARDLBT modeling, short-term dynamics are often represented by lagged variable values. The long-run denotes the stable equilibrium connection between variables over an extended timeframe, encompassing several years or the entirety of the dataset, for quarterly data, the long-run equilibrium might be established over several quarters or the entire dataset. In ARDL modeling, the long-term association is depicted by coefficients linked to the levels of variables (Kripfganz and Schneider, 2018), indicating the steady-state relationship between them without differencing.

For the three variable case, we have:

$$\Delta y_t = c_0 + \theta_1 y_{t-1} + \theta_2 x_{1t-1} + \theta_3 x_{2t-1} + \sum_{i=1}^{n} \gamma_i \Delta y_{t-i} + \sum_{i=1}^{n} \phi_i \Delta x_{1t-i} + \sum_{i=1}^{n} \omega_i \Delta x_{2t-i} + u_t \quad (2.3)$$

where y represents the dependent variable, and x represents the independent variables, Δ is the first difference. c_0 is the intercept, θ denotes long-run coefficients, γ, ϕ and ω represent short-term relationships and u_t is the error term.

First, we examine the stationarity of the variables. The stationarity of time series variables means that the statistical properties such as mean, variance, and autocorrelation are all constant over time. We use Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests to examine the stationarity of the variables.

Next, we test for cointegration to confirm the long-run relationship using the ARDL-bounds test developed by Pesaran et al. (2001). The cointegration between two variables would indicate a long-run effect, such that two variables cannot depart much from the equilibrium, and the difference between their means remains constant over time. The cointegration exists if the Wald test rejects the null hypothesis $H_0 : \theta_1 = \theta_2 = \theta_3 = 0$ (long-run coefficients equal 0). If the computed F-statistic exceeds the upper critical bound, it indicates the presence of cointegration, suggesting a long-run relationship among the variables. If the cointegration is found, the short-run dynamics can be calculated using equation (2.3), and the long-run coefficients can be estimated using the Bewley transformation:

$$y_t = \frac{c_0}{\theta_1} + \frac{\theta_2}{\theta_1} x_{1t} + \frac{\theta_3}{\theta_1} x_{2t} + u_t''' \quad (2.4)$$

We use the same analytical approach with additional controls (AGR and FDI) and the quarterly data. Instead of three variables, equations (2.1) and (2.2) will have two additional independent variables, and x_3 and x_4 will be included in the unrestricted error correction model. We also developed various models to test whether tourism impacts other variables:

$$RGDP_{(t)} = f[ITA_{(t)}, REER_{(t)}]; \quad (2.5)$$

$$RGDP_{(t)} = f[ITA_{(t)}, AGR_{(t)}, FDI_{(t)}, REER_{(t)}]; \tag{2.6}$$

$$ITA_{(t)} = f[RGDP_{(t)}, AGR_{(t)}, FDI_{(t)}, REER_{(t)}]; \tag{2.7}$$

$$AGR_{(t)} = f[RGDP_{(t)}, ITA_{(t)}, FDI_{(t)}, REER_{(t)}]; \tag{2.8}$$

$$FDI_{(t)} = f[RGDP_{(t)}, ITA_{(t)}, AGR_{(t)}, REER(t)]; \tag{2.9}$$

$$REER_{(t)} = f[RGDP_{(t)}, ITA_{(t)}, AGR_{(t)}, FDI(t)]; \tag{2.10}$$

2.4 Results

The correlation analyses presented in Table 2.2 and Table 2.3 suggest that real GDP, international tourist arrivals, and real effective exchange rates are positively correlated. The high correlation coefficient (0.97), between ln($RGDP$) and ln(ITA) implies that an increase in the number of tourists has a positive impact on economic growth. The correlation is also high between ln(ITA) and ln(AGR), and ln(ITA) and ln(FDI), 0.81 and 0.83 respectively.

Table 2.3 presents Spearman correlation, which does not assume a linear relationship between variables and measures the strength and direction of a monotonic relationship. Spearman correlation ranges from -1 to 1, where 1 indicates a perfect positive monotonic relationship, -1 indicates a perfect negative monotonic relationship, and 0 indicates no monotonic relationship. ln($RGDP$) and ln(ITA) have a strong positive monotonic relationship (0.95), ln($RGDP$) tends to increase as ln(ITA) increases. There is a moderate positive monotonic relationship between ln(ITA) and ln(AGR) (0.78), and ln(ITA) and ln(FDI) (0.79).

Before constructing the ARDLBT model, it is essential to assess the unit root characteristics of all variables. Table 2.4 presents Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity results with intercept, as well as with trend and intercept. In the ADF test, the null hypothesis is "the variable is not stationary," while in the KPSS test, the null hypothesis is "the variable is stationary." The optimal lag length was estimated using Akaike's Information Criterion (AIC). ADF results conclude that ln($RGDP$), ln($REER$), and ln(AGR) are stationary at first difference with and without trend. ln(ITA) is trend stationary at level. ln(FDI) is trend stationary based on KPSS results. These results indicate that the ARDLBT approach to cointegration is applicable, with the specified model including unrestricted intercept and restricted trend.

The bounds test approach is sensitive to lag length, therefore, the lag length was estimated using VAR lag order selection criteria. Given the small sample size, the error correction model was estimated using a maximum of 3 lags in the trivariate model and a maximum of 2 lags in models in models with additional controls. To examine the long-run relationship between the variables, we employed the ARDL bounds test developed by Pesaran et al. (2001).

Table 2.5 presents the estimated ARDL model and the bounds F-test for cointegration in the trivariate model. The results confirm the validity of TLGH and EGTH, the F-statistic is greater than the upper bound of critical values proposed by Pesaran et al. (2001) and Narayan (2005) at a 5% significance level. Based on these cointegration test results, we find the bidirectional relationship in the trivariate model (RGDP, ITA, REER).

The ARDL coefficient estimates for the trivariate model for the Tourism-led Growth Hypothesis are presented in Table 2.6. Results suggest that tourism development has a negative impact on real GDP in the long-run, with a 1% increase in tourist arrivals is associated with a -0.135% impact on RGDP. The impact is positive in the short-run, coefficients of $\Delta ln(ITA)_t$, $\Delta ln(ITA)_{t-1}$, and $\Delta ln(ITA)_{t-2}$ are all significant at 5% level. The Error Correction Term (ECT) coefficient indicates that any deviation from the long-run equilibrium between variables is corrected for each period. The ARDL coefficients estimated for the trivariate model for the Economic Growth-led Tourism Hypothesis suffer from serial correlation and, therefore are not discussed further (the RGDP coefficient was not significant, which indicates long-run relationship between ITA and REER based on the cointegration test, but not between ITA and RGDP).

The negative correlation observed from tourism development to economic growth needs further investigation. It may be argued that the increase in the number of visitors does not necessarily translate into an increase in government revenue, as with the new tax codes and free tourist zones many tourism businesses are exempt from profit and property taxes for 15 years. Additionally, while tourism may stimulate local agricultural production by increasing demand for local food products, it is plausible that the development of tourism in Georgia has also escalated demand for imports (Papava, 2018), and the tourism sector became rival to agriculture (Salukvadze and Backhaus, 2020). Some studies have also identified unidirectional causality from FDI to tourism in the short-run and bidirectional causality between tourism and FDI in the long-run. To address these complexities, we include AGR and FDI variables as additional controls in our model. This approach helps mitigate omitted variables bias and enables a more comprehensive investigation into the mechanisms through which tourism impacts the economy. Additionally, we estimate ARDL models with AGR and FDI as dependent variables and tourism as independent variables to examine the presence of a bidirectional relationship between them.

The ARDLBT model with additional controls in Table 2.7 reveals no long-run relationship between tourism development and economic growth. The coefficient for $ln(ITA)_t$ is positive but not statistically significant. Moreover, we do not observe the direct impact of tourism on RGDP in the short-run. To explore the potential effects of tourism on AGR, FDI, or REER, we conduct separate estimations of the ARDLBT model with each variable as the regressand. The analysis presented in Table 2.9 indicates that tourism development positively impacts REER in the long-run, and is positively correlated with AGR and FDI in the short-run. Specifically, a 1% increase in tourist arrivals corresponds to a 0.49% increase in AGR and a 1.46% increase in FDI in the short-run. Conversely, AGR and FDI exhibit negative short-term correlations with tourism development.

Several diagnostic tests were performed to ensure that our models fulfill the linear regression assumptions. The results of diagnostic tests are reported in the bottom panels of the tables. The Jarque-Bera test reveals that all models are normally distributed; the Breusch-Pagan-Godfrey heteroskedasticity test indicates that the modeling errors are uncorrelated and uniform. The Breusch-Godfrey serial correlation LM test shows that some of our specifications for ITA, FDI, and REER results (Table 2.8 column 1, 3, 4) suffer from serial correlation. One potential solution is to increase the number of lags; however, given the sample size of 23 observations, including more than

2 lags for dependent variables is not feasible. To mitigate this problem, we also examine quarterly data and compare our findings.

Table 2.9, Table 2.10, and Table 2.11 provide summary statistics, correlation matrix results, and Spearman correlation coefficients for quarterly data, respectively. Unit root test results in Table 2.12 indicate that the quarterly variables are stationary at the first difference and are integrated of order I(1), with ITA being trend stationary at level. Similarly to our annual analysis, we include a detrending variable to measure the tourism effects. Table 2.13 shows cointegration test results, revealing no evidence to reject the hypothesis for no long-run relationship hypothesis between GDP and ITA (the results do not support the TLGH hypothesis).

After confirming the bounds test conjecture and lag length criteria, we estimate the ARDLBT model using other variables as the regressand. Cointegration is found for three regressions. We do not find cointegration between RGDP and ITA, and FDI and ITA relationship. Similarly to the annual data findings, the results from the quarterly data (Table 2.14 Column 1) do not indicate long-run relationship between ITA and RGDP, leading us to reject the Tourism-led Growth Hypothesis. Moreover, there is no evidence to support the Economic-Driven Tourism Growth Hypothesis (Table 2.14 Column 2) as the coefficient for RGDP is not significant. The model estimating the long-run relationship between agricultural development and tourism, both in annual (Table 2.8 Column 2) and quarterly results (Table 2.14 Column 3), shows no relationship between tourism and agriculture in long-run, and a positive relationship in short-run.

To confirm that the original differences in quarterly and annual data (and specifically our transformation of AGR into USD) are not driving the results, we also estimate the models in the local currency, GEL. The findings remain consistent. No long-run relationship exists between ITA and RGDP. Tourism development is observed to have a positive long-run impact on REER. Further details can be found in Appendix B.

Similar results are obtained when we substitute International Tourist Arrivals with International Tourism Receipts and when we replace AGR (agriculture, forestry, and fishing, value added) with Total Agricultural Production. These substitutions do not change our findings.

Table 2.15 and Table 2.16 summarize the long-run and short-run tourism coefficients across all specifications. Utilizing linear regression assumption with unrestricted intercept and restricted trend, we do not find tourism development to have any significant impact on RGDP, AGR, and FDI in long-run. However, tourism is found to positively influence REER, with a 1% increase in tourism development leading to a long-term increase of 0.08-0.19% in REER. In the short-run, tourism does not directly impact RGDP, but it positively correlates with AGR and FDI, with increases ranging from 0.11% to 0.49% and 1.07% to 1.46%, respectively.

Table 2.17 presents findings on the impacts of RGDP, AGR, FDI, and REER on tourism. In the majority of our specifications, AGR and REER are found to have a positive long-run impact on tourism development. RGDP exhibits a positive short-run impact, while FDI shows a negative short-run impact on tourism development.

Although we do not find tourism to have a statistically significant impact on the economic growth in Georgia in the long-run, when we compare Georgia to Baltic countries during the transition time (early 2000s) we find that emphasis on tourism development in Georgia might be serving some other important goals. In their article, Nichols (2001) discusses the concept of placemaking, which involves intentionally selecting symbols and language to encapsulate the history, culture, and environment of a location, often used to construct national identity. Nichols (2001) points out that in the Baltic region, tourism development served as a platform for promoting the image of these nations as emerging from communist oppression to embrace Western values. Tourist narratives emphasized victimhood and a desire to reconnect with "natural Western roots," distancing themselves from their communist past. State-backed tourism development not only served economic goals but also political agendas, shaping foreign relations and supporting a push for the EU membership as well as NATO as investors in the tourism industry often promote positive relations between their home and host countries to safeguard their interests and support geopolitical objectives (Nichols, 2001). In Georgia, similar narratives of utilizing tourism to shape national identity and advance geopolitical objectives are evident, warranting further examination to uncover additional mechanisms through which tourism effects might be materializing in the country.

2.5 Conclusion

This study examines the impact of tourism development on economic growth in Georgia, employing the number of international tourist arrivals as a measure of tourism development. The analysis utilizes the ARDLBT model, examining both annual data spanning from 1997 to 2019 and quarterly data from 2011 to 2019.

The findings of the annual data analysis align with prior research by Aliyev and Ahmadova (2020), indicating a negative significant relationship between tourism and economic growth. However, upon incorporating additional controls for agriculture (AGR) and foreign direct investment (FDI), the long-term correlation between tourism and real GDP is not statistically significant. The quarterly results confirm our findings. The results are robust to other model specifications (annual and quarterly data measured in local currency, measuring tourism development using tourism receipts, measuring agriculture using total agricultural production).

In long-run, our analyses reveal no significant impact of tourism on real GDP (RGDP), AGR, or FDI. Tourism development demonstrates a positive correlation with the real effective exchange rate (REER), a 1% increase in tourism is associated with a 0.08-0.19% increase in REER. In short-run, tourism does not have any direct impact on RGDP, but it correlates positively with AGR and FDI, with increments ranging from 0.11%-0.49% and 1.07%-1.46%, respectively.

In summary, our findings suggest a bidirectional positive relationship between tourism and REER in the long-run, alongside a unidirectional positive relationship between AGR and tourism. In the short term, our findings indicate a positive relationship between tourism and AGR, tourism and FDI, as well as RGDP and tourism. However, a negative relationship is identified between FDI and tourism. Based on these findings we reject the hypothesis that tourism development leads to economic growth in Georgia.

2.6 Figures and Tables

2.6.1 Figures

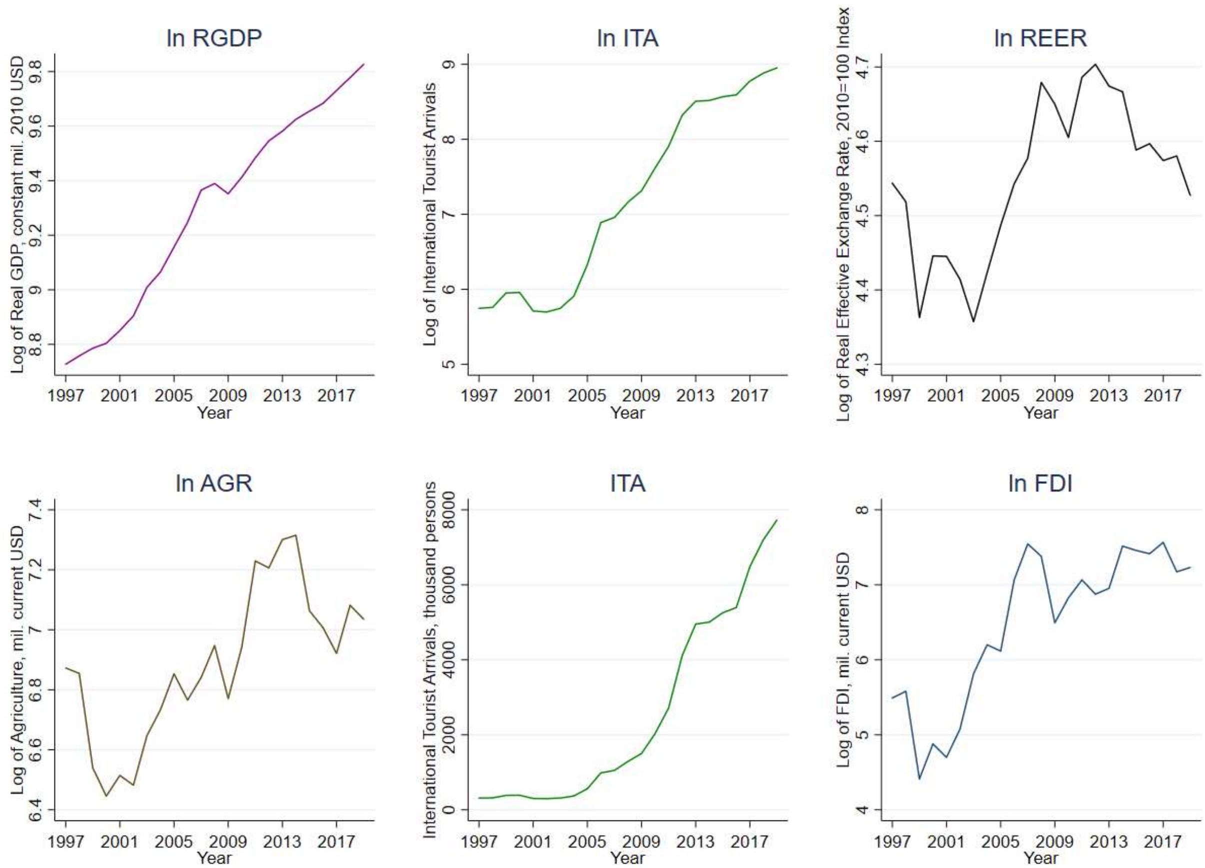


Figure 2.1: Annual Profile of the Logs of Variables

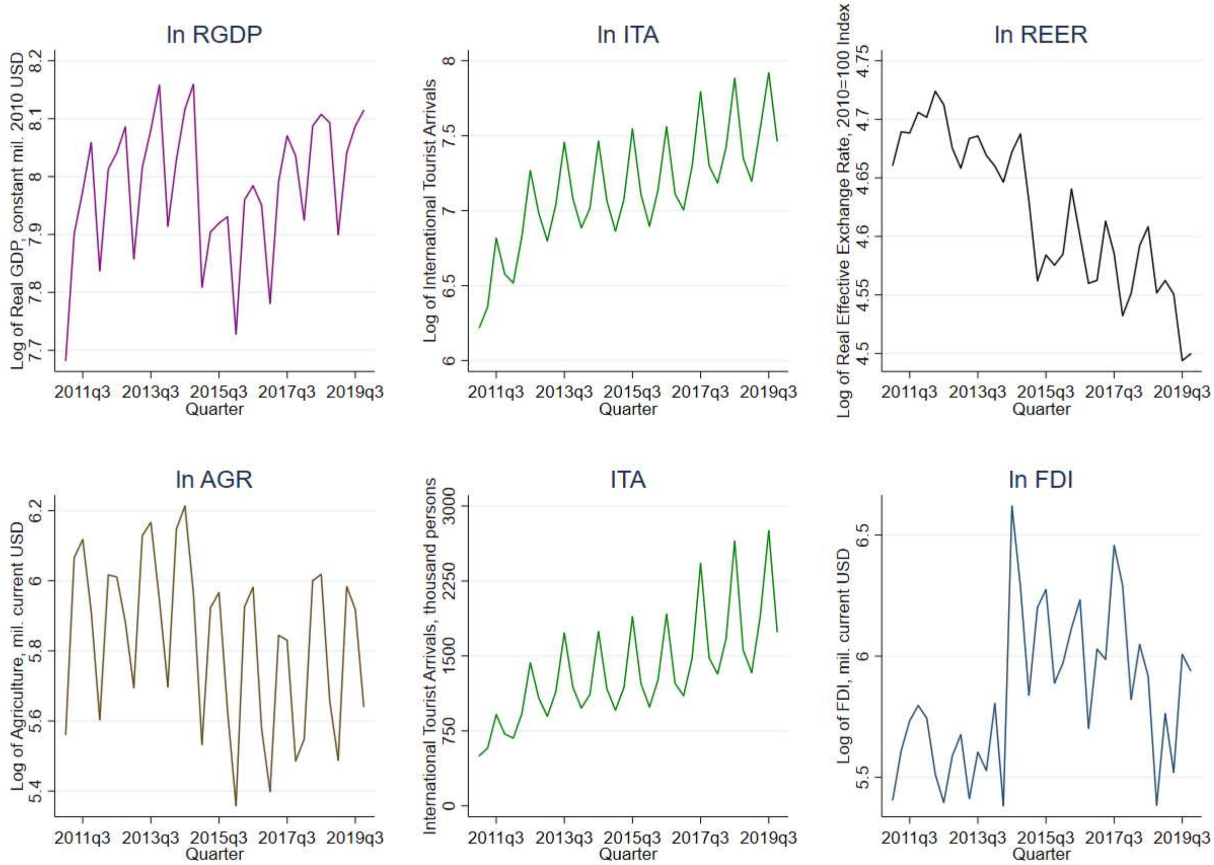


Figure 2.2: Quarterly Profile of the Logs of Variables

2.6.2 Tables

Table 2.1: Summary Statistics - Annual Data (1997-2019)

Variable	Obs	Mean	Std. Dev.	Min	Max
ln($RGDP$)	23	9.29	0.36	8.73	9.83
ln(ITA)	23	7.21	1.24	5.70	8.95
ln($REER$)	23	4.55	0.10	4.36	4.70
ln(AGR)	23	6.89	0.25	6.45	7.32
ln(FDI)	23	6.47	1.02	4.41	7.57

Table 2.2: Correlation Matrix of Variables - Annual Data

Variable	ln($RGDP$)	ln(ITA)	ln($REER$)	ln(AGR)	ln(FDI)
ln($RGDP$)	1				
ln(ITA)	0.97	1			
ln($REER$)	0.68	0.72	1		
ln(AGR)	0.77	0.81	0.83	1	
ln(FDI)	0.90	0.83	0.75	0.78	1

Table 2.3: Spearman Correlation Coefficients - Annual Data

Variable	ln($RGDP$)	ln(ITA)	ln($REER$)	ln(AGR)	ln(FDI)
ln($RGDP$)	1				
ln(ITA)	0.95	1			
ln($REER$)	0.60	0.64	1		
ln(AGR)	0.75	0.78	0.82	1	
ln(FDI)	0.84	0.79	0.61	0.66	1

Table 2.4: Unit Root Test Results - Annual Data

	ADF test				KPSS test	
	I(0)	lag	I(1)	lag	I(0)	I(1)
intercept						
$\ln(RGDP)$	-0.78	1	-3.22^{**}	0	1.22^{***}	0.14
$\ln(ITA)$	-0.25	2	-2.39	1	0.83^{***}	0.17
$\ln(REER)$	-1.29	1	-4.45^{***}	0	0.67^{**}	0.15
$\ln(AGR)$	-1.32	1	-4.13^{***}	0	0.80^{***}	0.12
$\ln(FDI)$	-1.12	1	-4.64^{***}	0	0.96^{***}	0.08
intercept, trend						
$\ln(RGDP)$	-1.49	2	-3.19^{*}	0	0.15^{**}	0.11
$\ln(ITA)$	-3.11^{*}	2	-2.34	1	0.11	0.15^{**}
$\ln(REER)$	-1.53	1	-4.33^{***}	0	0.17^{**}	0.14^{*}
$\ln(AGR)$	-2.84	1	-4.04^{***}	0	0.11	0.11
$\ln(FDI)$	-2.13	1	-2.62	2	0.15^{**}	0.09

Table 2.5: Results of Bounds Test for Cointegration - Annual Data

F-statistics	Significance Level	Pesaran et al. (2001) critical values		Narayan (2005) critical values	
		Lower bound	Upper bound	Lower bound	Upper bound
F_w=6.162** TLGH F_w=5.958** EGTH	1%	4.99	5.85	5.666	6.988
	5%	3.88	4.61	4.048	5.090
	10%	3.38	4.02	3.378	4.274

Table 2.6: ARDL Specification for TLGH - a Trivariate Model

The estimation of ARDL (2,3,2) specification			
Variables	Coefficient	SE	p-values
Long-run elasticities			
ln$(ITA)_t$	-0.135^{**}	0.053	0.031
ln$(REER)_t$	0.321	0.208	0.157
ECT	-0.808^{***}	0.246	0.009
Short-run elasticities			
Δ ln$(RGDP)_{t-1}$	0.309	0.232	0.215
Δ ln$(ITA)_t$	0.096^{**}	0.039	0.038
Δ ln$(ITA)_{t-1}$	0.135^{**}	0.044	0.013
Δ ln$(ITA)_{t-2}$	0.126^{**}	0.052	0.038
Δ ln$(REER)_t$	-0.315	0.184	0.121
Δ ln$(REER)_{t-1}$	-0.178	0.128	0.197
Trend	0.073^{***}	0.009	0.000
Constant	-111.313^{***}	33.005	0.008
Homoscedasticity	0.36 [0.547]		
No Serial Correlation	1.29 [0.255]		
Normality	0.84 [0.657]		
Cointegration test	6.162**		

*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests include: Breusch-Pagan heteroskedasticity test, χ^2 [probability]; Breusch-Godfrey serial correlation test; Jarque-Bera statistic for normal distribution.

Table 2.7: ARDL Specification for TLGH - Including AGR and FDI

The estimation of ARDL (2,1,2,2,2) specification			
Variables	Coefficient	SE	p-values
Long-run elasticities			
ln$(ITA)_t$	0.037	0.031	0.286
ln$(AGR)_t$	0.056	0.036	0.169
ln$(FDI)_t$	0.097^{***}	0.012	0.000
ln$(REER)_t$	-0.049	0.139	0.738
ECT	-1.594^{*}	0.704	0.064
Short-run elasticities			
Δ ln$(RGDP)_{t-1}$	0.449	0.341	0.237
Δ ln$(ITA)_t$	-0.069	0.062	0.303
Δ ln$(AGR)_t$	0.081	0.052	0.172
Δ ln$(AGR)_{t-1}$	0.026	0.048	0.606
Δ ln$(FDI)_t$	-0.077	0.051	0.177
Δ ln$(FDI)_{t-1}$	-0.058	0.042	0.216
Δ ln$(REER)_t$	-0.086	0.124	0.513
Δ ln$(REER)_{t-1}$	0.257^{**}	0.095	0.035
Trend	0.032^{***}	0.005	0.001
Constant	-88.763	53.623	0.149
Homoscedasticity	0.78 [0.377]		
No Serial Correlation	4.35 [0.037]		
Normality	0.14 [0.931]		
Cointegration test	3.928*		

*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests include: Breusch-Pagan heteroskedasticity test, χ^2 [probability]; Breusch-Godfrey serial correlation test; Jarque-Bera statistic for normal distribution.

Table 2.8: ARDL Specification for Impacts of Tourism on AGR, FDI, REER

Variables	**ln(ITA)**	**ln(AGR)**	**ln(FDI)**	**ln(REER)**
Long-run				
ln($RGDP$)	-31.41	10.51**	10.72***	-0.38
ln(ITA)		-0.18	-0.13	0.19**
ln(AGR)	2.73		-0.63*	0.04
ln(FDI)	2.61	-1.03***		0.11**
ln($REER$)	5.96*	0.32	-0.50	
ECT	-0.33*	-0.79**	-2.45***	-0.94***
Short-run				
Δ ln$(RGDP)_t$	8.87***	-4.60	-15.59*	-1.28***
Δ ln$(ITA)_t$		0.49**	1.46**	
Δ ln$(AGR)_t$	-0.45*		-0.38	0.29***
Δ ln$(FDI)_t$	-0.66***	0.49**		
Δ ln$(REER)_t$	-1.03	0.39	1.92	
Trend	1.36	-0.36**	-0.39***	-0.02
Constant	-819.96**	504.84*	1685.59**	45.11
Homoscedasticity	1.17 [0.28]	0.93 [0.34]	0.69 [0.41]	2.19 [0.14]
No Serial Correlation	13.52[0.00]	2.66 [0.11]	3.87 [0.05]	2.99 [0.08]
Normality	2.11 [0.35]	0.77 [0.92]	0.52 [0.77]	1.47 [0.48]
Cointegration test	12.96***	8.51**	10.33***	9.01***
ARDL(optimal lags)	(2,2,1,2,2)	(1,2,1,2,2)	(2,2,2,2,2)	(2,1,0,1,0)

*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests: Breusch-Pagan heteroskedasticity test, χ^2 [probability]; Breusch-Godfrey serial correlation test; Jarque-Bera statistic for normal distribution.

Table 2.9: Summary Statistics - Quarterly Data (2011-2019)

Variable	Obs	Mean	Std. Dev.	Min	Max
ln($RGDP$)	36	7.98	0.12	7.68	8.16
ln(ITA)	36	7.14	0.39	6.22	7.92
ln($REER$)	36	4.62	0.06	4.49	4.72
ln(AGR)	36	5.82	0.24	5.36	6.21
ln(FDI)	36	5.85	0.32	5.38	6.62

Table 2.10: Correlation Matrix of Variables - Quarterly Data

Variable	ln($RGDP$)	ln(ITA)	ln($REER$)	ln(AGR)	ln(FDI)
ln($RGDP$)	1				
ln(ITA)	0.58	1			
ln($REER$)	0.02	-0.56	1		
ln(AGR)	0.61	0.23	0.47	1	
ln(FDI)	0.10	0.43	-0.33	-0.03	1

Table 2.11: Spearman Correlation Coefficients - Quarterly Data

Variable	ln($RGDP$)	ln(ITA)	ln($REER$)	ln(AGR)	ln(FDI)
ln($RGDP$)	1				
ln(ITA)	0.56	1			
ln($REER$)	0.03	-0.56	1		
ln(AGR)	0.50	0.19	0.49	1	
ln(FDI)	0.06	0.42	-0.35	-0.17	1

Table 2.12: Unit Root Test Results - Quarterly Data

	ADF test				KPSS test	
	I(0)	lag	I(1)	lag	I(0)	I(1)
intercept						
$\ln(RGDP)$	-1.76	5	-2.25	5	0.17	0.13
$\ln(ITA)$	-0.26	5	-2.75^{*}	4	0.66^{**}	0.16
$\ln(REER)$	-0.37	3	-4.67^{***}	2	0.93^{***}	0.12
$\ln(AGR)$	-1.25	5	-2.60^{*}	5	0.34	0.12
$\ln(FDI)$	-2.71^{*}	1	-4.75^{***}	2	0.57^{**}	0.08
intercept, trend						
$\ln(RGDP)$	-1.77	5	-2.23	5	0.09	0.11
$\ln(ITA)$	-3.99^{**}	5	-2.06	4	0.11	0.08
$\ln(REER)$	-3.37^{**}	2	-4.61^{***}	2	0.06	0.05
$\ln(AGR)$	-1.94	5	-2.53	5	0.09	0.07
$\ln(FDI)$	-2.84	1	-4.66^{***}	2	0.21^{**}	0.05

Table 2.13: Results of Bounds Test for Cointegration - Quarterly Data

F-statistics	Significance Level	Pesaran et al. (2001) critical values		Narayan (2005) critical values	
		Lower bound	Upper bound	Lower bound	Upper bound
F_w=2.892 TLGH	1%	4.99	5.85	6.43	7.51
F_w=11.662*** EGTH	5%	3.88	4.61	4.54	5.42
	10%	3.38	4.02	3.77	4.54

Table 2.14: ARDL Specification - Quarterly Data

Variables	**ln(RGDP)**	**ln(ITA)**	**ln(AGR)**	**ln(FDI)**	**ln(REER)**
Long-run					
ln($RGDP$)		-1.624	1.028**	-0.555	0.286***
ln(ITA)	-0.079		0.063	1.048*	0.006
ln(AGR)	0.591***	0.125		-0.367	-0.045
ln(FDI)	-0.019	-0.028	-0.033		0.003
ln($REER$)	0.479	5.713*	-0.159	-3.409	
ECT	-0.448***	0.521***	-0.607***	-0.660***	-1.052***
Short-run					
Δ ln$(RGDP)_t$			0.439**		0.007
Δ ln$(ITA)_t$	-0.038		0.109*		
Δ ln$(AGR)_t$	0.281***	0.592***			
Δ ln$(FDI)_t$	0.021	0.081	0.115		-0.006***
Δ ln$(REER)_t$	0.342	-1.908**		2.902	
Trend	0.116**	0.056***	-0.012**	-0.037	4.183***
Constant	0.194	-10.08	-0.713	19.031	4.183***
Homoscedasticity	2.01 [0.16]	3.53 [0.06]	2.99 [0.08]	2.07 [0.15]	0.03 [0.87]
No Serial Correlation	0.11 [0.74]	0.98 [0.32]	0.02 [0.88]	0.11 [0.74]	0.08 [0.78]
Normality	0.85 [0.65]	1.67 [0.43]	1.09 [0.58]	4.69 [0.10]	0.97 [0.61]
Cointegration test	2.892	11.662***	6.527***	3.907	9.700***
ARDL(optimal lags)	(2,2,2,2,1)	(1,0,2,1,2)	(2,2,2,2,0)	(1,0,0,0,1)	(2,0,2,0,0)

Notes:*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests include: Breusch-Pagan-Godfrey heteroskedasticity test [probability]; Breusch-Godfrey serial correlation LM test; Jarque-Bera statistic for normal distribution.

Table 2.15: Summary of Findings - Long-Run Impact of Tourism on RGDP, AGR, FDI, REER

Model Specification	**RGDP**	**AGR**	**FDI**	**REER**
(1) RGDP, AGR in USD	0.04	-0.18	-0.13	0.19**
(2) RGDP, AGR in GEL	-0.01	0.11	0.14	0.10**
(3) Tourism = Tourism Receipts	0.01	0.06	-0.09	0.04
(4) AGR = Total Production in USD	0.15	-0.50	-0.40	0.08**
(5) RGDP, AGR in USD (quarterly data)	-0.08	0.06	1.05*	0.01
(6) RGDP, AGR in GEL (quarterly data)	0.04	-0.11	1.10	0.04

Table 2.16: Summary of Findings - Short-Run Impact of Tourism on RGDP, AGR, FDI, REER

Model Specification	**RGDP**	**AGR**	**FDI**	**REER**
(1) RGDP, AGR in USD	-0.07	0.49**	1.46**	
(2) RGDP, AGR in GEL	-0.06	0.32**	1.07**	0.27**
(3) Tourism = Tourism Receipts	-0.10	0.48**	1.42**	0.57
(4) AGR = Total Production in USD	-0.03		0.95	0.29***
(5) RGDP, AGR in USD (quarterly data)	-0.04	0.11*		
(6) RGDP, AGR in GEL (quarterly data)	-0.09**	0.29**		0.03

Table 2.17: Summary of Findings - Impacts of RGDP, AGR, FDI, REER on Tourism

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Long-run						
RGDP	-31.41	-24.50*	-9.60*	-30.64*	-1.62	-1.11
AGR	2.73	3.84*	1.06**	1.69**	0.59***	-0.84
FDI	2.61	2.48*	0.49	2.37**	-0.02	-0.08
REER	5.96*	7.88*	3.15**	10.40**	0.48	1.49
Short-run						
RGDP	8.87**	7.21***	5.67***	10.07***		
AGR	-0.45*	-0.42	-0.14	-0.49***	0.28***	0.84***
FDI	-0.66***	-0.68***	-0.25	-0.65***	0.02	0.09
REER	-1.03	-1.65**	-0.81	-1.71**	0.34	

Chapter 3

Land Conservation, Tourism, and Income Distribution: Georgia Application

3.1 Introduction

Protected areas including national parks, wilderness areas, community conserved areas, and nature reserves, stand as leading forest conservation measures for species and eco-service preservation. They are the key instruments available for countries to reduce emissions from deforestation and forest degradation, yet the empirical research quantifying their impacts and the mechanisms through which they affect social and environmental goals has been limited. Understanding their impacts on both social and environmental fronts is crucial for effective implementation of conservation policies.

Robalino (2007) measures the effect of conservation policies on landowners' rents and landless agricultural workers. It has been argued that when these policies extend to the agricultural frontier, two conflicting effects emerge: firstly, a reduction in land available for agriculture diminishes aggregate rents; secondly, an increase in the prices of agricultural goods, due to higher demand for agricultural products, will increase the level of rents. Robalino (2007) finds that the latter effect prevails, leading to a net increase in aggregate rents. For environmental impacts, Robalino (2007) shows that an increase in aggregate rents results in further deforestation. Higher agricultural prices incentivize agricultural production at new locations, where it was not profitable before and deforestation takes place. The reduction in the deforested area is not as substantial as the expansion of the protected area. As deforestation takes place beyond the protected areas, it is essential to account for the incentives of both landowners and agricultural workers when formulating forest conservation policies. Understanding these incentive structures is vital for predicting forest outcomes accurately.

As demonstrated by Robalino (2007), protected areas can impact communities beyond alterations in ecosystem services. The provision of tourism and recreational services presents another mechanism through which protected areas may influence disadvantaged populations (Sims, 2010; Ferraro and Hanauer, 2014; Robalino and Villalobos, 2015). If the benefits, such as employment opportunities in tourism, local ecosystem service contributions, and sustainable utilization of valuable renewable resources outweigh the constraints imposed on agricultural activities, the welfare effects can be positive.

In this paper, we evaluate the effects of protected areas on land use and income distribution, with a particular focus on the impacts of tourism and recreational services. Drawing from Robalino's analysis (2007), the expansion of protected areas, especially when reaching the agricultural frontier, yields two primary effects: first, a reduction in available agricultural land; second, an increase in agricultural prices. By extending Robalino's model to incorporate the tourism sector, we demonstrate that conservation policies have both economic and environmental implications, even without reaching the agricultural frontier.

Our findings indicate that the establishment of the protected area or an expansion of the protected area attracts more visitors, resulting in higher agricultural prices, increased aggregate rents, and higher inequality, particularly when the tourism service supply remains constant (Case 1). Furthermore, we observe impacts on land utilization within the buffer zone, where certain locations become profitable for agricultural production, potentially leading to deforestation. Additionally, we explore scenarios where tourism service supply increases (Case 2), necessitating higher wages to attract more workers to the sector. In this scenario, the number of agricultural workers diminishes, rendering some agricultural locations unprofitable. This, in turn, reduces the supply of agricultural goods and agricultural prices rise further. The ultimate impact on inequality remains uncertain. If increases in nominal wages outpace rises in agricultural prices, inequality decreases (with real wages rising and agricultural rents declining); conversely, if increases in nominal wages lag behind the increases in agricultural prices, inequality rises (with real wages declining and agricultural rents increasing).

The establishment of national parks in regions of Georgia like Kakheti and Adjara demonstrates varied outcomes depending on the existing economic structures and the interaction between conservation policies and agricultural frontiers. In Kakheti, where agriculture predominates, the expansion of protected areas has led to significant agricultural growth and increased inequality. Conversely, in Adjara, a region with a developing tourism sector, the expansion of protected areas has bolstered the tourism industry while also facilitating modest agricultural growth and a decrease in inequality.

Following this introduction, the paper proceeds with a Literature Review to examine pertinent prior research, followed by an exploration of the Theoretical Approach guiding the study. Subsequently, the Results section will present the equilibrium findings, leading to an analysis of Georgia Application to offer additional insights into the study's objectives.

3.2 Literature Review

Robalino's (2007) framework includes manufacturing and agricultural sectors. Work on the mechanisms by which protected areas could affect livelihoods is still in the early stages but existing efforts suggest that tourism is the main driver of positive material impacts [Sims (2010); Ferraro and Hanauer (2014); Robalino and Villalobos (2015)].

Some studies indicate that natural reserves exacerbate the poverty of local communities [Adams et al. (2004); Cernea and Schmidt-Soltau (2006); Coad et al. (2008); Duan and Wen (2017); Ferraro (2002); de Sherbinin (2008); Vedeld et al. (2012)], while others find positive impacts [Andam et al. (2010); Roe et al. (2013)].

Previous studies have indicated that protected areas with high tourism levels reduced poverty without exacerbating extreme poverty and inequality, while protected areas with low tourism levels reduced extreme poverty and inequality but had no impact on overall poverty (den Braber et al., 2018). Ferraro and Hanauer (2014) quantify three mechanisms through which protected areas affect poverty in Costa Rica: changes in tourism and recreational services; changes in infrastructure in the form of road networks, health clinics, and schools; and changes in regulating and provisioning ecosystem services and foregone production activities that arise from land use restrictions. They identified tourism and recreational services as the mechanism accounting for the greatest proportion of the total poverty reduction associated with the establishment of protected areas, with the estimated poverty reduction being about 70% smaller without this mechanism. Protection induced more forest cover, but this change had a small, positive effect on poverty and was not statistically significant. Changes in road networks had a minimal impact on poverty reduction and were not statistically different from zero. Unidentified mechanisms accounted for about one-third of the estimated poverty reduction.

Although Costa Rica has shown positive effects, findings across various studies are mixed, with improvements due to protected areas found in Costa Rica, Thailand, Uganda, Bolivia, and Indonesia [Andam et al. (2010); Sims (2010); Canavire-Bacarreza and Hanauer (2013)], no negative impacts observed in Cambodia (Clements et al., 2014), and mixed results reported in different parks in Uganda and Tanzania [Tumusiime and Sjaastad (2014); Baird and Leslie (2013)].

Research not only examines the impacts of protected areas on poverty but also investigates the influence of national park designation on visitor behavior, revealing insights into increased visitation and tourism as a consequential mechanism. Studies by Weiler and Seidl (2004) and Weiler (2006) delve into this phenomenon, employing rigorous econometric analysis to assess the effects of NPS site designation on visitation levels. The findings reveal significant and persistent impacts of designation, with each newly designated site attracting approximately 12,813 additional annual visitors, while the addition of 1,000 acres to a National Monument/Park results in approximately 116 new annual visitors. Moreover, the relative impact of designation varies widely, ranging from a substantial 15.8% increase in visitation for smaller parks to a marginal 0.4% increase for larger parks, highlighting the nuanced nature of visitor responses. The study also underscores the role of the national population in driving visitation trends, with approximately 56.9 new site visits occurring for every 1,000-person increment in the resident state population. Importantly, the credibility of the designation signal emerges as a key factor, as evidenced by an immediate increase in visitation in the year of the name change itself, suggesting that the signal primarily reveals site quality rather than additional amenities. Furthermore, the study dispels concerns regarding visitation fungibility, finding that park designation adds net new visitors to the NPS system without diverting visitation from other sites, indicating limited substitution effects in visitor behavior. Overall, these findings contribute valuable insights into the complexities of visitor responses to NPS site designation, shedding light on the multifaceted dynamics shaping visitation patterns in protected natural areas.

3.3 Theoretical Approach

To analyze the impact of land conservation policies on income distribution, Robalino (2007) uses a two-sector model and evaluates changes in the manufacturing and agricultural sectors. In addition to these two sectors, in our model, we also include the tourism sector and the number of national visitors. The economy is represented as a continuous one-dimensional space A = [0, *amax*]. There is only one city located at 0. There is a total of *L* homogeneous and perfectly mobile workers, who can work for either the agricultural sector, manufacturing sector, or tourism sector. There is a continuum of landowners attached to their land. We have five types of agents:

1. *Agricultural workers* (L_A) earn wages ($w_A(s)$), purchase manufacturing goods. They only sell agricultural goods since they consume out of their production.

2. *Tourism sector workers* (L_T) consume agricultural and manufacturing goods and earn wages (w_T). No rents are earned in the tourism sector.

3. *Manufacturing workers* (L_M) are located in the city. Manufacturing workers consume agricultural and manufacturing goods and earn wages (w_M). No rents are earned in the manufacturing sector.

4. *Landowners* earn rents (*R*(*s*)) from agricultural production. Agricultural activity takes place only if it is allowed and profitable.

5. *National Visitors/Tourists* (N_T) consume tourism services and agricultural goods. Visitors have identical homothetic preferences and a Cobb-Douglas utility function, where T repre-

sents tourism services (including lodging, transportation, entertainment, and visits to protected areas) and A represents agricultural products $U(T, A) = A^{1-\alpha}T^{\alpha}$. They earn their incomes (*I*) outside of this region and spend only a share of their income (I_T) during their visit.

Every agent, who earns income in our one-dimensional space A = [0, *amax*], has the same Cobb-Douglass utility function and consumes two goods, manufacturing goods and agricultural goods. National visitors also have a Cobb-Douglas utility function, but instead of manufacturing goods, they consume tourism services.

$$U(A, M) = A^{1-\alpha}M^{\alpha}$$

The results of the model are based on the following assumptions: (1) identical homothetic preferences at all income levels; (2) all labor is alike and free to move to the city; (3) real-utility wage equalization; (4) linear production in manufacturing and tourism sectors, constant marginal product and constant nominal wage in the city; (5) Leontief production of agricultural good, no substitutability between labor and land; and (6) closed economy (except open to visitors from other regions).

3.3.1 Agricultural Sector

Agricultural production takes place outside of the city and has a Leontief functional form:

$$A(L_A, H) = min\left[\frac{L_A}{c_A}, H\right],$$

where L_A represents the number of agricultural workers, H is the amount of land available for agriculture, and c_A is the quantity of labor needed to produce one unit of A. Leontief production function implies that the factors of production will be used in fixed proportions, as there is no substitutability between them. The per-location production function is:

$$a(l_A) = \frac{A(L_A, H)}{H} = min\left[\frac{l_A}{c_A}, 1\right],$$

where l_A is the number of workers per location.

From the utility function, agricultural workers spend the fraction $(1-\alpha)$ of their income on good A. Each location produces one unit of A, and each worker consumes $(1-\alpha)$ share of one unit of A and sells the rest. As a result, agricultural supply in the city is equal to

$$\textit{Agricultural Supply} = \int_{\Omega} \alpha e^{-\tau_A s} ds$$

Visitors, manufacturing workers, and workers in the tourism sector demand the excess agricultural goods. Therefore, agricultural demand in the city is

$$\textit{Agricultural Demand} = \frac{(1-\alpha)I_T}{P_A(0)} N_T + \frac{(1-\alpha)W_M}{P_A(0)} L_M + \frac{(1-\alpha)W_T}{P_A(0)} L_T$$

The price of agricultural goods decreases as the distance (s) to the city increases. At location s, the price of agricultural goods equals $P_A(s) = P_A(0)e^{-\tau_A s}$, where τ_A represents transportation costs, the percent of melting of agriculture per mile per transport.

Agriculture only takes place if it is allowed and profitable. The technology ensures that production per location is never higher than one, as a result, the maximum amount of labor hired at each location is equal to c_A. Forest will rise at every location s that is not used as an input in the agricultural production.

3.3.2 Manufacturing Sector

The manufacturing sector has a linear production function:

$$M(L_M) = \frac{L_M}{c_M},$$

where L_M is the labor used in the production of M and c_M is the quantity of labor needed to produce one unit of M. Linear production function implies constant marginal production in the manufacturing sector and as a result, constant nominal wage. The price of the manufacturing good at location s is denoted by $P_M(s)$. The price of M increases as the distance to the city increases, $P_M(s) = P_M(0)e^{\tau_M s}$, where $P_M(0)$ is the price of manufacturing goods produced at 0, at the city, and τ_M is the percent of melting of manufacturing per mile per transport. No agricultural production takes place in the city, manufacturing workers purchase agricultural goods produced at locations outside of 0.

To simplify our analyses, we assume that the manufacturing production is unchanged, and the number of manufacturing workers is constant, $\overline{L_M}$.

3.3.3 Tourism Sector

The tourism sector, similarly to the manufacturing sector, has a linear production function:

$$T(L_T) = \frac{L_T}{c_T}$$

L_T is the labor used in the production of T and c_T is the quantity of labor needed to produce one unit of T. The price of tourism services is constant and does not change with location. Tourism services are demanded by national visitors.

$$\textit{Demand for Tourism Services} = \frac{\alpha I_T}{P_T} N_T$$

Before the implementation of the conservation policy, tourism services are produced and consumed only in the city located at 0. After the establishment of a protected area, some tourism activities take place at the entrance of the protected area.

3.3.4 General Setup

Figure 3.1 provides the visualization of the general setup. First, we present the model without a conservation policy. As discussed in the previous sections, agricultural production takes place outside of the city. However, even in the absence of environmental restrictions, agricultural production does not take place at every location. It stops at the location s^* due to the profitability constraint.

Tourism and manufacturing activities take place only in the city. Workers employed in these sectors are also located in the city. They consume agricultural and manufacturing products. In our setup, the city is located at 0, and the prices that workers pay for the manufacturing and agricultural goods are $P_M(0)$ and $P_A(0)$ respectively.

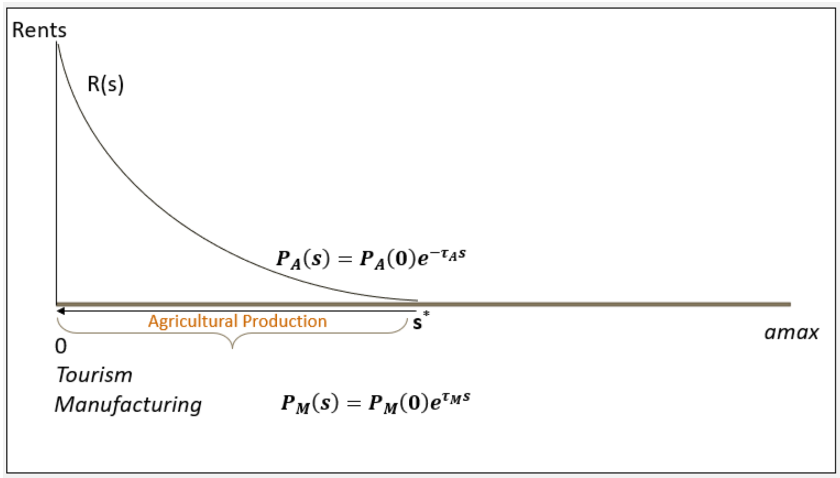
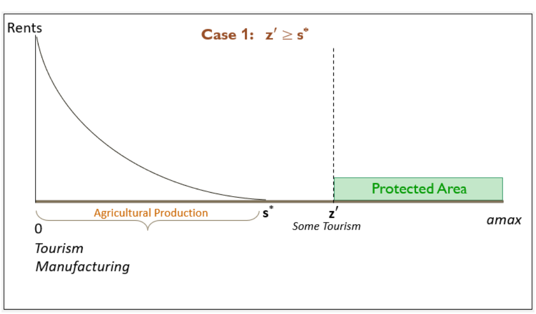
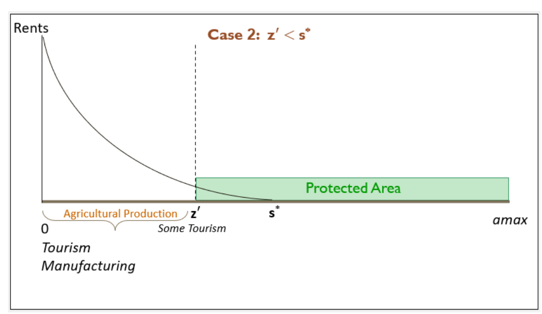


Figure 3.1: General Setup: No Conservation Policy

Figure 3.2 provides a general setup of the model with a conservation policy. Suppose that conservation takes place under the policy $b(z')$. At every location, $s\ \epsilon[z', amax]$ agricultural activities are prohibited. This could restrict the engagement of profitable agricultural activities in some locations. If $z' \geq s^*$ where s^* is equilibrium before the implementation of the policy, the equilibrium is unaffected, and rents remain unchanged. If $z' < s^*$ then the frontier is determined exogenously. The price of agricultural goods and land rents are now evaluated at z' instead of at s^*. To measure the change in total rents, we need to find the difference between total rents under the new policy $b(z')$ by evaluating its impact on agricultural prices.



(a) Case 1



(b) Case 2

Figure 3.2: General Setup: Conservation Policy

3.3.5 Equilibrium Results

Consider $b(z) = [z, amax]$ land conservation policy. At every location, $s \, \epsilon [z, amax]$ agricultural activities are prohibited. This could restrict the engagement of profitable agricultural activities in some locations. Suppose that an increase in the protected area takes place under the policy $b(z')$. This implies that we have two land conservation policies, the old policy $b(z)$ and the new policy $b(z')$, an increase in the protected area requires that $z' < z$.

Case 1a: $z' \geq s^*$, where s^* is equilibrium before the implementation of the policy. An increase in the size of the protected area results in an increase in the number of visitors, N_T increases and demand for tourism services and agricultural goods rises. If the supply of tourism services remains unchanged, then an increase in the demand will lead to higher P_A and P_T. In this case, an increase in the land protection increases the level of rents and the aggregate rents of the economy. This specific policy has no impact on nominal wages, but the increase in the prices of agricultural goods decreases the real wages and makes workers worse off.

Based on this scenario, an increase in the protected areas with no change in the supply of tourism services will increase inequality (aggregate rents increase by area C, Figure 3.3). For land use, there will be an increase in agricultural production and therefore, heavier deforestation in the buffer zone. The buffer zone decreases by $(s' - s^*)$. As demand for tourism services increases, the production of agriculture becomes profitable at these new locations.

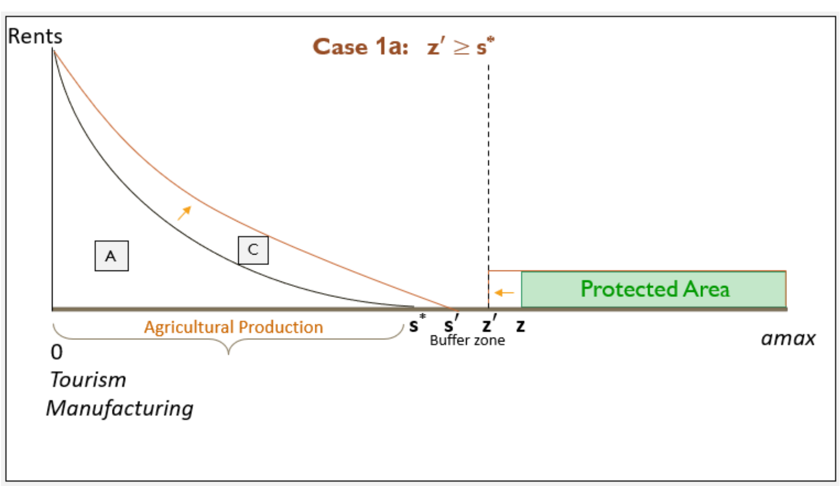


Figure 3.3: Increase in the Protected Area - No Change in Tourism Supply

Case 1b: $z' \geq s^*$. This scenario is similar to case 1a. However, now we analyze the impact of an increase in the protected area followed by an increase in the supply of tourism services. An increase in the size of the protected area results in an increase in the number of visitors, N_T increases and demand for tourism services and agricultural goods rises. To increase the supply of tourism services L_T should increase (L_A therefore will decline).

To attract more workers to the tourism sector, wages (w_T) need to increase. Real-utility wage equalization requires that nominal wages in the agriculture sector also rise. Due to the higher wages, some agricultural locations will no longer be profitable. The supply of agricultural goods will decline. In addition, as the number of visitors rises the demand for agricultural goods increases, hence there is an increase in the price of agricultural goods.

For Case 1b, nominal wages increase but prices increase as well, and we can not determine what happens to the inequality levels. If the increase in the nominal wage is larger than the increase in the price of agricultural goods ($\Delta w_A > \Delta P_A$), then the inequality decreases (real wages increase and the level of rents decline). If the increase in the nominal wage is smaller than the increase in the price of agricultural goods ($\Delta w_A < \Delta P_A$), then the inequality rises (real wages decline and the level of rents increase).

Figure 3.4 shows that the effects are ambiguous. Aggregate rents increase by area C, but decline by area B. Size of these areas will vary based on the changes in nominal wages and agricultural prices. Area D represents potential rents earned at the locations close to the entrance of the park. Some deforestation might take place in the buffer zones near the park, but a decrease in the profitability of agricultural production at locations between s' and s^* compensates for these losses in forestry.

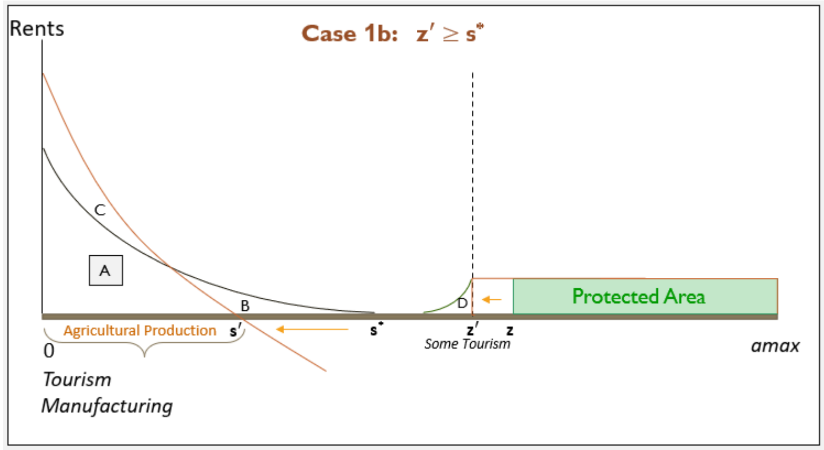


Figure 3.4: Increase in the Protected Area - Increase in Tourism Supply

Case 2: $z' < s^*$, the frontier is determined exogenously. The price of agricultural goods and land rents are now evaluated at z' instead of at s^*. To measure the change in total rents, we should find the difference between total rents under the old policy $b(z)$ and the new policy $b(z')$. Under the old policy, rents were determined at $\bar{z} = min(s^*, z)$, under the new policy rents are determined at z'. The change in aggregate rents is

$$\Delta TR = W_M c_A \left[\frac{(1-\alpha)}{\alpha}(z' - \bar{z}) - \frac{e^{(\alpha\tau_M - (1-\alpha)\tau_A)\bar{z}} - e^{(\alpha\tau_M - (1-\alpha)\tau_A)z'}}{\alpha\tau_M - (1-\alpha)\tau_A} \right] < 0$$

The first term inside the brackets is negative and the second term is positive. When land protection increases and meets the agricultural frontier, the aggregate rents of the economy increase despite the reduction in land resources. The prices of agricultural goods rise due to (1) a decrease in the agricultural supply, caused by the decline of land resources, and (2) an increase in demand, caused by the higher demand for agricultural products in the city due to the migration of workers to the city. This result is identical to what Robalino (2007) finds in his model. Area B (decline in the aggregate rents) is smaller than area C (gain in the aggregate rents) in Figure 3.5.

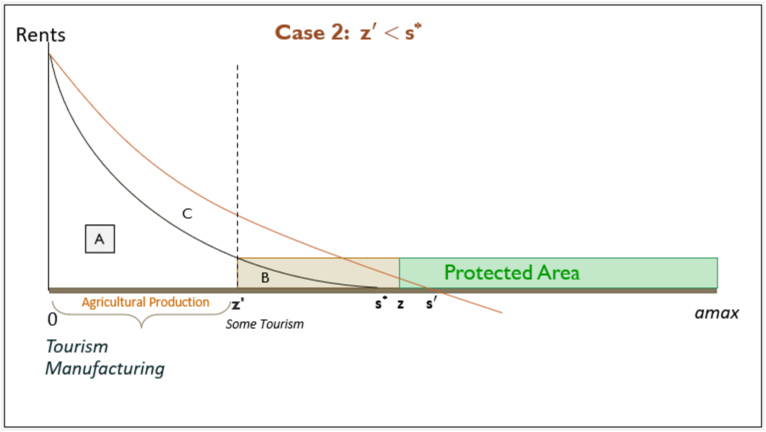


Figure 3.5: Increase in the Protected Area - Intersecting the Agricultural Frontier

3.4 Results

The initial findings of Robalino's (2007) model indicate that conservation policies affect both landowners and landless agricultural workers only when these policies intersect with the agricultural frontier (Case 2: $z' < s^*$). However, our extension of Robalino's model, incorporating the tourism sector, shows that conservation policies can have economic and environmental consequences even in cases where they do not intersect with the agricultural frontier (Case 1: $z' > s^*$).

In the scenario where the supply of tourism services remains constant (Case 1a), we observe an increase in agricultural prices and aggregate rents, leading to a rise in inequality. This also affects land use in the buffer zone, with some locations becoming profitable for agricultural production, potentially resulting in deforestation.

With an increase in the supply of tourism services (Case 1b), necessitating higher wages (w_T) to attract more workers to the tourism sector, agricultural employment decreases. This wage adjustment leads to certain agricultural locations becoming unprofitable. Consequently, the supply of agricultural goods diminishes, and prices of agricultural goods rise. If the increase in nominal wages surpasses the increase in the prices of agricultural goods, inequality decreases as real wages rise and rent levels decline. Conversely, if the nominal wage increase lags behind the increase in the price of agricultural goods, inequality worsens as real wages fall and agriculture rent levels increase.

In cases where the conservation policy meets the agricultural frontier (Case 2), the aggregate rents in the economy increase despite the reduction in land resources, and inequality rises. Deforestation might be significantly reduced, if the tourism sector expands and accommodates agricultural workers, who no longer are employed in agriculture due to conservation policies.

3.5 Examining Data: Georgia Application

Georgia is divided into nine regions, along with two autonomous republics, Adjara and Abkhazia, and its capital city Tbilisi.[7] The population of Georgia stands at around 3.7 million (UN, 2020), with Tbilisi being the most populous area in the country (1.1 million people). In contrast, the smallest regions, Racha Lechkhumi and Kvemo Svaneti account for just over 1% of the Georgian population. Economic structures vary across regions. Firms in Tbilisi tend to be larger and more productive compared to those in the regions. The regions with the most robust economies are those with significant service sectors (Tbilisi and Adjara) and industrial sectors (Kvemo Kartli) (Rodríguez-Pose and Hardy, 2017).

According to World Bank statistics, during 2003-2009, 50-55% of the employed in Georgia were working in the agricultural sector, despite agricultural production contributing just over 8% of GDP. In 2012, employment in agriculture decreased to 47% but remained above the world average of 37% for that year. Employment in agriculture ranged between 36-39% in neighboring Azerbaijan and Armenia, and 23-29% in Turkey during the same period. As of 2020, the share of employment in agriculture in Georgia remains higher at 41% compared to OECD countries (5%) and Europe and Central Asia (8%). Moreover, only 0.4% of agricultural workers work for pay, with over 80% of self-employed working in the agriculture sector. Yerushalmi et al. (2015) suggest that if Georgian farmland was extensively consolidated and labor were adequately trained, all of Georgia's agricultural sector would require no more than 45,000 full-time employees, including

[7] Abkhazia and South Ossetia are occupied by the Russian Federation.

proprietors. Considering additional workers from logistics, contract labor, food processing, and farm-sector services, the total workforce in this sector would be less than a third of the current working-age population in rural areas of Georgia (Yerushalmi et al., 2015).

Georgia exhibits higher levels of inequality compared to its post-Soviet counterparts, with the potential exception of Russia. The Gini index showed a consistent upward trend from 2004 to 2012, the index stood at 36, rising to 39.6 by 2012. In contrast, during the same period, Armenia witnessed a decline in inequality, with the Gini index decreasing from 37.5 to 29.6, Moldova also experienced a reduction from 35 to 29.2.

Georgia has 13 national parks, with eight of them established between 2002 and 2014 (1,190 square miles, which accounts for 4.4% of the total land). Per Georgia's Agency of Protected Areas, it is planned to expand two national parks, as well as to create the National Park of Glaciers on the Central Caucasus Mountain Range and Pshav-Khevsureti Protected Area. The number of visitors to protected areas has seen a significant increase since 2007.[8] In 2007, there were only 7 thousand visitors, which surged to 355 thousand visitors by 2013 and currently exceeds 1,078 thousand visitors. In 2023, the total number of visitors to all protected areas in Georgia reached about 1.1 million, slightly below the pre-Covid figure of 1.2 million. Among these visits, approximately 300 thousand visits were to national parks.

Applying the sustainable livelihoods frameworks, Kemkes (2015) conducted a survey encompassing 250 households across nine villages in the Upper Svaneti region, where two State-led initiatives were posing threats to household access to forests, pastures, and meadows. Firstly, the establishment of a commercial ski tourism area is causing conflicts over cropland and meadows held through traditional ownership, while also endangering the environment through potential deforestation and erosion. Secondly, the revision of the state Forest Code to permit 49-year concessions to forests, including their underground water and mineral resources, being granted to private companies, may restrict local access to forests and interspersed pastures and harm ecosystem functions if management plan enforcement does not improve. State officials argue that increased job

[8] The earliest year for which we have data.

opportunities in tourism and timber industries will benefit communities in the district, suggesting that wage income from planned developments could compensate for lost common pool resources (CPR) income and non-market benefits. Kemkes (2015) findings show that households in villages farthest from market centers have a higher income dependence on CPR and are more likely to participate in forest use activities. The results reveal that nearly all households, except one, primarily rely on fuel wood for heating, while three-quarters of them utilize the forest for livestock grazing. Regarding preferences on tourism development, 60% of respondents expressed a preference for small-scale tourism, such as locally owned guesthouses and shops. Meanwhile, 23% favored maintaining the status quo with infrastructure improvements like roads and bridges, and only 8% preferred job opportunities brought by external investors. On average, CPR constitute 12% of total income. However, the lowest quartile's range extends up to 60% of total income, and the second quartile's range reaches a maximum of 40%, indicating significant dependence. Notably, any degradation of these resources would disproportionately affect those already facing financial challenges.

The multifaceted dynamics of Georgia render it an intriguing subject for examination within our theoretical framework. Given the data constraints, our discussion predominantly focuses on the 2010-2020 period. Our theoretical framework demonstrates a high degree of contextual specificity, and variations in outcomes may manifest even within a single country.

Considering two distinct regions and their respective national parks in Georgia, we examine the case of Mtirala National Park, founded in 2006 within Adjara, a region bordering the Black Sea and Turkey. And Vashlovani National Park is situated in Kakheti, the eastern region of Georgia. Despite Kakheti being the largest region in terms of the land area, and Adjara being one of the smallest, both have similar population sizes. Adjara is the second most densely populated region, and it is the second most visited tourist destination within Georgia, following the capital city of Tbilisi. The economy of Adjara is driven by tourism, agriculture, and trade due to its strategic location on the Black Sea coast. Batumi, the largest city in Adjara, serves as a major port and transportation hub for the region. Kakheti's economy is primarily based on agriculture, particularly viticulture and winemaking. The region produces a significant portion of Georgia's wine and is a major contributor to the country's agricultural sector.

Regarding the two national parks, their establishment did not directly intersect with the agricultural frontier. Consequently, both fall under Case 1: $z' \geq s^*$. Taking Kakheti as an example, it falls under Case 1a, indicating no increase in tourism supply but an expansion of agriculture. This is because Kakheti boasts a sizable agricultural sector, attracting a relatively low number of tourists and lacking a significant tourism industry. According to the theoretical model in such a scenario, an expansion of protected areas without a corresponding increase in tourism services will exacerbate inequality. For land use, there will be an increase in agricultural production and therefore, heavier deforestation in the buffer zone. Adjara's example would fall under Case 1b (increase in tourism supply), because it has a smaller agricultural sector due to its geographic location, and a growing tourism sector. Analyzing the data reveals:

Kakheti:

1. The agricultural frontier remains unaffected.

2. Agricultural production increased - value added of agriculture increased fourfold, from 233 million GEL to 2,299 million GEL. GDP per capita in Kakheti increased by 8%, the second fastest growing region between 2010-2018 mostly due to agriculture.

3. The number of visitors has been modest, averaging only 132 thousand from 2015 to 2023.

4. The supply of tourism services has remained relatively stable, with an average of 932 employees in accommodation and food services, fluctuating between 363 and 1,024 from 2010 to 2020.

5. Forest outcomes indicate that while the forest area has remained mostly unchanged, Kakheti faces the highest incidence of illegal logging among all regions.

6. Other notable observations include a declining population in both urban and rural areas, alongside a notable increase in nominal wages within the tourism sector.

7. The Gini coefficient increased from 46.1 to 47.5 from 2010 to 2018.

Adjara:

1. The agricultural frontier remains unaffected.

2. Agricultural production increased - value added of agriculture increased 2-fold, but only from 95 million GEL to 224 million GEL.

3. The number of visitors has been substantial, averaging 665 thousand from 2015 to 2023.

4. The supply of tourism services has experienced growth, with an average of 5,607 employees in accommodation and food services, fluctuating between 2,278 and 8,185 from 2010 to 2020.

5. Forest area has remained mostly unchanged. Adjara has one of the lowest illegal logging incidences.

6. Other notable observations include a rising population in both urban and rural areas, alongside an increase in nominal wages within the tourism sector.

7. The Gini coefficient decreased from 50.7 to 38.8 from 2010 to 2018.

In Kakheti, agriculture is growing more than tourism, which boosts the economy but also leads to problems like illegal logging and inequality. On the other hand, the tourism sector drives economic activity in Adjara, accompanied by modest agricultural growth. These divergent paths underscore the intricate relationship between conservation efforts, economic development, and inequality within Georgia's regional context.

Evaluating macroeconomic data from the World Development Indicators, there were 142 instances between 2000 and 2020 where protected areas expanded, with an average increase of 3.89%. Out of these, 106 cases saw a rise in the number of visitors, averaging a 10.6% increase. Additionally, agricultural land decreased in 37 cases, remained unchanged in 40 cases, and increased in 39 cases. These changes have had diverse effects on agricultural employment and inequality measures, and underscore the importance of further research in this area. There is a need to thoroughly examine the effects of conservation policies, gather additional data, and carefully analyze each country and protected area. This will help distinguish the specific impacts of the conservation policies on inequality from other contributing factors.

3.6 Conclusion

In conclusion, our theoretical approach, grounded in the framework established by Robalino (2007), extends the analysis to incorporate the tourism sector, providing deeper insights into the interplay between land conservation policies, economic dynamics, and income distribution within the context of Georgia, particularly focusing on the Mtirala and Vashlovani National Parks. Through the theoretical framework applied and drawn from case studies, several key observations emerge.

Firstly, we demonstrate that conservation policies can exert significant economic and environmental effects, even in cases where they do not directly intersect with the agricultural frontier. Secondly, our analysis highlights the nuanced trade-offs inherent in conservation efforts. While expanding protected areas can enhance environmental conservation and biodiversity preservation, it may also lead to complex economic repercussions, including changes in agricultural production, tourism demand and supply, deforestation patterns, and income inequality. The differential impacts observed across distinct scenarios underscore the importance of tailored policy interventions that account for local contexts, economic structures, and sectoral dynamics.

These findings underscore the complex interplay between conservation efforts, economic development, and social equity. It is evident that a one-size-fits-all approach to conservation policy implementation may not be suitable, and careful consideration of local contexts and economic structures is essential. Moreover, the findings emphasize the importance of further research and empirical analysis to validate and refine our theoretical framework and deepen our understanding of the specific impacts of conservation policies on inequality in Georgia and beyond.

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Appendix A

Chapter 1

Table A.1: Summary Statistics - Determinants of Remittances - Household Level

	All HHs		Migrant HHs		Migrant HHs	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
HH receives remittances	32.3%		64.9%		66.1%	
Age (HH head)	57.3	15.4	56.9	14.8	57.1	14.7
Female (HH head)	43.5%		45.7%			
Separated/Divorced (HH head)	6.4%		7.1%		6.8%	
Widowed (HH head)	31.5%		33.2%		33.5%	
Household size	3.9	1.6	3.5	1.5	3.5	1.5
Family member abroad	44.5%					
Number of elderly (65 years and above)	0.47	0.64	0.41	0.60	0.42	0.61
Children 0-5 years old	0.43	0.67	0.40	0.65	0.40	0.66
Children 6-10 years old	0.29	0.56	0.27	0.53	0.27	0.53
Children 11-14 years old	0.19	0.44	0.17	0.41	0.16	0.41
Children 15-18 years old	0.19	0.46	0.19	0.45	0.19	0.46
Mean education of adults	12.8	2.3	12.8	2.1	12.8	2.1
Share of unemployed	0.42	0.39	0.43	0.40	0.43	0.40
Child disability	3.7%		2.6%		2.6%	
Elderly poor health	19.0%		15.7%		16.4%	
Asset index	0.05	1.86	0.36	1.72	0.36	1.72
Debt	22.8%		23.2%		23.4%	
Urban area	57.4%		58.7%		58.3%	
Migrant's age					42.9	10.9
Migrant is female					52.0%	
Migrant separated/divorced					30.8%	
Migrant widowed					9.0%	
Migrant's education					12.9	2.6
Lives in Europe/North America					49.3%	
Observations	3,346		1,486		1,389	

Table A.2: Summary Statistics - Initial Estimation Strategy (Excluding Caregiver Arrangements)

	All HHs		Migrant HHs		Migrant HHs	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
High academic performance[1]	0.56	0.50	0.57	0.50	0.57	0.50
HH receives remittances	30.6%		71.1%		71.6%	
Child's age	13.98	2.03	14.02	1.99	14.1%	
Child is a girl	48.8%		49.5%		49.7%	
Child is oldest	40.7%		38.8%		37.9%	
Child disability	4.8%		4.6%		4.6%	
Age (HH head)	53.49	14.15	53.52	13.22	53.25	13.19
Female (HH head)	38.9%		43.1%			
Separated/Divorced (HH head)	5.1%		5.8%			
Widowed (HH head)	25.8%		28.6%			
Education (HH head)	23.45	2.94	12.35	2.71		
Household size	4.43	1.43	3.98	1.33	3.96	1.33
Number of elderly	0.38	0.61	0.34	0.57	0.34	0.57
Children 0-5 years old	0.15	0.41	0.17	0.44	0.15	0.40
Children 11-14 years old	0.82	0.66	0.78	0.63	0.78	0.64
Mean education of adults	13.03	2.12	12.85	2.04	12.81	2.07
Share of unemployed	0.41	0.40	0.45	0.43	0.45	0.43
Asset index	0.43	1.84	0.62	1.71	0.55	1.72
Urban area	62.0%		58.8%		56.8%	
Migrant's age					44.21	9.19
Migrant is female					49.7%	
Migrant separated/divorced					22.9%	
Migrant widowed					8.8%	
Migrant's education					12.94	2.46
Lives in Europe/North America					48.7%	
Observations	879		325		306	

[1]Average scores for the OLS model are 8.56, 8.62, and 8.59. Standard deviations are not adjusted for clustering.

Table A.3: Summary Statistics - Current Caregiver Arrangements

	All HHs		Migrant HHs	
	Mean	Std. Dev.	Mean	Std. Dev.
High academic performance	0.57	0.50	0.57	0.50
HH receives remittances	32.0%		73.4%	
Child's age	13.98	2.01	14.02	1.96
Child is a girl	48.2%		48.5%	
Child is oldest	41.7%		38.0%	
Child disability	4.7%		4.4%	
Mother abroad - Father CG	4.2%		8.0%	
Mother abroad - Grandparents CG	7.4%		14.2%	
Mother abroad - Other CG	1.7%		2.6%	
Father abroad - Mother CG	12.7%		31.0%	
Both parents abroad - Grandparents CG	2.5%		5.5%	
Household size	4.53	1.43	4.01	1.35
Number of elderly	0.37	0.60	0.36	0.58
Asset index	0.45	1.82	0.55	1.70
Urban area	59.7%	0.49	54.4%	
Observations	769		274	

Table A.4: Summary Statistics - Current Caregiver Arrangements for Subgroups

	All HHs	Migrant HHs
Girls (11-18 years old)		
Mother abroad - Father CG	18 (4.9%)	13 (9.9%)
Mother abroad - Grandparents CG	28 (7.6%)	19 (14.5%)
Father abroad - Mother CG	38 (10.2%)	32 (24.5%)
Mother abroad - Other CG	8 (2.2%)	-
Both abroad - Grandparents CG	13 (3.5%)	10 (7.6%)
Total	105 (28.3%)	74 (56.5%)
Boys (11-18 years old)		
Mother abroad - Father CG	14 (3.5%)	9 (6.6%)
Mother abroad - Grandparents CG	29 (7.3%)	19 (14.0%)
Father abroad - Mother CG	60 (15.1%)	50 (36.8%)
Mother abroad - Other CG	5 (1.3%)	3 (2.3%)
Both abroad - Grandparents CG	6 (1.5%)	4 (3.1%)
Total	114 (28.6%)	85 (62.5%)
Urban areas		
Mother abroad - Father CG	13 (2.8%)	10 (6.7%)
Mother abroad - Grandparents CG	43 (9.4%)	28 (18.7%)
Father abroad - Mother CG	60 (13.1%)	51 (34.0%)
Mother abroad - Other CG	9 (2.0%)	4 (2.7%)
Both abroad - Grandparents CG	4 (0.9%)	2 (1.3%)
Total	129 (28.1%)	95 (63.3%)
Rural areas		
Mother abroad - Father CG	19 (6.1%)	12 (9.5%)
Mother abroad - Grandparents CG	14 (4.5%)	11 (8.7%)
Father abroad - Mother CG	38 (12.3%)	34 (27.0%)
Mother abroad - Other CG	4 (1.3%)	3 (2.4%)
Both abroad - Grandparents CG	15 (4.8%)	13 (10.3%)
Total	90 (29.0%)	126 (57.9%)

Appendix B

Chapter 2

Table B.1: Summary Statistics - Annual Data - RGDP, AGR in GEL

Variable	Obs	Mean	Std. Dev.	Min	Max
ln($RGDP$)	23	9.87	0.36	9.30	10.40
ln(ITA)	23	7.21	1.24	5.70	8.95
ln($REER$)	23	4.55	0.10	4.36	4.70
ln(AGR)	23	7.53	0.30	7.13	8.07
ln(FDI)	23	6.47	1.02	4.41	7.57

Table B.2: Correlation Matrix of Variables - RGDP, AGR in GEL

Variable	ln($RGDP$)	ln(ITA)	ln($REER$)	ln(AGR)	ln(FDI)
ln($RGDP$)	1				
ln(ITA)	0.97	1			
ln($REER$)	0.68	0.72	1		
ln(AGR)	0.92	0.92	0.49	1	
ln(FDI)	0.90	0.83	0.75	0.73	1

Table B.3: Spearman Correlation Coefficients - RGDP, AGR in GEL

Variable	ln($RGDP$)	ln(ITA)	ln($REER$)	ln(AGR)	ln(FDI)
ln($RGDP$)	1				
ln(ITA)	0.95	1			
ln($REER$)	0.60	0.64	1		
ln(AGR)	0.94	0.86	0.46	1	
ln(FDI)	0.84	0.79	0.61	0.74	1

Table B.4: ARDL specification for TLGH with Additional Controls - RGDP, AGR in GEL

The estimation of ARDL (2,2,1,2,2) specification			
Variables	Coefficient	SE	p-values
Long-run elasticities			
ln$(ITA)_t$	-0.011	0.018	0.566
ln$(AGR)_t$	0.109^{*}	0.048	0.064
ln$(FDI)_t$	0.096^{***}	0.011	0.000
ln$(REER)_t$	0.191^{*}	0.080	0.054
ECT	-1.785^{**}	0.545	0.017
Short-run elasticities			
Δ ln$(RGDP)_{t-1}$	0.628^{*}	0.276	0.063
Δ ln$(ITA)_t$	-0.063	0.043	0.193
Δ ln$(ITA)_{t-1}$	0.062^{*}	0.030	0.085
Δ ln$(AGR)_t$	0.029	0.060	0.645
Δ ln$(FDI)_t$	-0.093^{*}	0.043	0.074
Δ ln$(FDI)_{t-1}$	-0.075^{*}	0.036	0.082
Δ ln$(REER)_t$	-0.197	0.145	0.223
Δ ln$(REER)_{t-1}$	0.212^{*}	0.096	0.069
Trend	0.035^{***}	0.004	0.000
Constant	-112.493^{**}	40.781	0.033
Homoscedasticity	0.34 [0.559]		
No Serial Correlation	10.88 [0.001]		
Normality	0.88 [0.645]		
Cointegration test	5.701***		

*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests include: Breusch-Pagan heteroskedasticity test, χ^2 [probability]; Breusch-Godfrey serial correlation test; Jarque-Bera statistic for normal distribution.

Table B.5: ARDL specification for Impacts of Tourism on AGR, FDI, REER - RGDP, AGR in GEL

Variables	**ln(ITA)**	**ln(AGR)**	**ln(FDI)**	**ln(REER)**
Long-run				
ln($RGDP$)	-24.50*	5.87**	9.92***	3.07***
ln(ITA)		0.11	0.14	0.10**
ln(AGR)	3.84*		-1.24***	-0.43**
ln(FDI)	2.48*	-0.64***		-0.29**
ln($REER$)	7.88**	-1.24	-2.12***	
ECT	-0.39**	-0.98***	-2.35***	-1.69***
Short-run				
Δ ln$(RGDP)_t$	7.21***	-3.13	-12.8**	-3.90**
Δ ln$(ITA)_t$		0.32**	1.07**	0.27**
Δ ln$(AGR)_t$	-0.42			0.22
Δ ln$(FDI)_t$	-0.68***	0.38**		0.35**
Δ ln$(REER)_t$	-1.65**	0.56	2.71*	
Trend	0.90*	-0.19*	-0.34***	-0.11***
Constant	-649.34**	331.61*	1435.64***	351.93**
Homoscedasticity	0.46 [0.49]	0.82 [0.37]	1.40 [0.24]	1.89 [0.17]
No Serial Correlation	12.93[0.00]	8.21 [0.00]	4.00 [0.05]	11.92 [0.00]
Normality	2.97 [0.22]	0.86 [0.65]	0.43 [0.81]	3.56 [0.17]
Cointegration test	11.77***	9.64***	14.51***	4.15*
ARDL(optimal lags)	(2,2,1,2,2)	(1,2,2,2,2)	(2,2,2,0,2)	(2,2,2,1,2)

*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests: Breusch-Pagan heteroskedasticity test, χ^2 [probability]; Breusch-Godfrey serial correlation test; Jarque-Bera statistic for normal distribution.

Table B.6: Summary Statistics - Quarterly Data - RGDP, AGR in GEL

Variable	Obs	Mean	Std. Dev.	Min	Max
ln($RGDP$)	36	8.88	0.15	8.51	9.17
ln(ITA)	36	7.14	0.39	6.22	7.92
ln($REER$)	36	4.62	0.04	4.53	4.69
ln(AGR)	36	6.57	0.24	6.11	6.99
ln(FDI)	36	5.85	0.32	5.38	6.62

Table B.7: Correlation Matrix of Coefficients - Quarterly Data - RGDP, AGR in GEL

Variable	ln($RGDP$)	ln(ITA)	ln($REER$)	ln(AGR)	ln(FDI)
ln($RGDP$)	1				
ln(ITA)	0.84	1			
ln($REER$)	-0.68	-0.56	1		
ln(AGR)	0.73	0.77	-0.36	1	
ln(FDI)	0.35	0.43	-0.33	0.29	1

Table B.8: Spearman Correlation Coefficients - Quarterly Data - RGDP, AGR in GEL

Variable	ln($RGDP$)	ln(ITA)	ln($REER$)	ln(AGR)	ln(FDI)
ln($RGDP$)	1				
ln(ITA)	0.84	1			
ln($REER$)	-0.68	-0.56	1		
ln(AGR)	0.66	0.77	-0.29	1	
ln(FDI)	0.40	0.42	-0.35	0.29	1

Table B.9: ARDL specification - Quarterly Data - RGDP, AGR in GEL

Variables	**ln(RGDP)**	**ln(ITA)**	**ln(AGR)**	**ln(FDI)**	**ln(REER)**
Long-run					
ln($RGDP$)		-1.108	3.786***	-0.891	0.488**
ln(ITA)	0.035		-0.108	1.099	0.044
ln(AGR)	0.163***	-0.836		-0.304	-0.101
ln(FDI)	-0.007	-0.079	-0.024		-0.019
ln($REER$)	0.236**	1.485	-1.068	-5.098	
ECT	-1.689***	-0.521***	-0.871***	-0.624***	-0.965***
Short-run					
Δ ln$(RGDP)_t$			-0.957		
Δ ln$(ITA)_t$	-0.094**		0.286**		0.003
Δ ln$(AGR)_t$	-0.039	0.837***			
Δ ln$(FDI)_t$	0.013	0.088	0.017		0.023
Δ ln$(REER)_t$	-0.162		0.176	2.974	
Trend	0.010***	0.052***	-0.034**	-0.032	-0.011***
Constant	7.319***	2.406	-11.968	24.051*	3.017**
Homoscedasticity	0.13 [0.72]	8.02 [0.05]	0.13 [0.72]	2.12 [0.15]	0.04 [0.84]
No Serial Correlation	0.01 [0.91]	0.01 [0.93]	1.26 [0.26]	0.02 [0.90]	1.34 [0.25]
Normality	1.57 [0.46]	2.93 [0.24]	4.68 [0.10]	3.39 [0.18]	0.16 [0.93]
Cointegration test	14.591***	15.355***	4.426**	3.904	4.729**
ARDL(optimal lags)	(2,2,2,1,2)	(1,0,2,1,0)	(2,2,2,2,2)	(1,0,0,0,1)	(2,0,2,0,2)

Notes:*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests include: Breusch-Pagan-Godfrey heteroskedasticity test [probability]; Breusch-Godfrey serial correlation LM test; Jarque-Bera statistic for normal distribution.

Table B.10: ARDL Specification - Annual Data - ITR = International Tourism Receipts

Variables	**ln(RGDP)**	**ln(ITR)**	**ln(AGR)**	**ln(FDI)**	**ln(REER)**
Long-run					
ln($RGDP$)		-9.600*	16.185**	12.423***	0.749
ln(ITR)	0.013		0.056	-0.091	0.363
ln(AGR)	0.047*	1.061**		-0.559*	-0.121
ln(FDI)	0.082***	0.496	-1.285**		0.074
ln($REER$)	0.142*	3.149**	-2.673	-2.052*	
ECT	-2.278**	-0.643***	-0.600***	-2.379***	-0.737***
Short-run					
Δ ln$(RGDP)_t$		5.567***	-6.723**	-18.632*	-1.090
Δ ln$(ITR)_t$	-0.097		0.484**	1.423**	0.057
Δ ln$(AGR)_t$	0.104***	-0.141		-1.231**	0.182
Δ ln$(FDI)_t$	-0.106*	-0.245	0.506***		-0.021
Δ ln$(REER)_t$	-0.373	-0.809	1.767**	4.897*	
Trend	0.037***	0.576**	-0.645**	-0.474***	-0.108**
Constant	-152.122*	-700.688***	703.705***	2039.703**	156.072**
Homoscedasticity	2.28 [0.13]	0.49 [0.48]	2.49 [0.11]	1.52 [0.22]	0.19 [0.67]
No Serial Correlation	2.96 [0.09]	6.02 [0.01]	8.09 [0.00]	3.69 [0.05]	4.94 [0.03]
Normality	2.94 [0.23]	0.69 [0.71]	0.31 [0.86]	1.29 [0.52]	0.24 [0.89]
Cointegration test	4.843**	8.902***	8.316***	6.317***	6.575***
ARDL(optimal lags)	(2,2,1,2,2)	(1,2,2,2,2)	(1,2,2,2,2)	(2,2,2,1,2)	(1,1,2,2,2)

Notes:*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests include: Breusch-Pagan-Godfrey heteroskedasticity test [probability]; Breusch-Godfrey serial correlation LM test; Jarque-Bera statistic for normal distribution.

Table B.11: ARDL Specification - Annual Data - AGR = Total Agricultural Production in Current USD

Variables	**ln(RGDP)**	**ln(ITA)**	**ln(AGR)**	**ln(FDI)**	**ln(REER)**
Long-run					
ln($RGDP$)		-30.644*	15.323**	11.405***	3.048***
ln(ITA)	0.015		-0.504	-0.091	0.082**
ln(AGR)	0.027	1.69**		-0.405	-0.160***
ln(FDI)	0.086***	2.374**	-1.479**		-0.230***
ln($REER$)	0.113	10.403**	-0.326	-1.744	
ECT	-1.923	-0.333***	-0.657***	-2.391***	-1.734***
Short-run					
Δ ln$(RGDP)_t$		10.072***	-3.779	-17.897	-5.017***
Δ ln$(ITA)_t$	-0.033			0.954	0.291***
Δ ln$(AGR)_t$	0.031	-0.492***		-0.020	0.229***
Δ ln$(FDI)_t$	-0.084	-0.654***	0.420**		0.324***
Δ ln$(REER)_t$	-0.175	-1.712**	0.269	2.681*	
Trend	0.037***	1.403**	-0.516*	-0.436***	-0.137***
Constant	-129.541	-867.215***	601.844*	1884.455**	440.233***
Homoscedasticity	0.52 [0.47]	0.82 [0.36]	1.17 [0.28]	0.10 [0.75]	2.39 [0.13]
No Serial Correlation	4.81 [0.03]	15.73 [0.00]	2.31 [0.13]	3.29 [0.07]	14.14 [0.00]
Normality	3.98 [0.14]	2.12 [0.35]	1.26 [0.53]	5.84 [0.05]	1.80 [0.41]
Cointegration test	2.696	12.935***	7.862***	7.850***	7.075***
ARDL(optimal lags)	(2,2,2,2,2)	(2,2,1,2,1)	(1,2,0,2,2)	(2,2,2,2,2)	(1,2,2,1,2)

Notes:*,**, *** significance at 1%, 5% and 10% level respectively. Diagnostic tests include: Breusch-Pagan-Godfrey heteroskedasticity test [probability]; Breusch-Godfrey serial correlation LM test; Jarque-Bera statistic for normal distribution.

Appendix C

Chapter 3

C.1 Equilibrium, No Conservation Policy

The agricultural, manufacturing and tourism sector workers have identical homothetic preferences at all income levels, the utility function of all agents has a Cobb-Douglas form:
$U(M, A) = A^{1-\alpha}M^{\alpha}$

National Visitors/Tourists (N_T) consume both tourism services and agricultural goods. Visitors have identical homothetic preferences and a Cobb-Douglas utility function $U(T, A) = A^{1-\alpha}T^{\alpha}$, where T represents tourism services (including lodging, transportation, entertainments, visits to protected areas) and A represents agricultural products (meals during their stay). They earn their incomes (I) outside of this region and spend only a share of their income (I_T) during their visit.

Manufacturing Sector Manufacturing sector has a linear production function

$$M(N_M) = \frac{L_M}{c_M},$$

where L_M is the labor used in the production of M and c_M is the quantity of labor needed to produce one unit of M. Linear production function implies constant marginal production in the manufacturing sector and as a result, constant nominal wage.

Tourism Sector

For simplicity, we assume that the tourism sector also has a linear production function.

$$T(L_T) = \frac{L_T}{c_T}$$

L_T is the labor used in the production of T and c_T is the quantity of labor needed to produce one unit of T. Price of tourism services is constant and does not change with location. Tourism services are demanded by the national visitors. Demand for tourism therefore equals $\dfrac{\alpha I_T}{P_T}N_T$

Agricultural Sector

Following Fujita and Krugman (1995) and Samuelson (1983), Robalino (2007) uses a Leontief production function for the agricultural good

$$A(L_A, H) = min\left[\frac{L_A}{c_A}, H\right]$$

where L_A is the labor used in the production of A, H is the quantity of land, and c_A is the quantity of labor needed to produce one unit of A. Leontief production function implies that the factors of production will be used in fixed proportions, as there is no substitutability between factors. The per location production function of A in the economy is

$$a(L_A) = \frac{A(L_A, H)}{H} = min\left[\frac{l_A}{c_A}, 1\right]$$

where l_A is the quantity of workers per location. All the demand for the excess agricultural production is in the city.

Prices

The price of the manufacturing good and the price of the agricultural good at location s are denoted by $P_M(s)$ and $P_A(s)$ respectively. Individuals at location $s \epsilon L/0$ can only purchase manufacturing good, because it is produced at 0. The price of M increases as the distance to the city increases,

$$P_M(s) = P_M(0)e^{\tau_M s}$$

where $P_M(0)$ is price of manufacturing good produced at 0, at the city, and τ_M is percent of melting of manufacturing per mile per transport.

No agricultural production takes place in the city, hence manufacturing workers purchase agricultural goods produced at locations outside of 0. Individuals at location $s \epsilon L/0$ only sell agricultural good. $P_A(s)$ decreases as distance to the city, s, increases,

$$P_A(S) = P_A(0)e^{-\tau_A s}$$

Agriculture only takes place if it is allowed and profitable. The technology ensures that production per location is never higher than one, as a result, the maximum amount of labor hired at each location is c_A.

Agricultural Revenue

Agricultural activity only takes place if it is allowed and profitable. The profitability condition for agricultural production at location s is

$$R(s) = P_A(0)e^{-\tau_A s}a(n_A) - W_A(s)l_A \geq 0 \tag{C.1}$$

where $W_A(s)$ is the nominal agricultural wage at location s. Production per location is never higher than one. This implies that maximum labor higher at each location is c_A. Therefore equation (1) is equivalent to

$$R(s) = P_A(0)e^{-\tau_A s} - W_A(s)c_A \geq 0 \tag{C.2}$$

From the utility function, the fraction $(1-\alpha)$ of the income is spent on good A. Each location produces one unit of A, and consumes $(1-\alpha)$ of one unit of A and sells the rest. As a result, agricultural supply in the city is

$$\int_\Omega \alpha e^{-\tau_A s} ds \tag{C.3}$$

Agricultural demand in the city is

$$\frac{(1-\alpha)I_T}{P_A(0)}N_T + \frac{(1-\alpha)W_M}{P_A(0)}L_M + \frac{(1-\alpha)W_T}{P_A(0)}L_T \tag{C.4}$$

Aggregate rents in the economy are defined by

$$TR = \int_\Omega P_A(0)e^{-\tau_A s} - W_A(s)c_A ds \tag{C.5}$$

The real wages at locations s are respectively, $\omega_M = W_M P_A(0)^{\alpha-1}P_M(0)^{-\alpha}$ and $\omega_A = W_A(s)P_A(0)^{\alpha-1}P_M(0)^{-\alpha}$.

Equilibrium Results

First, we start by solving for P_A. To find the price of agricultural goods, we equate supply and demand, which are equations (3) and (4) respectively.

$$\int_{\Omega} \alpha e^{-\tau_A s} ds = \frac{(1-\alpha)I_T}{P_A(0)} N_T + \frac{(1-\alpha)W_M}{P_A(0)} L_M + \frac{(1-\alpha)W_T}{P_A(0)} L_T$$

$$P_A(0) = \frac{(1-\alpha)I_T N_T + (1-\alpha)W_M L_M + (1-\alpha)W_T L_T}{\int_{\Omega} \alpha e^{-\tau_A s} ds} \tag{C.6}$$

Second, we know that the number of workers in the agricultural sector equals $s^* c_A$ (the number of locations at which agricultural activity is profitable is s^*, number of workers per location equals c_A) and the number of workers in the manufacturing sector equals $\overline{L_M}$. We rewrite equation (6) and replace L_T

$$P_A(0) = \frac{(1-\alpha)I_T N_T + (1-\alpha)W_M \overline{L_M} + (1-\alpha)W_T(L - \overline{L_M} - s^* c_A)}{\int_{\Omega} \alpha e^{-\tau_A s} ds} \tag{C.7}$$

Due to the homogeneity and mobility of labor, real wages must be equal at every location, and therefore in equilibrium the following condition holds

$$W_A(s) = W_M e^{(\tau_M \alpha - \tau_A(1-\alpha))s} \tag{C.8}$$

$W_A(s)$ is determined by equation (1). Condition (8) becomes

$$P_A(0) = c_A W_M e^{(\tau_M + \tau_A)\alpha s^*} \tag{C.9}$$

Finally, we can find TR by plugging in equation (7) into equation (5).

$$TR = \frac{(1-\alpha)}{\alpha}(I_T N_T + W_M \overline{L_M} + W_T(L - \overline{L_M} - c_A s^*)) - c_A W_M \frac{e^{(\alpha\tau_M - (1-\alpha)\tau_A)s^*} - 1}{\alpha\tau_M - (1-\alpha)\tau_A} \tag{C.10}$$

C.2 Conservation Policy

Consider $b(z) = [z, amax]$ land conservation policy. At every location, $s\ \epsilon[z, lmax]$ agricultural activities are prohibited. This could restrict the engagement of profitable agricultural activities in some locations.

Case 1a: $z' \geq s^*$, where s^* is equilibrium before the implementation of the policy. Increase in the size of the protected area results in an increase in the number of visitors, N_T increases and demand for tourism services and agricultural goods rises.

We are keeping everything constant, except for increasing N_T by some amount ΔN_T. Based on the equation (10), total revenue will increase.

$$\Delta TR = \frac{(1-\alpha)I_T}{\alpha}\Delta N_T$$

Prices of agricultural goods will also increase.

$$\Delta P_A(0) = \frac{(1-\alpha)I_T}{\int_\Omega \alpha e^{-\tau_A s} ds}\Delta N_T$$

Case 1b: $z' \geq s^*$ This scenario is similar to the case 1a. However, now we analyze what happens if the supply of tourism services rises. Increase in the size of the protected area increases the number of visitors by ΔN_T. Demand for tourism services increases by:

$$\Delta D_T = \frac{\alpha}{P_T(0)} I_T \Delta N_T$$

That implies that for supply to equal demand, supply of tourism services should increase. Total supply would equal to

$$S_T = \frac{L_T + \Delta L_T}{c_T - \Delta c_T} = \frac{L_T}{c_T} + \frac{\alpha}{P_T(0)} I_T \Delta N_T \tag{C.11}$$

To increase supply of tourism services we will need to increase number of workers (L_T), and to do that we will need to increase the wage ($w_T = \frac{1}{c_T}$). Based on the linear production function, the only way to increase the nominal wage would be to increase productivity (and decrease c_T).

Prices of agricultural goods will also increase.

$$P_A(0) = \frac{(1-\alpha)I_T}{\int_\Omega \alpha e^{-\tau_A s} ds}[(N_T + \Delta N_T) + W_M L_M + (W_T + \Delta W_T)(L_T + \Delta L_T)] \tag{C.12}$$

We can simplify the equation (12) and find ΔP_A.

$$P_A(0) = \frac{(1-\alpha)I_T}{\int_\Omega \alpha e^{-\tau_A s} ds}\Delta N_T + \frac{\alpha}{P_T(0)} I_T \Delta N_T \quad \text{(C.13)}$$

We can calculate the increase in price if we know the ΔN_T, however, we do not know the change in wages. From the equation (11) we can not determine values of ΔL_T and Δc_T. Therefore, we can not determine which change is larger ΔP_A or Δw_A. If increase in the nominal wage is larger than the increase in the price of agricultural goods ($\Delta w_A > \Delta P_A$), then the inequality decreases (real wages increase and level of rents decline). If increase in the nominal wage is smaller than the increase in the price of agricultural goods ($\Delta w_A < \Delta P_A$), then the inequality rises (real wages decline and level of rents increase).

Case 2: $z' < s^*$ The frontier is determined exogeneously. The price of agricultural goods and land rents are now evaluated at z' instead of at s^*. To measure change in total rents, we should find the difference between total rents under the old policy $b(z)$ and under the new policy $b(z')$.

Under the old policy rents were determined at $\bar{z} = min(s^*, z)$,

$$TR(\bar{z}) = \frac{(1-\alpha)}{\alpha} W_M(L - c_A\bar{z}) - c_A W_M \frac{e^{(\alpha\tau_M - (1-\alpha)\tau_A)\bar{z}} - 1}{\alpha\tau_M - (1-\alpha)\tau_A} \quad \text{(C.14)}$$

under the new policy rents are determined at z'.

$$TR(z') = \frac{(1-\alpha)}{\alpha} W_M(L - c_A z') - c_A W_M \frac{e^{(\alpha\tau_M - (1-\alpha)\tau_A)z'} - 1}{\alpha\tau_M - (1-\alpha)\tau_A} \quad \text{(C.15)}$$

The change in aggregate rents is difference between (14) and (15), $\Delta TR = TR(\bar{z}) - TR(z')$

$$\Delta TR = W_M c_A \left[\frac{(1-\alpha)}{\alpha}(z' - \bar{z}) - \frac{e^{(\alpha\tau_M - (1-\alpha)\tau_A)\bar{z}} - e^{(\alpha\tau_M - (1-\alpha)\tau_A)z'}}{\alpha\tau_M - (1-\alpha)\tau_A}\right] < 0 \quad \text{(C.16)}$$

The first term inside the brackets is negative and the second term is positive. When land protection increases and meets the agricultural frontier, the aggregate rents of the economy increase despite the reduction in land resources.