

CENTER OF RESEARCH OF
ASOCIACIÓN FAMILIA, DESARROLLO, POBLACIÓN –FADEP–

Determinants of Economic Growth, Population, and Family Wealth

The Case of Guatemala
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2007

Determinants of Economic Growth, Population, and Family Wealth: The Case of Guatemala

Submitted to

Centro de Investigación Familia, Desarrollo y Población (FADEP)

by

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September 8, 2007

Acknowledgements

This study has been the fruits of a team effort. I am especially indebted for the help in the data collection as well as in the study design of Dr. Carmen Urizar de Rodriguez and Lic. Esteban Andrino. I am also especially indebted for the very generous and helpful discussions and comments received from Dr. Raquel Zelaya, Dr. Juan Pablo Pira, Dr. Sigfrido Lee, and Dr. Juan Carlos Castañeda among others. Any of the short-comings remaining in the study are my exclusive responsibility.

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Executive Summary

I. Purpose of the study

The study had two main goals:

- To identify the main determinants of economic growth for Guatemala and to understand how population influenced this process during 1950-2006.
- To investigate how the family engages in the process of economic growth.

II. Main findings

A. Aggregated level

- The openness of the economy has had a positive impact in both real output and *per capita* income.
- The Neo-Classical model seems to perform best. Consistent with the model, we find that investment and technology have had a positive impact on economic growth. Population growth is not significant while fertility rate is. Being Guatemala mainly an agricultural country and having, for the most part, an industry that is labor intensive, the labor force is an important factor of production. This indicates that the sources of poverty are other than the population size per se.
- Domestic Research and Development has had a positive effect on factor productivity while foreign research and development has not. However, technology has.
- There is an accentuated disparity in both income and wealth distribution, with high concentrations at both extremes. The majority of the population however does not fall in either category. Rather, the evidence indicates that while poverty exists in Guatemala, extreme poverty exists only among a reduced percentage of the population (10% of the households) and 0.04% of the households register high levels of wealth. Extreme poverty in this study is defined as the case where the household lacks housing, access to safe water, and sanitation. The head of the household typically also reports no education.
- The speed of aging population has accelerated significantly (from 130 years in 1982 to 59 years in 2006.) This is of concern for Guatemala, as it adds pressures to the already problematic fiscal situation. It has also had a negative impact on *per capita* income.
- The Malthusian model performs poorly in explaining growth, consumption, and investment, but the Neo-Malthusian model seems to correctly predict the impact of population growth on deforestation. On this point, the data supports the Neo-Malthusian

Biodiversity concern. However, this does not mean that the solution to the environmental problem of Guatemala is population control, as such policies will jeopardize long term real economic growth

- When human capital is introduced in the Neo-Classical Model, education (measured as average years of education) is not significant while experience and stock of capital is. We also find increasing returns to scale on human capital as Becker (1991) proposes. The average years of education of the Guatemalan population is 3. Such low level explains the lack of significance as well as the inefficiencies found in the social return of education.
- Access to credit, years of education, remittances, and *per capita* income are found to be relevant factors in decreasing inequality. The openness of the economy has positively affected income distribution.
- Overall, the empirical evidence at the aggregated level seems to support openness in the economy and underlines the importance of investment and technology as well as education in Guatemala. The low levels of education in Guatemala undermine the importance of education in the growth process. Yet, since increasing returns to scale to human capital have been found, increase in the levels of education of the population would positively impact growth. At the same time, and with the exception of the impact on deforestation, it lends no support for policies directed towards population control. Rather, it suggests that the impact of this approach on growth, *per capita* income and investment will be detrimental to sustainable economic growth because of the “aging population trap” and speed of aging effect.

B. *Disaggregated level*

- Family structure has been found significant on determining both levels of wealth and poverty in Guatemala. The intact family performs best, followed by *de facto* marriages also identified in Guatemala as unions. Controlling for other observable household characteristics, marriage households have the highest probability of owning a house, holding other assets (savings and others), and report a lower index of unsatisfied basic needs (NBI) than other family structures. On the opposite end, divorce and separated are the most harmed after single-mothers.
- Marriage structure, the level of education, occupation, race, remittances, location, and income are all significant factors in determining household wealth, and more specifically house ownership and savings. On average, marriage constitutes the single stronger observable characteristic in determining household wealth in Guatemala (it increases wealth by 29%). Living in an urban rather than a rural area increases wealth on average by 26%. The third largest impact on household’s wealth is remittances, which increases it by 25%, followed by sex (having households headed by women decreases wealth by 18%). Other observable characteristics that increase wealth include having a higher level of education (it increases wealth by 7.5%), the number of children (an increase of one additional child enhances wealth by 6.8%), the age of the household’s head (it increases it by 6.1% but at a decreasing rate), and the type of occupation (a more skilled occupation

increased wealth by 2.4%). Income (measured in this study as NBI) is also a relevant factor but given the limitation of the data, the meaning of the exact percentage is more difficult to determine. Nevertheless, it has a positive impact on wealth.

- On average, the level of NBI is significantly lower in households where the head is married (it decreases by 60%) and is male. It is also significantly improved with higher levels of education of the household head, and if the household is located in an urban area. The impact of the number of children in NBI, does not follow a consistent pattern but varies depending on the household characteristics.
- On average, the benefit of marriage on wealth and income is greater for Indigenous than for Ladinos. Among Ladinos marriage increases wealth by 24% while among indigenous the benefit is 28%.
- Savings are positively determined by age but at a decreasing rate (thus Modigliani's life cycle theory of income seems to be supported in Guatemala), marital structure, and education.
- Home ownership follows the same pattern than wealth and savings.
- The level of education strengthens/weakens the findings on wealth, savings, and NBI as the households have a higher/lower level of education, indicating that access to education is a relevant factor in reducing poverty.
- Living in urban areas decreases the level of NBI 2.9 fold while achieving a higher level of education decreases it by 1.2 fold. Married household decrease the level of NBI by 60%.
- Attendance to school is higher among married households than others. It is also reinforced by remittances.
- On average and independently of the ethnic background of the household, the probability of receiving remittances increases by 18.6% when it is headed by married women. In other type of family structures it decreases by 2.7%. The level of NBI does not have a significant impact on household receiving remittances (0.2%) indicating that, contrary to the common belief, other factors in addition to income levels are driving the population to work overseas.

C. Relation of this study findings to previous studies in Guatemala

- The findings at both the aggregated and the disaggregated level are for the most part consistent with other studies of economic growth in Guatemala. These include: Edwards (2000), Alejos (2003), Larraín (2006), Lardé (2002), Loening (2004), Segovia and Larde (2002), and Prera Estradé (1999). They are also, for the most part, consistent with other studies of institutional nature such as Asturias de Barrios *et al* (2004 and 2006), ASIES (1995 and 2006), INE (2002 a,b), ILO (2004), and PREAL (2007).

III. Policy Recommendations

- Continue to deepen the opening of the economy that began twenty years ago while reinforcing institutions at both national and local levels. Among them, the rule of law, transparency, property rights, the education system, and family structure should be priority.
- Expand access to economic opportunity for low income households by ensuring their members can get quality primary and secondary education as well as technical and university education. This recommendation is based on the evidence gathered for this study. As explained in the text, education does not seem to be a determinant factor of economic growth when viewed at an aggregate level only because the average school attendance in Guatemala is low: three years. However, it does report positive economies of scale indicating that an increase on the level of education generates higher human capital and economic growth. Furthermore, the family's wealth improves when the level of education and technical instruction of the head of household is greater.
- Expand the access to economic opportunity for low income households by enabling access to a functional process of fixed property titles as well as credit, especially for housing programs. Some of these initiatives are now in place in Guatemala, so it is important that continuity is ensured.
- Expand professional training, as it is often an effective way to raise families out of poverty and dependency. Its implementation, however, cannot be generalized, as its success depends on the effectiveness of this program to address cultural as well as geographical characteristics. Initiatives that foster the habit of savings among the low income households as well as access to microcredit have shown to be effective means of releasing households from extreme poverty conditions.
- Promote legislation that supports families *vis a vis* other types of living styles. Avoid tax policies and legislation that penalize families. For instance, it should not be the case that a working married couple pays more taxes than if both were single. Lower income tax rates are also beneficial to family welfare.
- Set as a priority the promotion and protection of healthy families as a means to eradicate poverty, especially the feminization of poverty. With this aim, private initiatives that promote healthy marriages and stable families should be encouraged and supported. For example, programs for couples in crisis and programs that promote marriage over unions or other types of family structures. Redistribution of income towards the victims of family disruption is not enough, there is a need to develop and implement legislation that supports families *vis a vis* other types of arrangements.
- Reform the public and private education system in Guatemala to improve the coverage and quality of educational services. Given that currently average school attendance is low and that the marginal costs of education exceed the marginal benefits, it is important to promote non government education initiatives that provide a variety of necessary

offerings (flexible schedules, vocational instruction, programs for intellectual talent, distance learning, multilingualism, etc.). The government can assist lower income families to choose among these alternatives through a voucher system or another demand-oriented financial mechanism. Thus, low-income families as well as large families will have the incentive to send their children to school rather than keeping them at home for child labor. They could send their children to the schools of their choice, especially in the case where some schools do not meet acceptable standards. At the same time, they reduce the education penalty for those parents who choose to send their children to private schools and who are already funding public education through property taxes or income taxes. Vouchers empower the family economic decision process while fostering market responsibility on the part of the supplier (educators) and those receiving the services. In Guatemala, there is plenty of room for efficiency gains in this field. This will also help enhance parents' own rights to educate their children.

- Promote programs that allow parents and teachers to engage in municipal school management. This has proven to be an efficacious way to foster accountability on both parts, around the world. Already, the Ministry of Education has encouraged the formation of committees of parents who oversee the teacher's performance, monitor school attendance, assist in maintenance of school facilities and provide the children with meals and more. Funding private sector initiatives, civil society and others, that promote this type of projects could improve efficiency gains in the area of education.
- Promote initiatives that enhance access to new technologies and means of communication as a method to improve the quality of life of families as well as their integration into the labor force. These plans should not only target schools, libraries and the head of the household, but also youth, homemakers, and the elderly. In this area, Guatemala is beginning to experience the positive effects of the mobile telecommunications revolution brought about by the 1996 General Law of Telecommunications, with the lowest tariffs and the highest penetration of cell phones per capita in the region, including in rural areas.
- Improve efficiency in the use of government funds now allocated to population by allocating them to needs of the population, which will open access to development. Redirect the present efforts towards population control and sexual education programs, by focusing on education and health initiatives in areas to which the population really lacks access: maternal and child mortality, child malnutrition, safe water sources and sanitation.
- Develop labor legislation that facilitates and provides incentives for the harmonization of family life and professional activity for all family members. The Labor Code (Decree No. 1441, published in 1971) tends to impose certain rigidities into the labor market that can hamper flexible and innovative work plans agreed to by employers and employees on a case by case basis. Freedom to enter into contract as well as legal and judicial respect of contracts can contribute to families' well-being and economic growth.

Determinants of Economic Growth, Population, and Family Wealth: The Case of Guatemala

I. Introduction

Can economic growth be sustained in the long run? If so, what determines the long run rate of growth? And what kind of policies can governments use to accelerate the improvement in living standards in developing countries? In addressing these questions governments often resort to policies that are geared towards decreasing population growth. Guatemala has not been an exception. Are population and the family relevant for economic growth? Some would respond affirmatively as they see in them obstacles to achieve sustainable development. Marriage, the union of a man and a woman, generates children. They believe that the Earth is limited. Therefore, the more we are, the poorer we will be.¹ In addition, others within this group see the family as detrimental to the political and economic advancement or “empowerment” of woman and children. Consequently, they contest, if poverty among women and children is to be eradicated and they empowered, it has to be monitored and regulated by national and international laws as well as by institutions.² Finally, others within this position see the increase of population as a problem for economic growth because they believe that large populations, by perpetuating poverty, threaten a country’s stability. People fight to access scarce resources and this causes resentment towards the rich.³

On the opposite end, others argue affirmatively because they believe population and the family contribute to sustainable economic growth. This is so, because healthy families are needed for the generation of human, social, and moral capital.⁴ Growth of population does not equal poverty, they uphold, rather poorly structured families and societies as well as bad

¹. Brown (1999) captures the typical Malthusian argument embedded in this position. A further corollary of this perspective, some times is identified as Neo-Malthusians. They see people as destroyers of resources and violators environmental limits. See Ehrlich and Ehrlich (1990) and Hardin (1998) for a presentation of this position. For a detailed analysis of their views see Simon (1996), Furedi (1997), Johnson (2000), and Eberstadt (2007).

². See de Beauvoir (1949), Friedan (1963 and 1997), and Coomaraswamy (1997) for this perspective. For a review of this position see Aguirre and Wolfgram (2002).

³. For a thorough discussion of this view see Kennedy (1993) and Eberstadt (2000).

⁴. Since the seminal work of Gary Becker on human capital, many other economists have supported this position. Among them is another Nobel Laureate, Amartya Sen. For their position on human capital and the family, see Becker (1991) and Sen (1994). Definition of these three types of capital can be found in the glossary of terms.

economic policies foster poverty.⁵ Finally, others consider that healthy families contribute to economic growth precisely because of its connection with population. They believe that hampering human generation undermines economic development because it leads to an “aging population trap” as opposed to the “population trap” predicted by Malthus.⁶ How people understand the connection between population, the family, and economic growth is critical, for it is by these perceptions that domestic and international economic and social policies are formulated and implemented. This fundamental and long term issue demands that the policymakers’ perceptions are grounded, not on rhetoric and emotions nor on piecemeal, short term solutions, but on established scientific and empirical data that sees the country in the context of long-term growth and seeks the well being of all citizens.

This study seeks to contribute to the understanding of the relevance of population and family to the economic growth process in Guatemala. With this aim it analyzes the determinants of economic growth in this country and it studies how population and the family fit in this process. To do so, it draws from the vast wealth of theoretical and empirical economic growth literature to identify useful tools of analysis. The study, does not seek to generate unique and innovative theoretical models, but rather it aims to empirically identify what model best fits the Guatemalan reality, what the key factors are, if any, that help explain the relationship between growth and population and how the family fits in this process. In this manner, we hope to facilitate and strengthen the present and future population and family policy design and implementation in Guatemala.

In the past 20 years, Guatemala has implemented important structural reforms, especially in the external sector, with a significant openness of the economy. As a result, during the past decade services and apparel assembly as well as some other non-traditional products together with remittances (\$3 billion dollars for 2006) have significantly increased the capital and the current account. Real gross domestic product (GDP) growth has been positive (4.6% real growth in 2006) but below its full employment level. Coexisting with these advances, there has been a decrease in some traditional agricultural production, which seems to have been compensated by a significant increase of the informal sector and an important migration of the labor force. The

⁵. See Sen (1981), Fukuyama (1999), Aguirre (2006), and Kilksberg (2000 and 2001). There are also those who attribute the present problems not to population but to the distribution of resources given the present structures. Some of these authors include Dobson (1997) and Rabkin (1997).

⁶. See Simon (1996 a), Eberstadt (1995 and 2000), and Aguirre (2002).

latter, has been composed mainly by males who seek job opportunities in the US. For 2006, it was estimated that the informal economy was 51.7% of the real GDP and that a net of 140,000 Guatemalans migrated to the US.⁷ Internal Migration, especially to Guatemala and Petén has followed suit. SEGEPLAN (2006) reports that 10.8% of the total population was living in other than their state of birth in 2002. Although the rate of internal migration vastly varies across regions in most countries, the percentage of total population reported in Guatemala is more than three times the average for the US and at least twice the size of the average internal migration for other developed and developing countries.

Income inequality continues to be accentuated in Guatemala as in many other countries, including developed countries such as the US. Guatemala's GINI coefficient was 58% in 2004 compared to 46.6% in the US.⁸ It is important to note that inequality is not a concerning fact in itself. Rather, it becomes a problem when it creates inequality of opportunities. This is why it is relevant to understand the factors underlying inequality. Alejos (2003) finds that for Guatemala, although there is a significant variation in the contributing factors between the aggregated and disaggregated levels, education is one of the main determinants at both levels. Other factors include ethnicity, gender, occupation, experience, non-labor income, and area (i.e., urban vs. rural).

Other institutional issues also pose serious challenges for Guatemala. These include, among others, a judicial system which is often backlogged and influenced by political mechanisms, lack of security, corruption, land invasions with the consequent weakening of property rights and property, weak and inefficient educational and health systems, and vague regulations that cause significant bureaucratic obstacles to establishing business.⁹

A large number of households face serious health and poverty problems. They often lack income and assets to attain basic needs: food, shelter, clothing, and competitive levels of education and health services. *Encuesta Nacional de Condiciones de Vida* (ENCOVI) (2000) estimated that about 56% of the population lives in poverty and *The Human Development Report* (2006) reports that 16% of the population in Guatemala lives below the \$1 a day level. A

⁷ See the Center for International Private Enterprise (CIPE) (2001) and Centro de Investigaciones Económicas Nacionales (CIEN) (2005) studies for a detailed analysis of the informal economy. For studies on Guatemala's emigration see among others Centro de Estudios para Guatemala (CEG) (2005) and OIM (2003 and 2006).

⁸ CIA, *Country Report*, 2006.

⁹ For a more detail institutional analysis of Guatemala see the Heritage Index of Economic Freedom, Larraín (2006), and SEGEPLAN (2006). This last study is specially revealing to understand the problem of education that today's

consequence of this situation is that households often lack access to human assets, as they do not have skills and training and at times even good health. They also lack access to natural assets such as land. They often do not have access to infrastructure or physical assets such as housing, sewers, electricity, etc. as well as to financial structures such as savings and access to credit. They also have diminished access to social assets, such as networks of contacts and reciprocal obligations that can be called on in time of need. Finally, often they are without aging security, as they have no access to sound social security systems. In Guatemala, the main source of social security is one's family; yet, these are becoming smaller as population control policies are imposed either by the government and/or by developed countries.¹⁰ Furthermore, these policies are often targeted to the poor as they are considered the ones in most need of them.¹¹ Access and the return to these assets not only depend on the behavior of the market, but also on the performance of governmental and private institutions. Their performance, in turn, is closely linked to human, moral, and social capital.¹² These problems make many families in Guatemala highly vulnerable to adverse shocks, as they are unable to cope with them.

It is evident that economic development is an outcome of more than economic processes. It is an outcome of economic, social, and political processes that interact with and reinforce each other in ways that worsen or ease the achievement of economic development. To attain it, opportunities need to be promoted, empowerment at all levels facilitated, and stability ensured. This requires actions at local, national, and international levels. How can priorities be decided in practice? What framework is needed to ensure economic growth and an effective distribution of wealth that generates equality of opportunities? By testing and analyzing the theoretical underpinning of different approaches to economic growth this study aims at shedding some light

Guatemala is facing in so many fronts, especially with regard to funding.

¹⁰. The 2006 report released by SEGEPLAN and the Ministry of Public Health's 2006 *Report on the Achievements on Maternal Mortality* are clear showcases of these types of "piecemeal" governmental policy and focus. In it is clear that the goal is to reduce the family size in Guatemala. Similarly, at the international level, several of the UN documents of the 1990s and more recent years, speaks about the need and the plan to reduce the family size in developing countries (see for example the *Programme of Action of the International Conference on Population and Development* (ICPD) (1994) and its *Follow up document* (ICPD+5) (1999)).

¹¹. In some countries, regulation of fertility includes compulsory measures such as forced sterilization or sterilization performed without proper informed consent, contraception, and abortion. Introduction of chemical contraception techniques and frequent legalization of abortion have been widespread while policies in favor of welcoming new lives have been weakened. In recent years, Mexico, Peru, Brazil, Guatemala, India, Pakistan, Uganda, Zambia, and several other developing countries have denounced forced sterilization. However, such sterilization measures have not been limited to less developed countries; cases have been found in Sweden among handicapped women as well as in several refugee camps. Some of these matters have been described in Sen (1996), CLADEM (1998), Mosher (1983).

to help answer these questions.

Population control policies have become the overriding approach to development, thus they are often thought to be the primary tool to “promote” economic growth in developing countries, raise the poor out of poverty, and protect the environment. The findings of this study suggest that, while the focus on population is not necessarily incorrect, the population control policies being implemented in Guatemala are mistaken since they hamper the growth of a key element of economic development: human capital and thus they render economic growth unsustainable.

Overall, the empirical evidence at the aggregated level seems to support openness in the economy. It also underlines the importance of investment and technology as well as education, since this last factor reports increasing returns to scale, to generate and sustain an economic growth process in Guatemala. At the same time, and with the exception of the impact on deforestation, it lends no support for policies directed towards population control. Rather, it suggests that the impact of this approach on growth, *per capita* income, and investment will be detrimental to economic growth because of the “aging population trap” it generates and its effect on the speed at which aging is taking place. Between 1982 and 2006, the speed of aging population has fallen from 130 years to 59.

At the disaggregated level, the findings of this study suggest that family structure is significant in determining both levels of wealth and income/poverty (measured as unsatisfied basic needs (NBI)) in Guatemala. The intact family performs best, followed by *de facto* marriages, which in Guatemala are also called “*uniones de hecho.*” Controlling for other observable household characteristics, marriage households have the highest probability of owning a house, holding other assets (savings and others), and report a lower NBI index. On the opposite end, divorce and separated households are the most harmed after single-mothers. Marriage structure, the level of education, occupation, race, remittances, location, and income are all significant factors in determining household wealth, especially household ownership. On average, marriage constitutes the single stronger observable characteristic in determining household wealth in Guatemala (it increases wealth by 29%). Living in an urban rather than a rural area increases wealth on average by 26%. The third largest impact on household’s wealth is remittances, which increases it by 25%, followed by the sex of the household’s head (having

¹². See note n. 4.

households headed by women decreases wealth by 18%). Other observable characteristics that increases wealth include having a higher level of education (it increases wealth by 7.5%), the number of children (an additional child enhances wealth by 6.8%), the age of the household's head (it increases it by 6.1% but at a decreasing rate), and the type of occupation (a more skilled occupation increased wealth by 2.4%).

On average, the level of NBI is significantly lower in households where its head is married (it decreases by 60%) and a male. It is also significantly improved with higher levels of education of the household head, and if the household is located in an urban area. The impact of the number of children on NBI, does not follow a consistent pattern but varies depending on the household characteristics (such as age, sex, level of education, race, marital status, area where the household live -rural vs. urban-, and type occupation).

The findings at both the aggregated and the disaggregated level are for the most part consistent with other studies of economic growth in Guatemala. These include: Edwards (2000), Alejos (2003), Larraín (2006), Lardé (2002), Loening (2004), Segovia and Larde (2002), and Prera Estradé (1999). They are also, for the most part, consistent with other studies of an institutional nature such as Asturias de Barrios *et al* (2004 and 2006), ASIES (1995 and 2006), INE (2002 a,b), ILO (2004), and PREAL (2007).

The study is organized as follows. Section II describes the characteristics of the data used in this study. In the section that follows, the theoretical underpinnings of the four main economic growth theories are tested for the case of Guatemala between 1950 and 2006. Section IV analyses the impact of family structure and other observable characteristics on wealth, poverty and education. This section is followed by policy recommendations in section V. The study finishes with the conclusions.

II. Data and Study Design

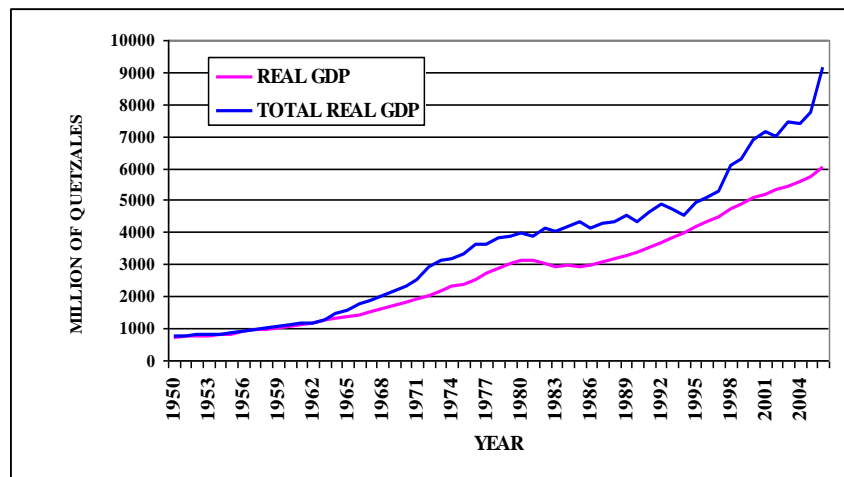
The study has been carried out using three databases. The first database consists of aggregated economic and social annual time series for Guatemala covering the period 1950-2006. These times series were used to test the validity of different growth theories to the case of Guatemala. To analyze the family structure and its impact in the economy we use the data collected by the *Encuesta Nacional de Empleo e Ingresos* (ENEI) 2004 and the Census of 2002.

The analysis was carried out by “*lugar poblado*.”¹³ Annex I and II present a summary of the data description and sources used to collect them.

A Neo-Classical model is used to frame the analysis at the macroeconomic level. Other explanatory variables have been added, when fitting, to capture some institutional realities in Guatemala. We tested the annual data for unit roots by using the Augmented Dicky-Fuller test (ADF) and Phillips and Perron (1987) test. In most variables, unit roots were found at the 5% level of significance but they were homogenous of degree 1.¹⁴ Also, a significant shift in the GDP was found in 1982, so a dummy variable (DUM82) was created. Figure 1 depicts total real GDP (TRGDP) and the formal real GDP (RGDP) for the period 1950-2006. The gap between the two lines is the contribution of the informal economy to the GDP, which has increased from 4% in 1950 to an estimated 52% in 2006.

Figure 1

Formal and Total Real GDP, 1950-2006



Sources: Banco de Guatemala, Urizar, Carmen , Julio Cole, Pablo Schneider and Caroll R. de Rodríguez “La Economía Informal en Guatemala”, CIEN, 1992, and CIEN (2001)

The mean of the TRGDP for the period is Q3,536.00 million with a corresponding average of total *per capita* income of Q355.42. The standard deviations are Q5,818.00 and Q79.60 respectively. Since the signing of the 1996 Peace Treaty, Guatemala’s GDP has increased at an

¹³ In the U.S., the closest census unit to this classification is *places* and *minor civil divisions*. Since neither of the two mentioned unit of analysis is an exact translation, we keep the exact wording in Spanish.

¹⁴ For the sake of brevity these results are not reported. They are available upon request.

average of 3.36%. After an initial expansion in 1996 Guatemala's growth slowed down during the 2001-2003 period. Since 2004, however, the economy has begun again an expansionary path. A significant portion of that growth has been generated by the informal sector.

Since the study seeks to determine the effect of different macroeconomic variables on growth, GDP rates of growth are used when TRGDP or *per capita* total real GDP (TRGDPPC) are the dependent variable. All variables were logged to minimized volatility.

Models are estimated using ordinary least squares (OLS) regressions and violations of OLS assumptions were tested and corrected. AR(1) processes when appropriate were introduced by using a Hildreth-Lu procedure to estimate the AR(1) coefficient. The remaining autocorrelation and heteroskedasticity were corrected by using Newey-West to estimate the variance-covariance matrix. Thus, the coefficients obtained are efficient and unbiased. Regressions were also tested for the presence of multicollinearity.

To design the analysis of the family using disaggregated data, Neo-Classical economic theory of maximization and the empirical literature on the study of family structure and wealth were taken into account. The data was analyzed in two different groups: head of household and children to examine whether household characteristics, especially family structure, affected the welfare of these two groups differently. The ENEI 2004 provided 64,339 data points. Of these, 10,168 corresponded to head of households. After eliminating outliers and households with missing information, the sample was reduced to 8,684 for head of households and 19,970 children corresponding to these households. Of these households, 2,388 reported being unions, 5,808 being married, 546 being separated, 61 being divorced, 754 being widowed, and 224 being single parents.

Since the focus of the study is the economic growth process, three relevant factors for this process, which could be extracted from the ENEI 2004, were selected: wealth, poverty/negative income, and school enrollment, as a proxy for access to education or human capital. Wealth and poverty were selected not only because they are relevant for the financial security of the families but also because they are relevant for investment and consumption at the macroeconomic level. School enrollment was selected because of its impact on human capital and productivity. In this study, the analysis at the disaggregated level seeks to determine how these three variables are affected by relevant household observable characteristics, including family structure. The household observable characteristics used were age, sex, level of education, race, marital status,

area where the household live (rural vs. urban), number of children in the household, type occupation of the head of household, level of income (measured as NBI) and whether they received remittances or not.

Given that the reporting on exact amounts of wealth and income received in each household were, for the most part, either not available or not reliable, proxies were constructed for these two variables. The NBI composite is used in this study as a proxy for poverty and/or income (i.e., negative income). A factor analysis procedure based on the six components recommended by the INE (2002) was used.¹⁵ Two relevant factors were identified among the six components. Outliers (measured as three standard deviations or more) were eliminated from the NBI series obtained. Most of these outliers belonged to the municipality of *La Reforma* in the Department of *San Marcos* and were driven by the NB11 component, i.e., percentage of NBI based on the quality of the house.

The proxy for wealth was constructed based on the data provided by the ENEI 2004. The following components were included: home ownership, whether the household received rent or not, whether the household had savings or not, whether the household had received dividends in the past three months or not, whether the household had sold assets in the past three months or not, whether the household had received income from rentals in the past three months or not, and finally on whether the household had received remittances in the past three months or not. Because most of the variables are binary (1=YES and 2=NO) and because when they are not, the higher the value reported for the classification used, the worse off the household is, the higher the value of the wealth composite, the lower the level of wealth of the household.¹⁶ The factor analysis carried out on these seven components identified three factors.

Figure 2 and 3 depicts the wealth and income composite distribution respectively. There is a significant gap in the wealth distribution in Guatemala, with 1% of the households holding the highest concentration of wealth, followed by another 8% of the households (Figure 2). Most of the households in Guatemala (60%) hold some type of wealth in the form of house ownership and/or receive remittances. Of them, a large proportion is characterized by low living standards if not slightly above the poverty line. The next 8% of the households own a house that has been

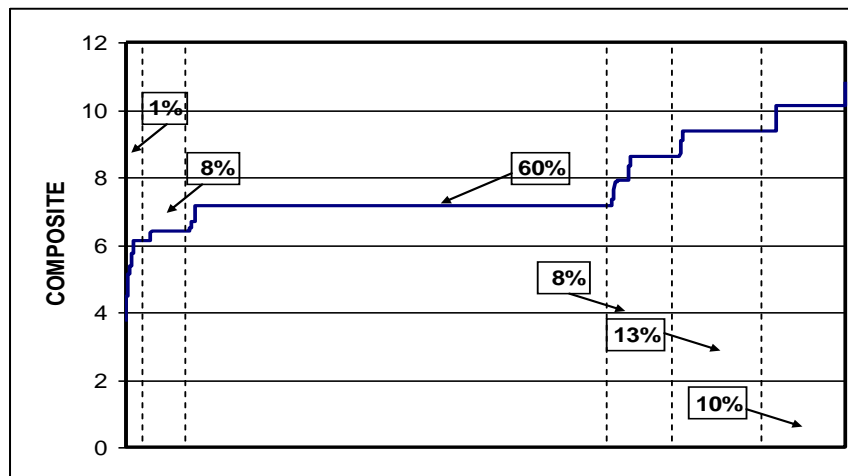
¹⁵ The breakdown of the elements used to calculate the composite are detailed in Annex II. The composite per *lugar poblado* was constructed using factor analysis with a rotation, which was calculated using a Varimax methodology with Keiser normalization and the Anderson-Rubin procedure for scoring.

¹⁶ For example, for the case of house ownership, the higher the number the weaker is the ownership of the house

received either by inheritance or has been donated to them but the condition of the houses is poor. They also report having received remittances. The second to the last lower level of wealth correspond to households that rent the house where they live but they might received some other income, typically remittances. Finally, the bottom 10% of households report not owning their homes or any other type of assets.

Figure 2

Wealth Composite Distribution for Head of Households (2004)



Sources: ENEI, 2004.

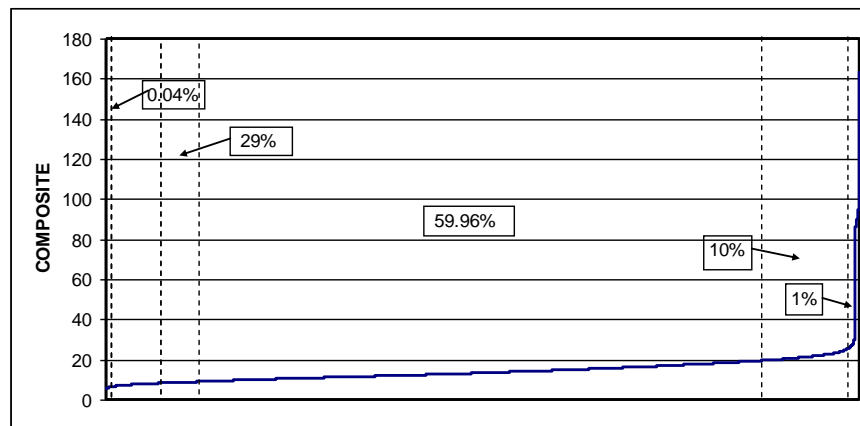
Percentages indicate the proportion of households within the sample that fall into a given category.

The distribution for the NBI composite used as a proxy for poverty is presented in Figure 3. It follows very closely the composition of the wealth composite distribution. As it was the case for wealth, the NBI distribution also indicates a significant gap in poverty/income among Guatemala's population. 0.04% of the households hold the highest income with practically all the necessary basic needs met and high levels of education. The following 29% also have their basic needs met but the level of education typically finish at the college level. 59.96% of the households in Guatemala, however, have their basic needs met but the quality of the housing and education, for the most part, is slightly above the poverty level. For example, they typically report having metallic roofs and/or walls, cement walls, and a high school or lower level of education. The 10% that follows report housing conditions, sanitation services, and access to

(1=full ownership, 2= paying the house, 3=inherited or donated, 4=renting, and 5= on loan).

safe water sources that are much more precarious as well as a level of education that, for the most part, is not higher than grade school. Finally, the bottom 10% in the distribution corresponds to households in extreme poverty where they lack housing, access to safe water, and sanitation. The head of the household typically also reports no education.

Figure 3
Income Composite or NBI Distribution for Head of Households (2004)



Sources: ENEI, 2004.
 Percentages indicate the proportion of households within the sample that fall into a given category.

The wealth and NBI composite's distributions clearly show that neither extreme poverty nor high levels of wealth concentration are the norm in Guatemala but extremes that affect only a small percentage of the households. Yet, there is a large percentage of the population, roughly 60% that would significantly benefit from access to higher levels of education and thus quality job opportunities, better housing, access to safe water sources, and sanitation services. Because the distributions of both wealth and NBI composite are highly skewed, an OLS estimation would not provide efficient and unbiased estimations. We used Generalized Least Squares instead.

Table 1 provides a snapshot of the wealth and NBI sample used to run the study. As previously mentioned, this sample does not include the outliers either at the top or at the bottom of the distribution. On average whether one compares means and percentiles, there are not significant differences between the head of the household wealth and NBI composites and that of children. The difference between the NBI's median between head of households and children is more pronounced, perhaps reflecting the impact of the number of children in a household.

However, the fact that the NBI's median for children is lower than the mean, is an indication that the number of children per se does not generate poverty but other causes might be contributing. These causes are further investigated in section IV of this paper. We now turn to the analysis of the economic theories of distribution.

Table 1
Average Household Wealth and NBI
(n=28,654)

	Mean	25 th percentile	Median	75 th percentile
Wealth				
All sample	5.54	2.77	4.61	9.40
Head of Household	5.51	2.75	3.89	9.39
Children	5.49	2.78	3.86	9.46
NBI				
All sample	13.85	5.64	14.07	19.5
Head of Household	14.00	5.61	13.20	19.11
Children	14.61	5.65	14.49	19.89

Sources: ENEI 2004.

The sample used to calculate these figures is the sum of head of households and children used in this study

III. Theories of Economic Growth

Economic theories that attempt to explain the growth process and its relationship with population can be grouped in four categories: Neo-Classical theory, Human Capital theory, Malthusian theory, and Neo-Malthusian theory. All of these have important consequences for policy.¹⁷

1. Neo-Classical Model

Historically, Neo-Classical economists embraced Malthus's inverse relationship between population growth and real growth but acknowledged the key role of investment and thus savings in the process of growth.¹⁸ That is, adjustments in growth take place due to the behavior of

¹⁷ For a review of the literature see Ehrlich and Lui (1997) and Temple (1999).

¹⁸ Thomas Robert Malthus in his *Theory of Population and Income* (1798), introduced a relationship between population growth and what he termed subsistence. He sustained that the first grew geometrically while the second

investment in physical capital and the law of diminishing returns on the factors of production holds. In Neo-Classical models, growth is a worldwide process and country characteristics determine the relative level of income. Solow (1956) proposed a growth model where population is taken into consideration, but economic growth takes place through investment. Based on the standard Solow Model and following Mankiw *et al* (1992), the following reduced form is estimated to test this theory in the case of Guatemala:

$$\ln (Q/L)_t = w \ln (A) + (\alpha/(1-\alpha)) \ln (s)_t - (\alpha/(1-\alpha)) \ln (n+g+ \delta) + \gamma \ln(FR)_t + \beta \ln (Q/L)_{t-1} + \theta DUM82 \quad (1)$$

where Q is the TRGDP and it includes the informal economy, L is the labor force, A is the level of technology in the US and w is the weight.¹⁹ s is the average share of private and public real investment on GDP, i.e. $\ln(I/GDP)$, n is the average rate of growth of working age population (15 to 64), g is the long run rate of growth of output *per capita*, and δ is the rate of depreciation which has been estimated to be 7%.²⁰ To emphasize the impact of population size on the growth process, the fertility rate (FR) is included. Since an AR(1) process was found, this is also included in the original regression together with a dummy variable (DUM82), which captures a break on the series in 1982. Furthermore, to test for the validity of the Malthusian assumption embedded in the Neo-Classical model, the following linear restriction was tested: $[\ln(I/GDP) - \ln(n+g+\delta)]$. If Malthusian theory holds, the sign of the coefficient should be negative. The results of the estimation are reported in Table 2, Column 1.²¹ Because of the presence of random walks in some of the variables used in equation (1), the regression run is on the first differences of these variables. Thus, its results capture the effect of the change of these variables on

increased only at an arithmetic ratio. Thus, he proposed the existence of an inverse relationship between population growth and development derived from the law of diminishing returns. This law is the belief that more people mean fewer goods for each person; thus, as population grows, poverty inevitably increases.

¹⁹ As explained in Annex I, the weights was calculated as follows: 13% for transportation assuming a complete transfer of foreign technology, 23% for agriculture assuming a 50% transfer of foreign technology in the sugar and coffee industry, 12% for industry assuming complete transfer of foreign technology, and 24% for commercial, assuming a 10% transfer of foreign technology. The weight (w) thus is: $\tau_{US}*(0.13+0.23*0.5+0.12+0.24*0.1)$

²⁰ We used the level of depreciation proposed by Artana(1999).

²¹ For the sake of space, only the relevant coefficient for testing the Malthusian theory ($\ln(I/GDP) - \ln(n+g+ \delta)$) is reported in Table 2, Column 1. Similarly, although two different regressions to test for the significance of population growth and fertility rates were run, only the values of the coefficient for population growth is reported in Table 2, Column 1.

economic growth per capita or the change of GDP per capita rather than on the levels of these variables.

In equation (1) and with the exception of the coefficient on population growth, which is not significant, all variables are significant. The fertility rate, $(n+g+\delta)$, and the Malthusian restriction captured by $[\ln(I/GDP) - \ln(n+g+\delta)]$, have a positive sign rather than the negative predicted by the model; all other variables behave consistently with Neo-Classical theory. The latter underlines the failure of Malthusian assumptions in Guatemala. The fact that the coefficient for the change on the fertility rate is significant and has a positive sign indicates that a higher number of children increase *per capita* GDP rather than decreasing it as Malthusian assumptions predict it should. The rate of population growth in Guatemala has not varied too significantly over the period under study (in 1950 it was 2.85 while for 2006 it was 2.3), this might partially explain why it is not significant in the determination of the *per capita* growth rate. On the other hand, because Guatemala has been mainly an agricultural country and most of its industry is labor intensive, the labor force is an important factor of production. Thus, an increase on the fertility rate can be expected to have a positive impact on economic growth as it expands the labor force and therefore, production's resources and the production possibility frontier. The significance and signs of both population growth and the change in fertility rate indicates that in Guatemala, the sources of poverty are other than the population size *per se*. Similarly, the positive sign of the coefficient for $\Delta (n+g+\delta)$ indicates that an increase of n and on g also facilitates rather than decrease GDP *per capita* growth.

At the same time, the positive and significant sign of the break on the series for 1982 coefficient indicates that the openness of the economy has contributed to economic growth. Finally, the AR(1) process has a negative sign indicating that a fall in the GDP *per capita* the previous year does not lead to a fall in the following year but vice-versa. Deviations from the long-term growth's path are reversed within a year. Thus, Equation 1 results suggest that the Malthusian prediction which is assumed in the Neo-Classical model is not supported in Guatemala, but the role of investment, the self-adjustment of the market towards the long-term growth's path, and the openness (which also can be understood as liberalization) of the market are. The value of the R^2 (.82) also suggests a good fit.

In an effort to better understand investment and its connection to population and institutions, we run Equation (2).

$$\ln (I)_t = \beta_0 + \beta_1 \ln (i)_t + \beta_2 \ln (FR)_t + \beta_3 \ln (PI)_t + \beta_4 \ln (I)_{t-1} + \varepsilon_t \quad (2)$$

Where, I is investment, i is the domestic market interest rate, FR is fertility rate, and PI is political instability as captured by the index of economic freedom defined by the Heritage Foundation. An AR(1) process was found, which is captured in the last term. Results are reported in Table 1, Column 2. Once again, because of the presence of random walks in some of the variables included in equation (2), the regression is run on first differences.

The elasticity for the fertility rates is positive and greater than one, indicating high sensitivity of investment with regards to fertility rates. The coefficient for openness of the economy is significant and positive but less than one. The AR(1) process also is significant and positive. Finally, interest rate has a negative sign, but it is not significant. Thus, Neo-Classical theory of investment, which proposes that investment is a function of interest rates, does not hold. Investment in Guatemala, rather than being determined by its opportunity cost, it seems to be affected by institutional factors.

The experience of an aging population in developed countries has generated serious concerns, among other things, because of the fiscal burdens and the loss of productivity that it has generated.²² Given that for Guatemala, there seems to be no support for Malthusian assumptions within the Neo-Classical model, it is relevant for policy to understand how not only the fertility rate, but aging population and the speed at which this aging population takes place affect the process of economic growth. With this purpose, equation (1) was again estimated this time incorporating these two additional aging population factors.

$$\ln (Q/L)_t = w \ln (A) + (\alpha/(1-\alpha)) \ln (s)_t - (\alpha/(1-\alpha)) \ln (n+g+\delta) + \gamma \ln (FR)_t + \beta \ln (Q/L)_{t-1} + \theta DUM82 + \varphi \ln (AP)_t + v \ln (SA)_t \quad (3)$$

where AP is aging population calculated as the dependency ratio (population aged ((45-64) + >65)/ (population aged 15-64)) and SA is the speed of population aging (calculated as the number of years for the percentage of population aged 65 and over to rise from 7% to 14%). As for the previous regressions, first differences of the variables are used when applicable. The

²² For some studies in this subject see Chand and Jaeger (1996), Becker *et al* (1999), and Aguirre(2006)

results are reported in Table 2, Column 3.

The signs and values of the coefficients in equation 3 reflect closely the results obtained in the estimation of equation (1) (Table 2, Column 1). The coefficients for both the aging population and the speed of aging are significant and have a positive sign, suggesting that while the aging population in Guatemala has not affected negatively the growth process, the speed of the aging population has. Specifically, both φ [$\partial(\Delta\ln(Q/L))/\partial(\ln(AP))$] and ν [$\partial(\Delta\ln(Q/L))/\partial(\ln(SA))$], are elasticities. Thus, an increase/decrease in the percentage change of the aging population or in the percentage change of the speed of aging population generates an acceleration/ slow down of real GDP growth *per capita*. Given these results, two points are important to note. First, for the most part, over the period 1950-2006, Guatemala experienced a significant portion of young population (for example, in 2000 the labor force constituted 54% of the population and the proportion of the population under 14 was 42%, while the percentage of population aged 65 and above was only 4%).²³ Thus the percentage of aging of population in Guatemala is not that large. Furthermore, many of them still are an active part of either the labor force and/or the informal economy. Second, the speed at which aging population is taking place in Guatemala has accelerated since 1982 falling from 130 years to 59 years 2006 (Figure 4 depicts the speed of aging population for Guatemala during the period 1982-2006.) Such drastic reduction could only have been expected to have a negative effect on growth.

Developed countries are facing serious fiscal difficulties, although they are rich and have savings, because of their aging population. Developing countries are poor and they do not have savings or social securities in place that can support the aging population. The impact of the acceleration on the speed of aging population therefore will have much more devastating effects in these countries than the one it is having in developed countries, as it hampers not only economic growth but savings and fiscal solvency.²⁴

²³ INE (2002).

²⁴ This phenomenon is not unique to Guatemala. Other developing countries are facing the same problem. While it has taken France 115 years, Sweden 85, and the US 69 years to face the aging population problem, it will take 20 for Colombia, 21 to Brazil. U.S. Census Bureau (2000).

Table 2

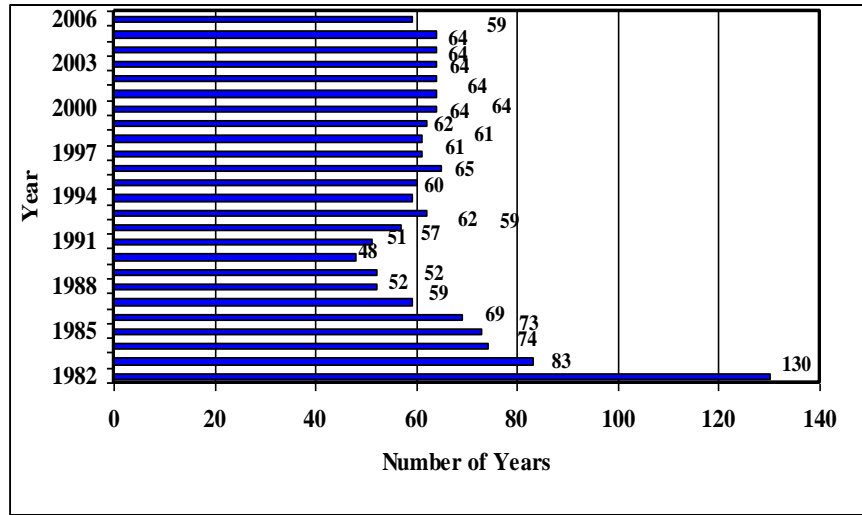
Neo-Classical Theory of Growth

Variables	Equation 1	Equation 2	Equation 3
Independent Variable	Δ Real GDP <i>Per capita</i>	Δ Investment	Δ Real GDP <i>per capita</i>
Constant	-0.07* (0.008)	0.51** (0.23)	-0.22* (0.06)
Δ Technology (τ)	0.11* (0.03)		0.10* (0.04)
Δ Investment	0.03* (0.01)		0.03* (0.01)
Δ (n+g+ δ)	1.4* (0.17)		1.4* (0.09)
Fertility Rate	0.23*** (0.14)	4.82** (2.56)	0.19* (0.12)
Population Growth	-0.03 (0.03)		
Dum82	0.015* (0.004)		0.015* (0.004)
Index of Economic Freedom		0.28** (0.14)	
AR(1)	-0.45* (0.13)	0.44* (0.12)	-0.44* (0.08)
MALTHUSIAN RESTRICTION: Δ Investment – Δ (n+g+ δ)	0.52* (0.17)		
Domestic Interest Rate		-0.38 (0.87)	
Years of Education			
Aging Population			0.04* (0.02)
Speed of Aging			0.012* (0.004)
Fraction of Income invested in Education			
Research & Development			
R²	0.82	0.53	0.83
ADW	2.2	1.8	2.2

Sources: Data Collected by Study, 1950-2006. Values are logged thus the coefficients are elasticities.

- When population was included as an independent variable, two separate regressions were run. One included population growth and another included fertility rates. The numbers for the coefficients reported in this table correspond to the regression that reported the highest R². Thus, the coefficients for rate of population growth reported in this table belong to a different regression. It is worth noting that the values for the other coefficients are very similar.
- The Malthusian Restriction Coefficient is reported from a separate regression.
- * indicate 1% , ** indicate 5% , and *** indicate 10% significant levels respectively.
- A positive sign on the IEF indicates grater openness in the economy.

Figure 4
Speed of Aging Population, 1982-2006



Sources: Raw data obtained from INE.

In calculating the speed of adjustment for each year, the aging population rate for that year was kept constant. In fact, in the case of Guatemala this was not the case, but it fluctuates over the 1982-2006 period. Thus the calculations tend to be undershooting the actual value.

2. Human Capital Theory

By introducing the concept of human capital in the growth process, Gary Becker proposes an alternative to the Malthusian assumption of the Neo-Classical theory of growth. In his model, human capital is an important source of economic development that depends on advances in technological and scientific knowledge. A key assumption of this model is that the rate of return on investments in human capital rises rather than declines as the stock of human capital increases; man is creative and therefore today’s education implies more production for the future. For this reason, resources are not necessarily fixed and may increase as population increases.

In order to test this theory the Solow model presented in Equation (3), augmented to include human capital as an accumulated factor, is estimated as presented in Equation (4).

$$\ln (Q/L)_t = w \ln (A) + (\alpha/(1-\alpha)) \ln (s)_t - (\alpha/(1-\alpha)) \ln (n+g+ \delta) + \gamma \ln(FR)_t + \beta \ln (Q/L)_{t-1} + \theta DUM82 + \varphi \ln (AP)_t + v \ln (SA)_t + (\alpha/(1-\alpha)) \ln(h)_t \quad (4)$$

where h is average years of education. Following Loening (2002), h is measured as the average years of schooling evident in the labor force.²⁵ The results are reported in Table 3, Column 1. Once again, the coefficients are consistent with the previous findings. Average years of education are not significant. This finding contradicts those of Loening (2004) but only on the surface. Given that the average level of education in Guatemala is three years, it is to be expected that at the accumulated level of education makes no difference. In order to by pass this problem Loening (2004) employs an error-correction model and finds that, in fact, education has a positive and significant impact on economic growth. As it will be seen later, this study finds consistent results when analyzing the disaggregated data.

In order to better reflect the reality of the labor force in Guatemala, we next incorporate not only average years of education but the experience that workers obtain on the job. For this, following Bloom *et al* (2004), a Cob Douglas production function of the following form is defined

$$Q_t = A K_t^\alpha L_t^\beta e^{\theta_1 h_t + \theta_2 EXP_t + \theta_3 EXP_t^2 + \theta_4 hl_t} \quad (5)$$

where Q is output, L is labor, EXP stand for experience and is the amount of time spent in the labor force, EXP^2 is its value squared, h is the average years of education of the labor force, and hl is health, measured as life expectancy. Experience was calculated as: average age (i.e., the average years of school-age at which school starts (here it is assumed to be 6 years old)). The age groups were divided as follows: (15-19, 20-24, ..., 60-64, 65+). To calculate K , the perpetual inventory method is used. The first year was set equal to the average of the five first years of the ratio of inventory to GDP (Ave. Inv/GDP). This, in turn was multiplied by the GDP at t_0 and divided by the depreciation (δ). This was assumed to be the stock at t_0 . The remaining amounts were calculated as $K_{t+1} = K_t - \delta K_t + Inv$. Taking logs in equation (5) the following reduced form is derived:²⁶

²⁵ This measure does not take into account quality changes within the education system. However, as Loening (2004) has already noted, “it proves impossible to obtain an index of quality changes of education for the period under study.”

²⁶ Typically the first term in this type of models requires the modeling of the total factor productivity so to avoid that this information may be lost into the error term. In this case however, since the model is applied to only one country and a weight has been introduced on the factor productivity (A), it has been deemed such modeling unnecessary given the purpose of this study.

$$\ln(Q)_t = w \ln(A) + \alpha \ln(K)_t + \beta \ln(L)_t + \theta_1 \ln(h)_t + \theta_2 \ln(EXP)_t + \theta_3 \ln(EXP^2)_t + \theta_4 \ln(hl)_t \quad (6)$$

This equation also allows us to calculate the marginal benefit of schooling (MBS= $Q_t/\partial s_t = \theta_1$ (Y/L)), the marginal cost of schooling (MCS= $\partial Q_t/\partial L_t = \beta$ (Y/L)) and the social rate of return (SRR= θ_1/β). Results are reported in Table 3, Column 2.

Once again, the results are consistent with the previous models estimated. In addition, the coefficient for the rate of growth of labor is significant and positive, indicating that an increase in the labor force has a positive impact on real TGDP. Experience is significant and negative while its squared value is positive. The last result provides support for Becker's assumption of an increasing return to scale on human capital. This last result, provides support for education at least, on the job education, and thus indicate the importance of education on growth even if, previous results indicate that average years of education per se are not significant in the determination of real growth of GDP per capita.

It is a well established fact that life expectancy is a good predictor of economic growth. Guatemala is not an exception on this point. Life expectancy is positive and very significant in the determination of growth, indicating that in Guatemala, the better the health the higher growth is. The results are consistent with the finding of Bloom *et al* (2004) as well as with a large body of literature on economic development.

Finally, in order to inquire on the school efficiency in Guatemala, its marginal benefit (MBS) and costs (MCS) are estimated. The (MBS) is $\partial Q_t/\partial h_t = \theta_1$ (Y/L)₀₆ = Q108.60; the marginal cost of schooling (MCS) is $\partial Q_t/\partial L_t = \beta$ (Y/L)₀₆ = Q173.76, and the social rate of return is SRR = $\theta_1/\beta = 63\%$, indicating high inefficiencies in schooling. Figure 5 presents the marginal benefit (MB) and marginal cost (MC) of education for the period 1950-2006. As can be seen, education's efficiency has significantly declined in recent years. The reason for this decline are beyond the scope of this study, yet the recent study of PREAL(2007) give some lights on this issue. Among other things it highlights the below standard education being delivered in many schools, a great gap, both in levels and accessibility, between urban and rural education, education expenditures are not well allocated, and only $\frac{3}{4}$ of the educators have the minimum necessary education required to carry out their jobs.

Table 3

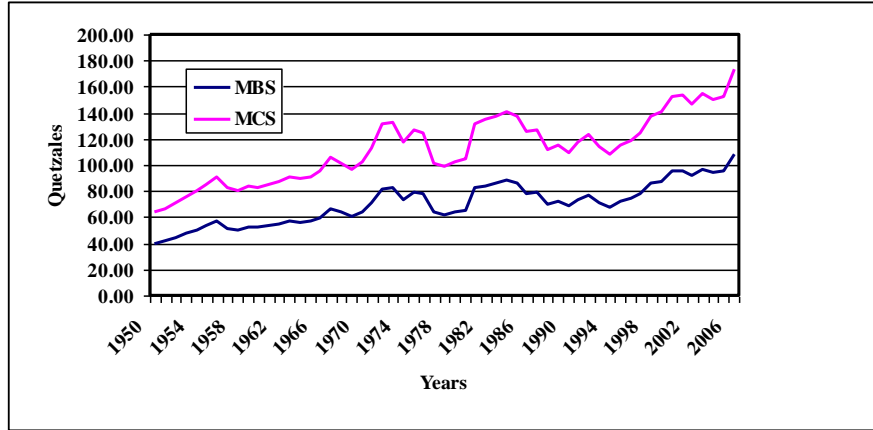
Human Capital Theory of Growth

Variables	Equation 4	Equation 6	Equation 7	Equation 8
Independent Variable	Δ GDP <i>Per capita</i>	Δ Real GDP	Δ Real GDP	Δ Investment/ Investment
Constant	-0.22* (0.06)	-0.07* (0.022)	-0.83* (0.34)	42.71* (13.88)
Δ Technology (τ)	0.10* (0.04)	0.15* (0.05)	0.13** (0.06)	
Δ Investment	0.03* (0.01)	0.05* (0.008)	0.06* (0.01)	0.786*** (0.53)
Δ (n+g+ δ)	1.4* (0.09)			
Fertility Rate	0.20* (0.12)			
Dum82	0.011* (0.003)	0.013*** (0.007)	0.01 (0.01)	
AR(1)	-0.44* (0.08)	0.29* (0.12)	0.31** (0.17)	
Years of Education	0.02 (0.06)	0.05 (0.12)		
Aging Population	0.04* (0.02)			
Speed of Aging	0.012* (0.004)			
Δ Labor		0.08** (0.04)	0.06** (0.03)	-3.53* (1.13)
Experience		-0.24* (0.07)		
Experience ²		0.00003* (0.000008)		
Life Expectancy		13.3* (3.8)	0.19** (0.083)	
Human Capital Accumulation			0.12* (0.05)	3.56* (1.29)
GINI Coefficient Proxy				1.38* (0.47)
IEF				4.28** (2.14)
R ²	0.83	0.60	0.58	0.33
ADW	2.2	2.3	2.3	2.1

Sources: Data Collected by Study, 1950-2004. Values are logged thus the coefficients are elasticities.
 - When population was included as an independent variable, two separate regressions were run. One used population growth and another included fertility rates. The numbers for the coefficients reported in this table correspond to the regression that reported the highest R². Thus, either the fertility rate or the rate of population growth coefficients reported belong to a different regression. It is worth noting that the values for the other coefficients are very similar.
 - The Malthusian Restriction Coefficient is reported from a separate regression.
 - * indicate 1% , ** indicate 5% , and *** indicate 10% significant levels respectively.
 - A positive sign on the IEF indicates grater openness in the economy.

Figure 5

Marginal Benefit and Cost of Schooling, 1950-2006



Given that there seems to be evidence of an increasing return to scale of education, how the stock of human capital has influenced the growth process in Guatemala is next examined. For this we resort to a gross accounting model with human capital stock as proposed by Benhabib and Spiegel (1994) to which an AR(1) process as well as a dummy for 1982 together with life expectancy has been added. Specifically, the model estimated is

$$\Delta \ln(Q)_t = w \Delta \ln(A) + \alpha \Delta \ln(K)_t + \beta_1 \Delta \ln(L)_t + \gamma \left(\frac{1}{T} \sum_0^T \ln(h)_t \right) + \beta_2 \Delta \ln(LE)_t + \beta_4 \Delta \ln(Q)_{t-1} + \beta_5 DUM82 \quad (7)$$

where $(1/T) \sum_0^T \ln(h)_t$ is the average level of the log of h over a period of time. It is calculated as a moving average. The results are presented in Table 3, Column 3. Results suggest that while in Guatemala human capital enters insignificantly in explaining GDP growth, the human capital stock level is significant and positive, thus providing further support for the Human Capital theory in Guatemala. Furthermore, it underlines the importance in Guatemala of both a solid education and health system to support economic growth.

An alternative channel for human capital to contribute to growth is through the impact that this can have in the accumulation of physical capital. Lucas (1990) has suggested that one reason for physical capital not to flow to developing countries could be that these countries are poorly endowed with factors complementary to physical capital. Consequently, the marginal

product of capital in developing countries may not be that high in spite of the apparent scarcity. Other studies have shown that political instability or a skewed income distribution affects negatively economic growth.²⁷ In order to examine how, if at all, these dynamics play in Guatemala the ratio of gross investment to capital stock is regressed on factor stocks: human capital, physical capital, labor force, as well as the GINI coefficient (PGINI or proxy for the GINI coefficient) and the Index of Economic Freedom (IEF), so as to capture both the effects of political instability and income distribution.

$$(\Delta K_t/K_t) = \beta_0 + \alpha K_t + \beta_1 L_t + \beta_2 ((1/T) \sum_0^T \ln(h_t)) + \beta_3 PGINI + \beta_4 IEF + \varepsilon_t \quad (8)$$

Results are reported on Table 3, Column 4. Capital and human capital stock as well as political stability, as captured by the IEF, show the expected results. Labor supply on the other hand, is negative suggesting a higher marginal productivity of labor than a marginal productivity of capital in Guatemala. Similarly, income inequality seems to have had a positive impact on gross investment rather than a negative one as Persson and Tabellini (1991) predict. In order to further understand why this has been the case, we next turn our attention to the impact of research and development (R&D), **both** foreign and domestic, on the total factor productivity of Guatemala. For this we resort to the vast literature on endogenous growth theory.²⁸ Equation (9) is estimated as follows,

$$\ln(F)_t = \beta_0 + \beta_1 \ln(DR\&D)_t + \beta_2 w m \ln(FR\&D)_t + \beta_3 \ln(F)_{t-1} + \varepsilon_t \quad (9)$$

where F is the total factor productivity calculated as $[\ln(Q) - \alpha K_t - \beta L_t]$, DR&D and FR&D represent domestic and foreign R&D respectively, w is the weight for technology, and m is the fraction of imports to GDP. We also incorporate an AR(1). The results are presented below. The numbers in parenthesis are the standard deviations.

$$\ln(F)_t = 0.41 + 0.04 \ln(DR\&D)_t + 0.008 m \ln(FR\&D)_t + 0.73 \ln(F)_{t-1}$$

(0.13) (0.015) (0.006) (0.08)

$$R^2 = 0.97 \quad ADW = 1.9$$

²⁷ Alsina *et al* (1992) and Persson and Tabellini (1991) study these issues.

²⁸ For a review of this literature see Grossman and Helpman (1994), Howitt (2000), and Kremer(1993)

Both domestic and foreign research and development are significant and positive. The domestic research, in this case, is driven by the sugar industry investment in research and development, which is estimated to be approximately 10% of their production.

In order to finish analyzing the relationship between population and growth within the Neo-Classical and Human Capital Models, we estimate the path of GDP *per capita* under different population growth scenarios. We take as initial values the ones obtained in equation (3) with the exception of h_t , which we replaced by the stock of human capita coefficient (equation 7). We start our estimations by using Guatemala's 2006 population distribution as our base.

Figure 6 depicts the aging population ratio path. After the first 59 years, the aging process accelerates. This suggests that unless Guatemala reverses the present decline on fertility rates, the aging population problem will accelerate by 2,065, with the consequent problems that an aging population imposes on the government's fiscal responsibility.

Figure 6
Estimation of the Aging Population Path
Given Current Population Trends
(Base year: 2006)

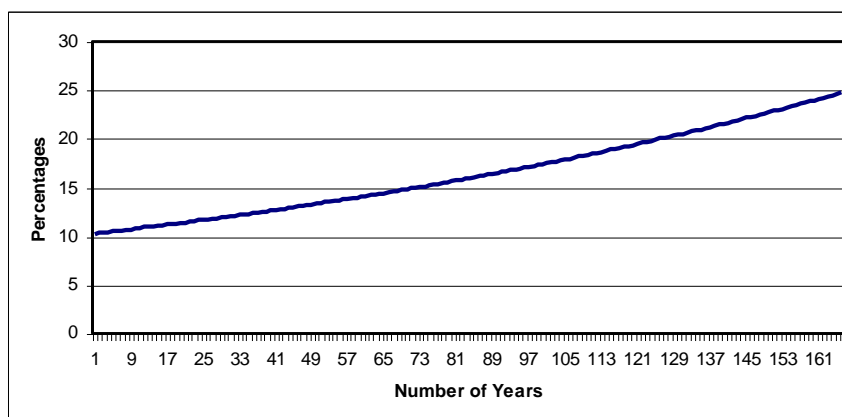
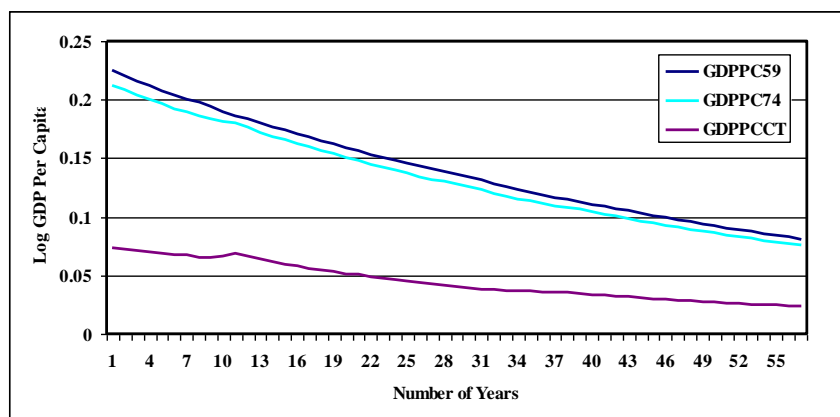


Figure 7 presents the estimations of the GDP *per capita* path under different distribution of population assumptions. GDPPCCT depicts the GDP *per capita* path under the current aging population acceleration conditions. GDPPC59 captures the TGDPPC path for the present population structure assuming no change in technology or human capital, while GDPPC74 assumes a 2% population growth. In all cases, the estimations indicate a decline in the GDPPC

in spite of a fall in the rate of growth of population. The lost on productivity due to the reversal of the population pyramid, is not compensated by the decline in the population size. This is what is often referred to the “aging population trap”, as oppose to the “population trap” that Malthus predicted.

Figure 7

**Estimation of Gross Domestic Product *Per capita*
Under Various Assumptions
(Base year: 2006)**



Sources: Authors’ estimations.
 GDPPCCT was estimated based on the current trend of aging population acceleration.
 GDPPC59 captures the *per capita* GDP path for the present population structure.
 GDPPC74 captures the *per capita* GDP path for a 2% population growth.
 All other coefficients are assumed constant.

In summary, except for the Malthusian assumption which is not supported by the economic growth process of Guatemala, the Neo-Classical and the Human Capital models overall perform well in explaining economic growth. The Neo-Classical Model as captured by equation (3) seems to be the best fit, with an R^2 of 83%. Accordingly, technology growth, investment, and the openness of the economy have positively influenced *per capita* GDP growth. Human capital also has favored the growth process but rather than average years of education is human capital accumulation or stock (equation (7)) which seems to have made a difference. Such results support the Human Capital model. There is no evidence that validates the assumption that population growth negatively affects economic growth. On the contrary, the empirical evidence indicates that the decline in the fertility rate that Guatemala has experienced since the 1950s, rather than helping has slowed down the growth process. This is of concern, as the speed of aging population has negatively affected economic growth as well, and this has

significantly accelerated since 1982. Furthermore, estimations suggest that as the rate of population growth continues to fall, the GDP *per capita* will be negatively affected. In Guatemala as it has been found to be the case in other developing countries, life expectancy positively affects growth, thus underlying the importance of health service access to the population. Finally, both domestic and foreign research and development have increased total factor productivity over the period 1950-1982. A special acceleration took place after 1982, when the economy began to open.

We turn now to the last of the growth theory tested in this study, Malthusian Theories.

3. Classical and Neo-Malthusian Theory:

In 1968, two influential ‘Neo-Malthusian’ works were published, Paul Ehrlich’s *Population Bomb* (1968) and Garrett Hardin’s "Tragedy of the Commons" (1968). Warnings about the limits of sustenance, of resources, food, energy, land, and the environment capture the attention of both popular media and politicians. Within this theoretical framework, there are two main sub-categories: The ‘Limited Resource Perspective’ and the ‘Socio-Biological Perspective.’ The former takes the classic Malthusian argument and applies it to all natural resources, while the latter, almost acting as a sub-set of the former, treats the environment as a limited resource and regards people as a threat to the biodiversity and ecological balance of resources.

Malthus predicted an inverse relationship between population growth and food consumption.²⁹ A *ceteris paribus* condition regarding a *given amount of resources* lays at the foundation of his theory. In order to see how his prediction fairs in Guatemala we test a Neo-Classical demand for food consumption function, where Consumption is a function of prices and income. We also incorporated additional variables to test for Malthusian assumptions.

$$\begin{aligned} \ln C_{ft} = & \beta_0 + \beta_1 ((1/T) \sum_0^T \ln (h_t)) + \beta_2 AGLAND_t + \beta_3 FR_t + \beta_4 (Solow Residual)_t + \\ & + \beta_5 Y_{rt} + \beta_6 (p/p^*)_t + \beta_7 DUMF1 + \varepsilon_t \end{aligned} \quad (10)$$

Where C_{ft} is the consumption of food *per capita*, $((1/T) \sum_0^T \ln (h_t))$ is the stock of human capital, AGLAND is the percentage of total land allocated to agriculture, FR is the fertility rate, Y_r is real income, and p/p^* is the relative price. Solow residuals are introduced in order to capture the

²⁹ See footnote n. 18.

impact of technology. The results are reported below. The numbers in parenthesis report the standard deviations.

$$\begin{aligned}
 \ln(C_f)_t = & \mathbf{0.13} + \mathbf{1.3} \left(\frac{1}{T} \sum_0^T \ln(h_t) \right) - \mathbf{31.62} \ln(\text{AGLAND})_t + \mathbf{2.4} \ln(\text{FR})_t + \\
 & \mathbf{(0.06)} \quad \quad \mathbf{(0.43)} \quad \quad \quad \mathbf{(10.54)} \quad \quad \mathbf{(1.6)} \\
 + & \mathbf{0.004} (\text{Solow Residual})_t + \mathbf{1.21} Y_{rt} - \mathbf{1.26} (p/p^*)_t + \mathbf{0.44} \text{DUM82} \\
 & \mathbf{(0.001)} \quad \quad \mathbf{(0.40)} \quad \mathbf{(0.62)} \quad \quad \mathbf{(.20)} \\
 & \mathbf{R^2 = 0.66} \quad \mathbf{ADW = 2.3}
 \end{aligned}$$

All variables are significant and have the expected sign except for FR, which is not significant, and for AGLAND which is inversely related to consumption *per capita*. The fact that accumulations of human capital as well as the Solow residuals report a positive sign indicates increasing returns to scale rather than constant, on the part of the factors of production. These results contradict Malthus' assumption of both the *ceteris paribus* condition regarding resources and the consequent prediction of the existence of an inverse relationship between population and consumption.

Among those supporting the socio-biological perspective of Malthusian theory, are those concerned with environmental sustainability. Deforestation is one of the areas where population growth, they contend, is a threat. In Guatemala, deforestation has been a standing concern, especially in rural areas where often trees are used as a source of energy, because of the erosion of the land that it generates. In order to determine how population affects this process and how other factors such as investment, economic growth, the speed of growth, and food consumption also affect deforestation, the following *ad hoc* equation is regressed,

$$\begin{aligned}
 \Delta \text{FORSTOCK}_t = & \beta_0 + \beta_1 \Delta \ln(Q/L)_t + \beta_2 \Delta \ln(\text{Inv})_t + \beta_3 (\Delta \tau / \tau)_t + \beta_4 \Delta \ln(\text{FR})_t + \\
 & \beta_5 \Delta \ln(\text{POPSIZE}) + \beta_6 \Delta \ln(Q)_t + \beta_7 \Delta \ln(Q/L)_t^2 + \beta_8 \Delta \ln(\text{FOCON})_t + \\
 & + \beta_9 \Delta \ln(\text{POPGR})_t + \beta_{10} \Delta \ln(\text{FORSTOCK})_{t-1} + \varepsilon_t \quad \quad \quad \mathbf{(11)}
 \end{aligned}$$

where FORSTOCK is the stock of forest, POPSIZE is the population size, POPGR is population growth, and FOCON is food consumption.

The regressions results show support for the Neo-Malthusian assumptions regarding deforestation. Specifically, an increase of the population size, leads to a decrease of the forestation rate (i.e., an increase of the deforestation rate.) Similarly, and increase on the rate of food consumption leads to a decrease in forestation.

The principal cause of deforestation in Guatemala is due to the burning of trees and other vegetation for the purpose of sawing maize and beans for family consumption. This takes place mainly in areas where agricultural expansion occurs. Under this production scheme, a larger number of children per family, especially males, expand the labor available to undertake this labor intensive and rudimentary agricultural work, which at the same time requires low if any levels of capital and technology.

Precisely because of the characteristics described above, although the Neo-Malthusian model captures this phenomenon, such phenomena in Guatemala is not widespread across the country but rather constitutes an isolated one. It fails to capture the agricultural production reality of Guatemala when population is seen from a national level perspective. This is so, because advances of technology are absent in the rudimentary scheme previously described. Consequently the solution to the problem of deforestation, if it is to be effective, should not be framed within a Malthusian perspective but rather from a perspective which seeks the development of families in an integral manner. That is, a perspective that takes into account not only agricultural production but also social characteristics of the families involved on this type of activity. Similarly, such perspective should also incorporate the many opportunities that forests can provide to enhance the family income.

Finally, the AR(1) process is significant and positive. All other variables are not significant, suggesting that neither factors affecting the process of growth nor fertility rates or population growth *per se* have a direct negative effect on deforestation.

$$\begin{aligned}
 \Delta \ln(\text{FORSTOCK})_t = & \mathbf{0.014} - \mathbf{0.001} \Delta \ln(Q/L)_t + \mathbf{0.002} \Delta \ln(\text{Inv})_t + \mathbf{0.001} (\Delta \tau / \tau)_t - \\
 & \quad (0.006) \quad (0.02) \quad \quad \quad (0.001) \quad \quad \quad (0.004) \\
 & - \mathbf{0.048} \Delta \ln(\text{FR})_t - \mathbf{0.005} \Delta \ln(\text{POPSIZE}) + \mathbf{0.03} \Delta \ln(\Delta Q)_t + \mathbf{0.01} \Delta \ln(Q/L)_t^2 - \\
 & \quad (0.04) \quad \quad (0.002) \quad \quad \quad (0.02) \quad \quad \quad (0.02) \\
 & - \mathbf{0.003} \Delta \ln(\text{FOCON})_t - \mathbf{0.29} \Delta \ln(\text{POPGR})_t + \mathbf{0.7} \Delta \ln(\text{FORSTOCK})_{t-1} \\
 & \quad \quad (0.002) \quad \quad \quad (0.19) \quad \quad \quad (0.10) \\
 \mathbf{R^2 = 0.89} \quad \mathbf{ADW = 1.8}
 \end{aligned}$$

In conclusion, while in Guatemala there is no evidence that supports the Malthusian theory of food consumption and population, there seems to be evidence for supporting environmentalists' concerns for an increasing population size and its effect on deforestation. It would be mistaken, however, to necessarily conclude that there is support in Guatemala for population control policies because there is a conflict between population and the environment. As the evidence provided in this section suggests, in Guatemala, population growth per se does not affect growth directly. When significant, there is a positive relation between fertility rates and economic growth and between human capital (captured by experience rather than education) and economic growth. Programs of reforestation and food production directed to sustainable use of the forest, such as those proposed by the *Proyecto de Fortalecimiento Forestal Municipal y Comunitario* (2002), where municipal and communal forestation is strengthened seem to be an effective way of addressing the real causes of deforestation. Similarly, the type of initiatives documented by Asturias de Barrios *et al* (2006) where efforts are directed to a more productive management of the natural forest, seem also to address both deforestation and forest preservation efficiently. Behind these types of initiatives is the premise that “the incorporation of natural forests in the economic activity will allow its conservation as long as its population depends on these natural resources and, thus, understands the benefits of their conservation.”³⁰

IV. Proximate and Wider Sources of Growth: Institutional Realities

After examining the explanatory power of the four main theories of economic growth for the case of Guatemala, we turn to some institutional and infrastructure considerations. The economic choices of the population, and more specifically of the poor, are constrained by their market environment and by the lack of shared infrastructure.³¹ Here infrastructure is understood as including roads, electricity connections, schools, health facilities, and public health infrastructure (mostly water and sanitation).

The magnitude and importance of the topic of institutions for economic growth requires a sole study of the subject in itself.³² Therefore, here we only intent to underline institutional factors that are very pertinent to explaining how population and the family fits within the process

³⁰ Asturias de Barrios *et al* (2006), p.8.

³¹ For a review of the institutional and economic situation of the poor in developing countries see Banerjee and Duflo (2007).

³² For the coverage of the role of institutions in economy growth see North (1990).

of growth. In doing so, we approach this issue from both a macroeconomic aggregated and disaggregated perspective. This section focuses on the aggregated analysis. The disaggregated approach is dealt with in the following section.

When analyzing the validity for Guatemala of the different models of growth, an effort was made to incorporate into them some institutional factors. Some of these included openness of the economy (captured by the IEF), political stability (also captured by the IEFPI), education, and health (captured by life expectancy). In all cases these factors were significant in the determination of Guatemala's growth process. As previously mentioned, inequality of the distribution of income has been reported by the literature on economic development to be an important factor undermining economic growth in these countries.

We first study the effect of income inequality in the Neo-Classical growth theory (equation 12).

$$\ln(Q/L)_t = w \ln(A) + \beta_1 \ln((1/T) \sum_0^T \ln(h_t)) - (\alpha/(1-\alpha)) \ln(n+g+\delta) + \gamma \ln(FR)_t + \beta \ln(Q/L)_{t-1} + \theta DUM82 + \varphi \ln(PGINI)_t \quad (12)$$

where PGINI stands for the proxy of the GINI coefficient, which is calculated as the ratio of the top 20% quintile to lowest 20% quintile and multiplied by a 100. The results are presented in Table 4, Column1.

The PGINI coefficient is significant and positive, contradicting the typical findings of the literature. The results are to some extent explained by equation (8), which reported a positive influence of the PGINI coefficient on capital formation. Investment in Guatemala is generated mainly at the upper levels of income concentration.

Income inequality has been attributed in developing countries to several factors. These include, among others, political instability, lack of access to lines of credit, to fixed assets, to means of production, and to education.³³ It has also been attributed to lack of access to appropriate health services. This is especially problematic for the low income population, as typically they have no access to formal insurance. For the most part, the family social network is the only access to extra income, thus when they have health problems, as Banerjee and Duflo (2007) point out, their "insurance often means eating less or taking their children out of the

³³ Banerjee and Duflo (2007).

Table 4

Institutions and Economic Growth

Variables	Equation 12	Equation 13	Equation 14
Independent Variable	Δ Real GDP <i>Per capita</i>	GINI Proxi	Δ Real GDP <i>per capita</i>
Constant	-0.06* (0.006)	3.17 (2.72)	0.04* (0.01)
Δ Technology (τ)	0.10* (0.04)		
Δ Investment	0.02* (0.01)		
Δ (n+g+ δ)	1.5* (0.11)		
Δ Fertility Rate	0.23*** (0.14)		
Δ Stock of Education	-0.004 (0.004)	0.59 (0.39)	
Dum82	0.02* (0.004)		0.26* (0.006)
Δ GINI Coefficient Proxy	0.0004** (0.0002)		
AR(1)	-0.45* (0.09)	0.61* (0.09)	0.86* (0.10)
Index of Economic Freedom		0.35* (0.14)	
Access to Credit		0.22 (0.13)	
Income <i>per capita</i>		-0.45* (0.12)	
Life Expectancy		0.15 (0.66)	
Remittances		-0.000000126* (0.000000027)	
Δ Real Exchange Rate			0.003 (0.01)
Δ Inflation			0.01* (0.003)
Δ Real Interest Rate			-0.008 (0.005)
Degree of Bank Deregulation			0.03*** (0.01)
Δ Dollarized Exposure			0.014* (0.005)
Country Risk			0.007** (0.003)
R ²	0.83	0.94	0.
ADW	2.3	2.0	2.0

Sources: Data Collected by Study, 1950-2004. Values are logged thus the coefficients are elasticities.

- * indicate 1% , ** indicate 5% , and *** indicate 10% significant levels respectively.
- A positive sign on the IEF indicates grater openness in the economy.

school.³⁴ In order to shed some light on the dynamics behind the high levels of income inequality prevalent in Guatemala, we run the following *ad hoc* regression for the PGINI coefficient:

$$\ln(PGINI)_t = \beta_0 + \beta_1 \ln(ACCRED)_t + \beta_2 \ln(Y/L)_t + \beta_3 \ln((1/T) \sum_0^T \ln(h_t)) + \beta_4 \ln(LE)_t + \beta_5 \ln(IEF)_t + \beta_6 \ln(GINI)_{t-1} + \beta_7 \ln(REMIT)_t + \beta_8 DUM82 + \varepsilon_t \quad (13)$$

where ACCRED is access to credit, LE is total life expectancy, and REMIT stand for the remittances received. IEF is used as a proxy for political instability. Table 4, Column 2 presents the results.

Income *per capita*, IEF, stock of education, remittances and the AR(1) are all significant and provide the correct sign. The PGINI coefficient falls as income *per capita* and remittances increases, the former having a stronger effect than the latter. It also reports an inverse relationship between the PGINI coefficient and political instability, this is especially important because of the internal unrest that Guatemala suffered for so many years.

Figure 8 presents the percentage share of income for the lowest and highest 20% quintiles as well as for the remaining 60% percent. As it can be observed in the graph, between 1982 and 1996, when the peace treaty was signed, income disparities worsened. Income wise, the lowest income levels and the middle 60% were the population most affected by the war and the consequent political unrest. Since then, even though the inequality overall has improved, except for few years in the late 1990s early 2000s, the gap has remained significant.

One plausible explanation which seems to be supported by the coefficient's value of access to credit and years of education in equation (13), is that a large part of the population in Guatemala lacks access to the opportunity to improve their lives.

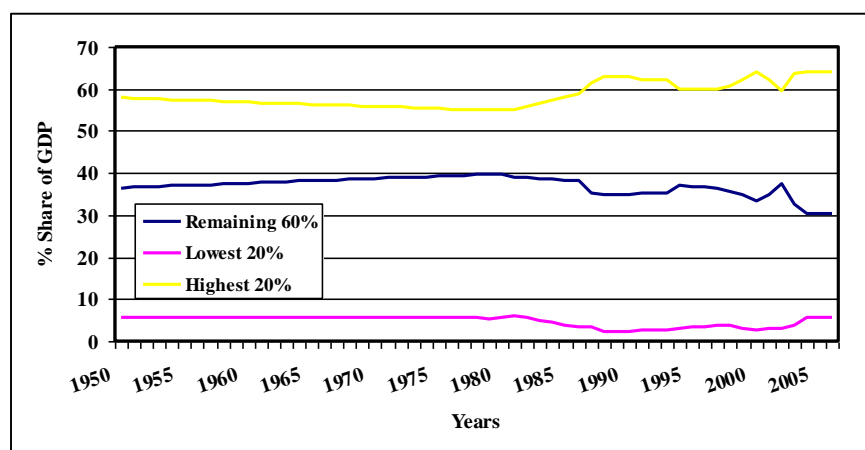
The average of years of education in the country is 3, and it is only a small percentage of the population that has access to credit. This last factor might also help explain why it is mainly, if not only, at the upper levels of income concentration where investment in fixed capital takes place. It might also explain the lack of social mobility across income levels found in Guatemala.³⁵ Access to credit, together with education, has been shown to be important for

³⁴ Banerjee and Duflo (2007), p. 157.

³⁵ Since the seminal work of Glass (1954) much has been researched about alternative measures of social mobility.

social mobility. In Guatemala both elements have been in short supply. The poor typically cultivate a small plot of land, because they lack collaterals more often than not have no access to credit, and can not obtain any kind of insurance against the many risks they face.³⁶ One consequence of this is that a secondary source of income is highly valued. This has led to a pattern of diversification among rural households. 65% of the rural extremely poor say they obtain some income from self-employment in agriculture, 86% work as laborers outside agriculture, and 24% are self-employed outside agriculture.

Figure 8
Percentage of GDP Share of the Lowest and Highest 20% Quintiles



Sources: World Bank Database.

We next examine the impact of financial variables as well as structures in Guatemala's growth process. Specifically we want to determine whether real exchange rates and interest rates, inflation, financial system liberalization, country risk, currency volatility, remittances, and dollar liability exposure have affected *per capita* GDP. With this purpose, we estimated the *ad hoc* regression (equation 14).

$$\ln(Q/L)_t = \beta_0 + \beta_1 \ln(q)_t + \beta_2 \ln(INF)_t + \beta_3 \ln(IEFFR)_t + \beta_4 \ln(r)_t + \beta_5 \ln(COUNTRISK)_t + \beta_6 \ln(DOLEXP)_t + \beta_8 \ln(Q/L)_{t-1} + \beta_9 DUM82 + \varepsilon_t \quad (14)$$

For a recent study of social mobility in developed countries see Blandel *et al* (2005).

³⁶ For a detailed review of the literature on the situation of the poor in the developing world and the obstacles to social mobility see Banerjee and Duflo (2007).

where q is the real exchange rate, INF is inflation, IEFFR is financial liberalization as measured by one of the components of the IEF, r is the real interest rate, COUNTRISK is the country risk calculated as the difference between the real domestic interest rate, the change in the exchange rate and the US real interest rate, i.e. $(r - \Delta e - r^* = \text{country risk})$, EXCHVOL and DOLEXP is the net asset dollarized exposure of the financial sector. The results are reported in Table 4, Column 3.

The results indicate that both institutional factors as well as economic fundamentals have had an effect on income *per capita*. Inflation, deregulation of the financial sector, dollarized exposure, and the decrease in the country risk,³⁷ have had a positive effect on income *per capita* growth, especially after 1975.

Table 5 presents an overview of the conditions of primary health, welfare, and living standards in Guatemala as compared to developed countries. Two characteristics are clearly shown: 1) Guatemala's population live under much worse conditions than developed countries and 2) the type of access available to the different services, for the most part, is of better quality in developed countries. However, in Guatemala, only 10% of the population, as opposed to 50% in other developing countries, lacks basic water and sanitation. The percentage of the population with access to improved water is higher in urban cities than in rural areas.

When telephone and wireless accesses are considered, one can see a trend towards the expansion of cellular phones over telephone landlines. Guatemala, as many other developing countries, is moving directly into wireless services, which, in turn allows them to access the Internet without the need of a large infrastructure. This implies access to a wealth of information that before was not available for a large part of the population in this country. Because of the successful implementation of the *Ley General de Telecomunicaciones*, in this area Guatemala stands as a model to other countries. The liberalization of this sector is already bearing fruits among which can be included lower wireless prices than world prices, competitiveness, and widespread access to these services. The effect of this success on the agricultural sector, however, is not so evident yet.

³⁷ According with the measure for banking and finance used for the calculation of IEF, after 1996, this measure has fallen from 5 to 2 in 2006.

Table 5
Environmental Health, Welfare and Living Conditions in
Guatemala vs Developed Countries, 2004

Indicator	% of population with access	
	Guatemala	Developed countries
House Connection: water	89	99
House Connection: sewerage	59	99
House Connection: electricity (rural/urban)	50/62	100
Water consumption (liter per person)	50-100	600
Improved water (rural/urban)	88/98	100/100
Improved Sanitation	90	100
Access to Basic Essential Drugs	85-90	91
Immunization	92	100
Under-five mortality (per 1000)	49	6
Life Expectancy	65	85
Public Expenditures on Health (%GDP)	5.7	6.2
Paved Road	87	94
Telephone mainlines (per 1000)	77	597
Cellular subscribers (per 1000)	165	605
Literacy	69.1	100

Sources: Human Development Report, 2005 and Millennium Development Goal Indicators, 2005.

Notwithstanding, while these means can provide access to information, education, and potential markets and, in doing so, open new opportunities for economic growth, an infrastructure that reaches all the population is required. This is not the case in Guatemala.

Although most of the population has access to affordable essential drugs as well as immunization, other areas of health services are still poor, especially in rural areas and among the indigenous population. This hampers growth. Healthier workers are physically and mentally more energetic and robust, consequently they are more productive. On the other hand, illness and disability reduce wages substantially, with a negative effect on income especially strong in Guatemala, where a high proportion of the work force is engaged in manual labor. This further accentuates inequality.

The main health risks and causes of death for man and woman in Guatemala are summarized on Table 6. Non Communicable diseases are the main causes of death in Guatemala, with cardiovascular diseases, cancer, and injuries being the main causes of death

among these types of diseases.³⁸ Compared with other causes of death, infectious diseases among adults are significantly lower in Guatemala and significantly lower than in other developing countries. Maternal mortality is the second leading cause of death and in most cases this occurs because of lack of skilled personnel available (only 25% in rural areas have access to them) or proper antenatal care rather than because of high risk pregnancies. Furthermore, in Guatemala's rural areas women have more readily access to contraceptives than to skilled health personnel, indicting poor efficiency in the allocation of health funds. The case for children is similar, among whom the leading causes of death are neonatal causes.³⁹ Diarrhea is the fourth leading cause of death and only 58% of children with diarrhea receive rehydration therapy, when such a treatment can prevent up to 95% of deaths from diarrheal diseases. In addition, 54.2% of children are undernourished in rural areas and 32.4% in urban areas. This percentage is highly correlated with low levels of education and income and it is indicative of the lack of access to health services among different population groups.⁴⁰

Although the health needs of the Guatemalan people, especially in rural areas, are other than sexual health, the present health policy has an overriding theme: population control and with it sexual health.⁴¹ The data clearly shows that such allocation in the area of health is inefficient as it does not address the real health needs in Guatemala. In addition, it hampers long run economic growth because it leads to an aging population problem.

The positive correlation between human capital and economic growth, infrastructure and economic growth, robust institutions and economic development, as well as health and income *per capita*, are well-known relations in international economic development. These correlations are commonly thought to reflect a causal link running from human capital and infrastructure to economic growth, from healthy institutions to economic development, and from income to health.

³⁸ Noncommunicable diseases are defined as chronic conditions that do not result from an acute infectious process. These conditions cause death or dysfunction in the quality of life, and they usually develop over relatively long periods. Generally, these conditions or diseases result from prolonged exposure to causative agents, many associated with personal behaviors and environmental factors. Noncommunicable diseases include injuries, cardiovascular diseases, cancer, respiratory diseases, digestive diseases, Neuropsychiatric Disorders, and Genitourinary Diseases.

³⁹ Neonatal causes of death are those that occurred during the newborn period which, by convention, is the first four weeks after birth.

⁴⁰ The prevalence of child death is 65.3% among the lowest wealth quintile while it is only 7.5% in the highest quintile. Similarly, it is 64.4% among the lowest level of education and 12% among the highest level. (*Core Health Indicators for Guatemala* WHO)

⁴¹ . See for example the strategy for social welfare included in SEGEPLAN (2006).

Table 6
Leading Causes of Death and Health Services in Guatemala

<i>Adults</i>	
Total Non-communicable diseases (per 100 000 population)	562.0
Maternal mortality ratio (per 100 000 live births)	240
Cardiovascular diseases (per 100 000 population)	188.0
Non-communicable diseases other than cardiovascular, injuries and cancer (per 100 000 population)	183
Injuries (per 100 000 population)	98.0
Cancer (per 100 000 population)	93.0
HIV/AIDS (825 infected and 77.8 new cases every year) (per 100 000 population per year)	21
Tuberculosis (109. infected) (per 100 000 population)	13.1
<i>Children</i>	
Neonatal causes rate	37.3
Other causes rate	29.8
Pneumonia rate	15.0
Diarrhea diseases rate	13.1
Injuries rate	1.5
Malaria rate	0.4
Measles rate	0.1
HIV/AIDS	2.7
<i>Services</i>	
Antenatal care coverage - at least one visit	86
Antenatal care coverage - at least four visits (%)	68
Births attended by skilled health personnel (rural/urban)	25/66.1
Contraceptive prevalence rate	43.3
Hospital beds (per 10 000 population)	7.0

Sources: Data collected from *Core Health Indicators* for Guatemala, WHO.
The diseases are presented in order of magnitude.

Recent economic analyses, however, indicate that human capital is essential to both, the development of healthy institutions (social capital) and for infrastructure and technology to allow economic development.⁴² Furthermore, these economic analyses also indicate that health status (as measured by life expectancy) is a significant predictor of subsequent economic growth as it

⁴². See note 11.

contributes to human capital growth.⁴³ The data thus far analyzed indicate that Guatemala is not an exception to these findings. We now turn to the analysis of the disaggregated data.

V. Economic Growth and the Family

Important elements of economic development are income, investment, and education. Human capital, social capital, and infrastructure do not fall behind. Evidence across sciences indicates that the best for the healthy development of a person is for that person to live within a family that is functional, i.e., with his biological or adoptive mother and father in a stable marriage.⁴⁴ The academic and social performance of a child is very closely related to the structure of the family in which he lives and this is important for the quality of both human and social capital. School attendance is an important part of ensuring good academic performance and it has been a serious challenge in Guatemala. The fact that the average years of education for the country, is less than 3 years speaks to this fact. The psychological stability and health of a child and his parents is closely related to strong families and this is important for worker's productivity and government finances. Social science research also shows that the breakdown of the family is a symptom of a sick and thus weak society. In this section we analyze how, in Guatemala, family structures affect income, wealth, and education as captured by school attendance.

Across countries, marriage has historically been viewed as a source of financial security, especially for women and children. Its importance, however, goes beyond individual financial securities as it also affects the growth process. In developed countries, evidence has been found that indicate that the holding of wealth and income as well as its opposite, poverty, are closely connected to family structures, even after controlling for other household characteristics. The knowledge of whether this is the case in Guatemala is of interest for several reasons: 1) savings are needed for investment, 2) there is a large portion of the population who lives in poverty, 3) access to wealth facilitates social mobility, 4) family structure is relevant in the determination of human and social capital, both of which are essential for development, 5) Guatemala cannot afford the cost that developed countries today face due to the breakdown of the family, and 6) for

⁴³ . Bloom anning (2004) and for a more extensive list of citations see WHO (1999b).

⁴⁴ For a further development of this argument as well as a review of these findings see Fukuyama(1999) and Aguirre(2006).

policy design purposes. We first turn to the study of wealth. For this, we examine how wealth is affected by the following household characteristics: the head of household's age, sex, race, level of education, and type of occupation, as well as number of children, family structure, and area in which they live (urban *vs* rural). Also are included whether the household is the recipient of remittances or not.

Household savings can vary for a variety of reasons. Standard models of allocation of consumption over time suggest that savings depend on a family's stage in the life cycle.⁴⁵ Households that wish to smooth their consumption over time will save during their working years in order to finance consumption after retirement. Empirical evidence suggests that this pattern applies to urban middle income levels but not to lower income households, many of which do not have assets, or to the wealthiest households, which often inherit wealth.⁴⁶ Income also affects wealth accumulation through savings. In a given period, two households with the same saving rate but different levels of income will accumulate different levels of wealth.⁴⁷ Sex differences among health of households might also affect the accumulation of wealth. This can be due to several factors, such as a gap in earnings, access to credit, disparity of educational levels, etc.

Figure 9 and 10 present a highlight of the distribution of income (NBI) and wealth, and savings and property ownership by family structure, respectively. Because of the manner in which the composite was constructed, as it was described in section II, the higher the number of the wealth and income composite, the lower the value of wealth and income owned by the household. The NBI, therefore, also can be seen as a measure of poverty (or negative income).

On average, households headed by married persons have higher income (35% lower NBI) than not married households while they report the same level of wealth (Figure 9). This suggests that married couples are more efficient in the use of their resources. Their wealth composition, however, seems to vary between married and other type of family structures. As preciously mentioned, the later composite was estimated based on seven components.

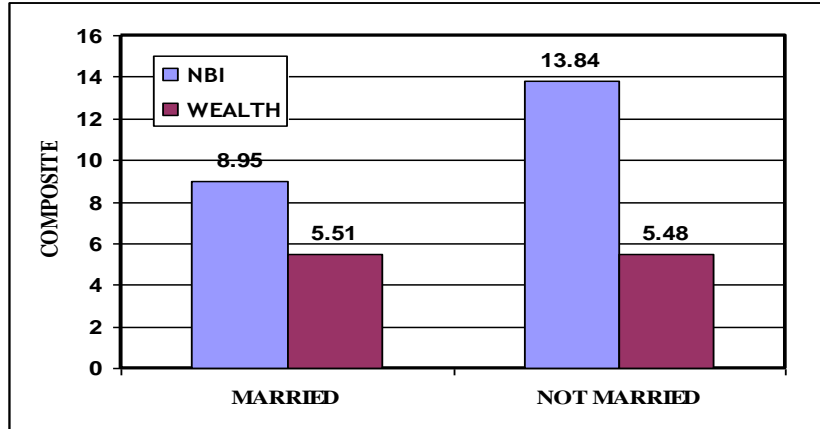
Figure 10 reports two of them: house ownership and holdings of savings. A significant higher percentage of married households report that they hold savings and own property *vis a vis* other family structures. They are followed by unions, widows, separated and divorced. Thus, in

⁴⁵ This thesis was first proposed by Modigliani and Brumberg (1954) and is know as Modigliani's theory of income.

⁴⁶ Wolff (1981).

Figure 9

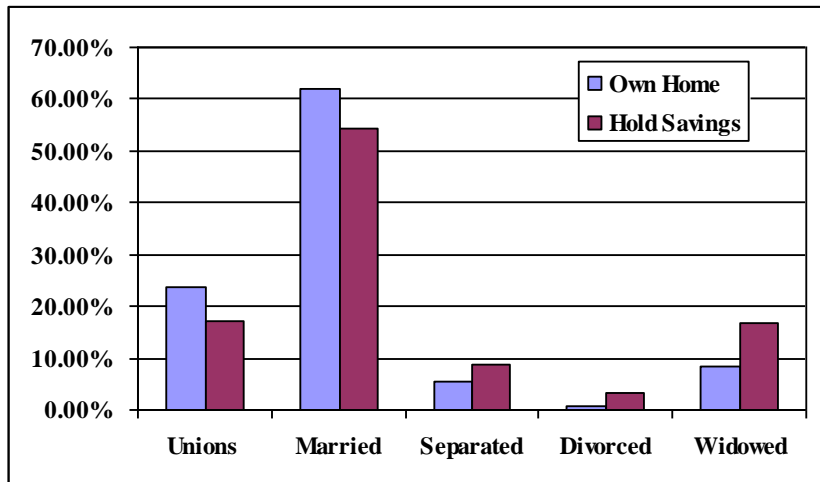
Level of Income (NBI) and Wealth of the Head of Household by Family Structure



Source: ENEI (2004)

Figure 10

Percentage of Head of Households that Report Owning Property and Holding Savings



Source: ENEI (2004)

Guatemala, even though the vast majority of unions are *de facto* marriages the economic benefits of the married family structure from a point of view of income and wealth are not the same.

⁴⁷ Zeldes (1989).

To capture in more detail how other characteristics also affect wealth and income, as well as savings and home ownership, we ran the following regression for all the head of household available in the sample (8,684 households):

$$\begin{aligned}
 \mathbf{WEALTHCO} = & \beta_0 + \beta_1 \mathbf{AGE} + \beta_2 \mathbf{AGE}^2 + \beta_3 \mathbf{SEX} + \beta_4 \mathbf{EDUC} + \beta_5 \mathbf{OCUP} + \\
 & + \beta_6 \mathbf{FAMSTRUCT} + \beta_7 \mathbf{NUMCHILD} + \beta_8 \mathbf{AREA} + \\
 & + \beta_9 \mathbf{REMIT} + \varepsilon_t \qquad (15)
 \end{aligned}$$

Where WEALTHCO is the wealth composite, AGE is the age of the head of the household, AGE² is the squared value of age, SEX is the sex of the head of the household, EDUC captures the level of education of the head of household, OCUP is the type of occupation the head of the household holds, FAMSTRUCT is the family structure, NUMCHILD is the number of children per household, AREA differentiates between urban or rural areas, and REMIT stand for remittances received. Table 7, Column 1 reports the results for equation (1).

In order to see how its components are affected by the same household characteristics, we run regressions on home ownership, rent, savings, dividends, and remittances. For the sake of brevity and because of its significance for the welfare of the family and economic growth, in Table 8 we report the results for home ownership, savings, and remittances. In most cases the signs and significance is what one would have expected and the results are consistent with the findings in both developed and developing countries.

Marriage structure, the level of education, occupation, race, remittances, location, and income are all significant factors in determining household wealth, especially household ownership. On average, marriage constitutes the single strongest observable characteristic in determining household wealth in Guatemala (it increases wealth by 29%). Living in an urban rather than a rural area increases wealth on average by 26%. The third largest impact on household's wealth is remittances, which increases it by 25%, followed by sex (having households headed by women decreases wealth by 19%). Other observable characteristics that increase wealth include having a higher level of education (it increases wealth by 7.5%), the number of children (one more child enhances wealth by 6.8%) , the age of the household's head (it increases it by 6.1% and at an increasing rate of 0.03%), and the type of occupation (a more

Table 7

Regressions on Sources of Wealth
(All households, n=8,684)

Variables	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Independent Variable	Wealth Composite	Savings (yes=1, no=2)	Owens a Home (yes=1, no=2)	Remittances (yes=1, no=2)	NBI
Constant	2.65* (0.27)	1.92* (0.028)	0.535* (0.08)	2.34* (0.04)	22.7* (0.6)
Age	-0.061* (0.007)	0.002** (0.0008)	0.17* (0.002)	0.002*** (0.001)	-0.21* (0.01)
Age2	0.0003** (0.00007)	-0.00002** (0.000008)	-0.0001* (0.00002)	-0.00003* (0.00001)	0.002* (0.0001)
Sex (man=1, women=2)	0.019* (0.05)	-0.069* (0.013)	-0.07* (0.017)	-0.27* (0.02)	-0.95* (0.12)
Married (no=0 or Married=1)	-0.29* (0.03)	0.069* (0.009)	0.89* (0.11)	-0.03* (0.006)	-0.60* (0.08)
Married (no=0 or Married plus unions=1)	-0.19* (0.07)	-0.007* (0.001)	0.74* (0.22)	-0.17* (0.019)	-0.53* (0.17)
Married (by category)	-0.025*** (0.01)	-0.005** (0.001)	0.05 (0.05)	0.027* (0.003)	-0.12 (0.39)
Education (by level achieved)	-0.075* (0.014)	-0.015* (0.002)	-0.27* (0.004)	-0.004* (0.002)	-1.18* (0.03)
Ethnicity (by category)	-0.0009 (0.003)	-0.005 (0.006)	-0.0002 (0.001)	-0.002* (0.0009)	0.027* (0.008)
Ethnicity (indigenous=0 or ladino=1)	-0.37* (0.36)	-0.06* (0.24)	-0.07* (0.02)	-0.017* (0.05)	-0.80* (0.102)
Number of Children	-0.068* (0.009)	-0.12* (0.10)	0.18* (0.003)	-0.001 (0.001)	0.55* (0.02)
Income Composite (NBI)	0.017* (0.004)	0.0009*** (0.0006)	-0.003** (0.001)	0.001* (0.0006)	--
Occupation (by type)	0.024* (0.009)	0.03* (0.001)	-0.007* (0.003)	0.001 (0.001)	0.19* (0.022)
Remittances (yes=1, no=2)	0.25* (0.07)	0.097* (0.17)	0.097* (0.021)	--	0.55* (0.18)
Location (Urban=0 or Rural=1)	0.26* (0.05)	0.33* (0.06)	-0.81* (0.17)	-0.013*** (0.008)	-2.92* (0.18)
R ²	0.08	0.04	0.9	0.08	0.38
N	8684	7498	8684	8684	8684
VIF	1	1.67	1	1	1
TOL	0.99	0.92	0.99	0.99	0.99

Sources: Values for different measures of marital status and ethnicity report the value those coefficient only rather than the complete Regression. The other variables reported correspond to the regression with the highest family coefficient.

* indicate 1% , ** indicate 5% , and *** indicate 10% significant levels respectively.

skilled occupation increased wealth by 2.4%; the higher the level of occupation, the lower the skill required). Income (measured in this study as NBI) is also a relevant factor but given the limitation of the data, the meaning of the exact percentage is more difficult to determine. Nevertheless, it has a positive impact on wealth, in that the lower the NBI, the higher the level of wealth and vice versa. On average, the benefit of marriage on wealth and income is greater for Indigenous than for Ladinos. Among Ladinos, marriage increases wealth by 24% while among indigenous the benefit is 28%.

Savings (Equation 2, Table 7, Column 2), which are a component of wealth, are positively determined by age of the head of the household but at a decreasing rate (thus Modigliani's life cycle theory of income seems to be supported in Guatemala), marital structure, education, number of children, income level, location, occupation, race, and remittances, the last three being the most important ones. Having a Ladino background rather than an Indigenous one, increases savings by 6%. Homeownership follows the same pattern than wealth and savings (Equation 3, Table 7, Column 3). Receiving remittances (Equation 4, Table 7, Column 4), another source of wealth accumulation, is negatively affected by age. Women have a 27% lower probability of receiving remittances than men, but being married or living in unions increases the probability of receiving remittances by 17%. Indigenous populations received more remittances than Ladinos. Finally, living in rural areas is inversely related to receiving remittances. Analyzing subgroups, we find that, on average and independently of the ethnic background of the household, the probability of receiving remittances increases by 18.6% when it is headed by married women. The level of NBI does not have a significant impact on household receiving remittances (0.2%) indicating that, contrary to the common belief, other factors in addition to income levels are driving the population to work overseas.

All variables but married (only when this is measured in a way that includes all categories at once) are significant in the determination of Poverty, as captured by NBI (Table 7, Column 5, Equation 5). On average, the level of NBI is significantly lower in households where its head is married (it decreases poverty by 60%), and is male. As was the case for wealth, married performs better than unions (when these are added to marriage the coefficient falls to 53%) and all other family structures. Also of interest is the significant impact of education. Reaching one more level of education (i.e., moving from no education to grade school, or from grade school to high school and so forth), reduces the probability of poverty by 1.18 times. Similarly,

living in urban areas decreases poverty by almost a factor of three. Women are more vulnerable to poverty (it increases the probability by 95%) while being Ladino decreases it by 80% and receiving remittances decreases it by 55%.

The impact of the number of children on poverty does not follow a consistent pattern but varies depending on the household characteristics. At lower levels of income and education, as well as rural and non-married households, the impact tends to be negative. This is not the case within married family structures on the highest 25% of income and with college education or higher. It is not the case either for households living in urban areas. Such results are consistent with the aggregated level in that they indicate that it is not the number of children per se, but rather the characteristics surrounding the household that causes the number of children in it to be problematic. Lack of access to education and other assets, as well as opportunities seems to be at the root of what causes the number of children in some households to be a burden.

Although analysis were carried out controlling for every household characteristic included in Table 7, and for every factor considered both in wealth and poverty, for the sake of brevity, we report and include only some of the results in this study.⁴⁸ In this study we included the household characteristics that appear to be most relevant in determining wealth and poverty in Guatemala's families: family structure, levels of education, location, sex, and ethnicity.

When analyzing the behavior of wealth and its components by specific family structures, we find that in households where the head is married, race, occupation, sex, and remittances are not relevant for wealth, while more children increases it by 6%. In Guatemala, as previously mentioned, children contribute to the household production by helping with agricultural tasks and other activities that enhance the household income. This is especially the case at low income levels.

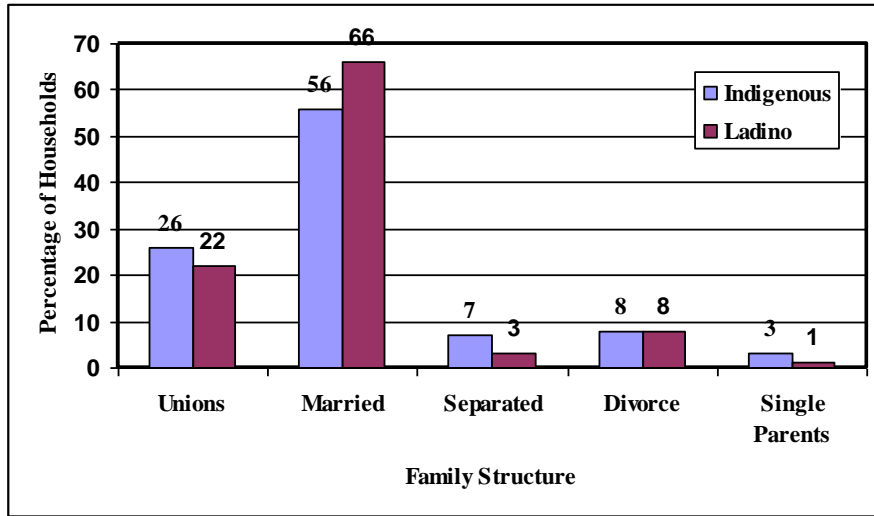
When comparing how household characteristics affect wealth and poverty in married households *vis a vis* other type of family structures, it is clear that these others structures are much more vulnerable. In most cases, wealth and poverty are closely linked to the sex of the household head, level of education, race, remittances, and occupation. This is especially true of single-parents who show the highest vulnerability to poverty of all family structures. Annex III reports the regression results for wealth and NBI for married, unions, and single parent households.

⁴⁸ Results not included are available upon request.

Figure 11 depicts the family structures by race. Ladinos seems to have a healthier family structure than the Indigenous, as they have a greater percentage of married households and lower percentages of any other structure with the exception of divorce, where both have a rate of 8%.

Figure 11

Family Structure by Race

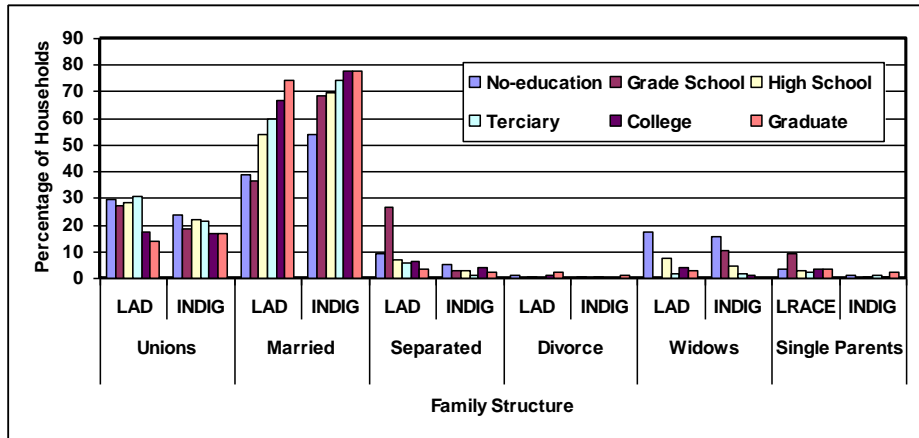


Sources: ENEI (2004)

The higher/lower level of education attained by the head of the households strengthens/weakens the findings on wealth, savings, and NBI, indicating that access to education is a relevant factor in reducing poverty. Family structure is still significant for households with education below college. Across levels of education, married households perform better than other types of structures; marriage is especially helpful in alleviating poverty, especially among the non-educated (75%). Annex IV present the wealth and NBI regression results for three of the four levels of education analyzed in this study: no education, high school, and college. Figure 12 depicts the percentage of households with different levels of education per family structure.

Figure 12

Level of Education of the Head of Household per Race and Family Structure

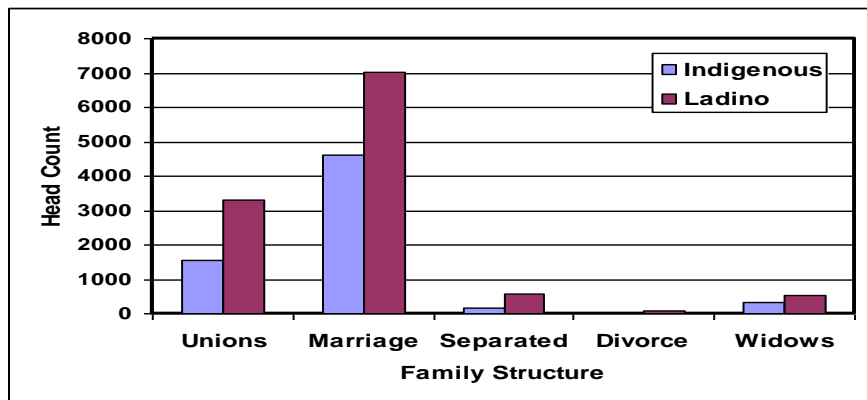


Sources: ENEI (2004)

Figure 13 shows children school attendance per family structure. Frequency in school attendance is higher for both races in married households than in any other family structure. We also find that school attendance is facilitated by remittances.

Figure 13

Children School Attendance by Family Structure



Sources: ENEI (2004)

In order to further understand how family structure and other characteristics of the parent head of households affect school attendance, we run the following regression:

$$\begin{aligned}
\text{CHILDSCHATT} = & \beta_0 + \beta_1 \text{EDUCPA} + \beta_2 \text{NUMCHIL} + \beta_3 \text{SEX} + \beta_4 \text{WELATHPA} \\
& + \beta_5 \text{INCOMEPA} + \beta_6 \text{RACE} + \beta_7 \text{AREA} + \\
& + \beta_8 \text{FSTRUCTURE} + \varepsilon_t \quad (16)
\end{aligned}$$

where CHILDSCHATT is children school attendance, EDUCPA is the level of education of the parent head of household, NUMCHIL is the number of children, SEX is the sex of the parent head of household, WELATHPA is the wealth level of the parent head of household, INCOMEPA is the level of income of the parent head of household, RACE is the race of the head of the household, AREA is the area where the household live, and FSTRUCTURE is the family structure of the head of the household, which in this case is measured as married or not.

The results for equation (16) are reported below,

$$\begin{aligned}
\text{CHILDSCHATT} = & 1.36 + 0.11 \text{EDUCPA} + 0.0006 \text{NUMCHIL} + 0.01 \text{SEX} + \\
& (0.03) \quad (0.002) \quad (0.001) \quad (0.005) \\
& + 0.01 \text{REMIT} + 0.04 \text{WELATHPA} + 0.04 \text{INCOMEPA} + \\
& (0.02) \quad (0.002) \quad (0.0007) \\
& + 0.05 \text{RACE} + 0.08 \text{AREA} + 0.10 \text{FSTRUCURE} \\
& (0.005) \quad (0.007) \quad (0.006)
\end{aligned}$$

Except for the number of children and the sex of the head of the household, all variables are statistically significant and have the expected sign. Clearly in Guatemala, human capital is neither indifferent to family structure (it increases attendance by 10%) nor to the levels of education (it increases attendance by 11%), wealth (it increases attendance by 4%), income (it increases attendance by 4%), race (it decreases attendance by 5% when the parent is Indigenous), and area where the household live (it increases attendance by 8% when the household live in an urban area). Furthermore, it is best helped by marriage households.

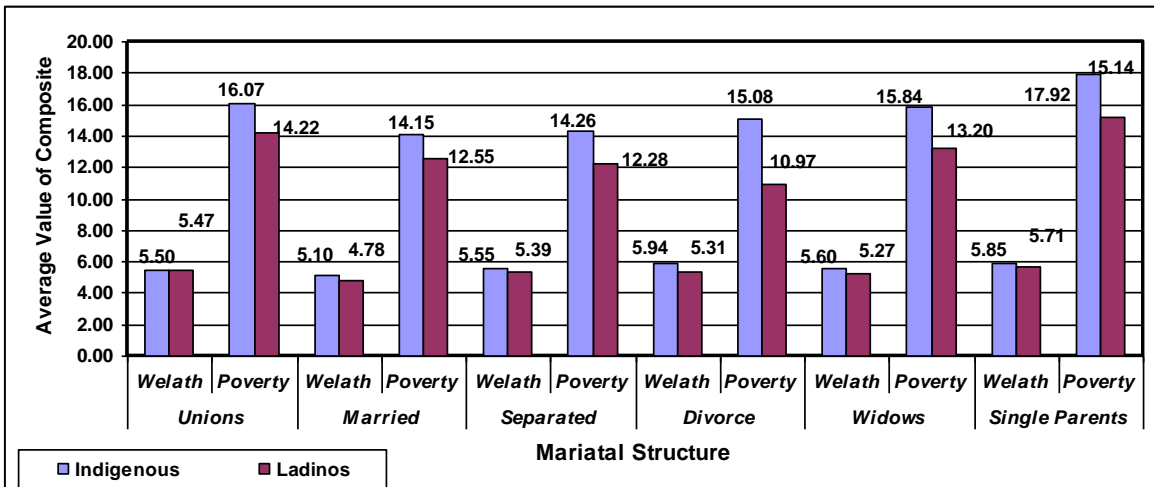
Annex V presents the regression results for poverty and wealth by household's area. Living in urban areas decreases the poverty level 2.9 fold. As discussed in the previous section, services and infrastructure, for the most part, are typically available in urban areas. As in most of the previous characteristics examined, family structure makes a difference in both wealth and the poverty level of household. The benefit of marriage is strangely felt among urban households, where poverty is reduced by 69%. Wealth is also enhanced both among urban and

rural households by marriage, as it raises the level in both. Savings are also highest among urban married households.

Households whose heads are men are overall better off than those headed by a woman, especially among disrupted families or single parent households. Annex VI presents the results for the wealth and poverty regressions. Marriage increases women’s headed households’ wealth by 40% versus those headed by men for whom the increment is of 28%. At the same time, poverty is reduced by 56% versus 58% for women versus men head of households. Savings is also higher among households who are married and whose head is a man.

Race also plays an important role in wealth and poverty determination. Annex VII presents the results of the regressions based on race for wealth and poverty. Among Indigenous households, marriage increases wealth by 26% and reduces poverty by 69%. Among Ladinos this marriage effect causes a 22% increase in wealth and a reduction of poverty of 70%. Figure 14 presents the average values of wealth and poverty per family structure and race. On average, the numbers are very similar across races, indicating that poverty is quite spread across family structures and race. Even then, marriage seems to mitigate these effects.

Figure 14
Average Wealth and Income Composite per Family Structure and Race



Sources: ENEI (2004)

When examining the children sample, we found the same results than the ones described in this section. Thus we do not report the results in this study. This is not surprising as the

children typically follow the parents' pattern of wealth and income. One point worth noting is that children in broken families, especially single parent families are worse off than in married families. These results are, however, available upon request.

Summarizing, family structure makes a difference in the wellbeing and welfare of the family in Guatemala because it has been found to be significant on determining both levels of wealth and poverty in this country. The intact family performs best, followed by *de facto* marriages also identified in Guatemala as unions. Controlling for other observable household characteristics, marriage households have the highest probability of owning a house, holding other assets (savings and others), and report a lower index of unsatisfied basic needs (NBI) than other family structures. On the opposite end, divorce and separated are the most harmed after single-mothers. This positive effect is significantly enhance by the household living in an urban area rather than a rural, being the recipient of remittances, and having as head of household a man.

VI. Policy Recommendations

In the last twenty years, Guatemala has been undergoing a process of institutional transformation. Yet for political reasons, these reforms have often lacked continuity and focus. The implementation of the Peace Treaty in 1996 is a case in point. Today there is a serious concern with the widespread poverty that reigns in the country, “the two Guatemalas” as it has come to be known. There also seems to be, on the part of the government and some international organizations as well as foreign countries, a serious commitment to reduce it. Governments can foster and promote the family through using multiple constructive tools: taxes, education, health care, homeownership, and work participation policies among others. Yet, one of the main tools they have embraced to carry out this commitment has been the implementation of an aggressive population control policy. The evidence provided in this study, however, seems to indicate that such high level of political and financial commitment is mistaken as it neither addresses the real causes of the problem, nor ensures a better future, especially for the poor population. Rather, it sets the country on a path that would only make the poor poorer and lead the country to an “aging population trap.”

The *2006 Informe Anual* of the SEGEPLAN clearly exposes this miss-targeted and too narrow focus on population control and reproductive education. Efforts outlined and carried out

by SEGEPLAN, in response to the Decree N. 42-2001, have identified five main areas of policy: health, education, employment and migration, disaster areas, and social communication. Yet most of the efforts being implemented in each of these relevant and key areas seem to be focused on funding population control efforts rather than attending the more relevant and real pressing needs.

There is no clear evidence that at the macroeconomic level, the size of the population per se is at the core of the widespread poverty in Guatemala. The evidence does reveal that a significant portion of the population (more than 60%) need improved access to quality education. There is also a clear need for a large percentage of the population to have access to a better environment which will require quality health services and infrastructure as well as access to credit and other financial assets. Meeting these real needs will provide a large amount of the population an opportunity to access something that they now lack, that is, the formal economy. In doing so it will create the social mobility needed for sustainable long-term lasting growth.

This study, consistent with other recent studies that have been carried out in Guatemala, points out the importance of human capital as well as healthy institutions, at the root of which is a strong family unit. Family structure has been shown to be relevant not only for human capital and social capital, but for wealth and poverty.

Any policy initiative to be effective in fostering growth, therefore, needs to take into consideration how it will impact the family. What follows are some policy recommendations:

- Continue to deepen the opening of the economy that began twenty years ago while reinforcing institutions at both national and local levels. Among them, the rule of law, transparency, property rights, the education system, and family structure should be priority.
- Expand access to economic opportunity for low income households by ensuring their members can get quality primary and secondary education as well as technical and university education. This recommendation is based on the evidence gathered for this study. As explained in the text, education does not seem to be a determinant factor of economic growth when viewed at an aggregate level only because the average school attendance in Guatemala is low: three years. However, it does report positive economies of scale indicating that an increase on the level of education generates higher human

capital and economic growth. Furthermore, the family's wealth improves when the level of education and technical instruction of the head of household is greater.

- Expand the access to economic opportunity for low income households by enabling access to a functional process of fixed property titles as well as credit, especially for housing programs. Some of these initiatives are now in place in Guatemala, so it is important that continuity is ensured.
- Expand professional training, as it is often an effective way to raise families out of poverty and dependency. Its implementation, however, cannot be generalized, as its success depends on the effectiveness of this program to address cultural as well as geographical characteristics. Initiatives that foster the habit of savings among the low income households as well as access to microcredit have shown to be effective means of releasing households from extreme poverty conditions.
- Promote legislation that supports families *vis a vis* other types of living styles. Avoid tax policies and legislation that penalize families. For instance, it should not be the case that a working married couple pays more taxes than if both were single. Lower income tax rates are also beneficial to family welfare.
- Set as a priority the promotion and protection of healthy families as a means to eradicate poverty, especially the feminization of poverty. With this aim, private initiatives that promote healthy marriages and stable families should be encouraged and supported. For example, programs for couples in crisis as well as programs that promotes marriage over unions or other types of family structures. Redistribution of income towards the victims of family disruption is not enough, there is a need to develop and implement legislation that supports families *vis a vis* other types of arrangements.
- Reform the public and private education system in Guatemala to improve the coverage and quality of educational services. Given that currently average school attendance is low and that the marginal costs of education exceed the marginal benefits, it is important to

promote non government education initiatives that provide a variety of necessary offerings (flexible schedules, vocational instruction, programs for intellectual talent, distance learning, multilingualism, etc.). The government can assist lower income families to choose among these alternatives through a voucher system or another demand-oriented financial mechanism. Thus, low-income families as well as large families will have the incentive to send their children to school rather than keeping them at home for child labor. They could send their children to the schools of their choice, especially in the case where some schools do not meet acceptable standards. At the same time, they reduce the education penalty for those parents who choose to send their children to private schools and who are already funding public education through property taxes or income taxes. Vouchers empower the family economic decision process while fostering market responsibility on the part of the supplier (educators) and those receiving the services. In Guatemala, there is plenty of room for efficiency gains in this field. This will also help enhance parents' own rights to educate their children.

- Promote programs that allow parents and teachers to engage in municipal school management. This has proven to be an efficacious way to foster accountability on both parts, around the world. Already, the Ministry of Education has encouraged the formation of committees of parents who oversee the teacher's performance, monitor school attendance, assist in maintenance of school facilities and provide the children with meals and more. Funding private sector initiatives, civil society and others, that promote this type of projects could improve efficiency gains in the area of education.
- Promote initiatives that enhance access to new technologies and means of communication as a method to improve the quality of life of families as well as their integration into the labor force. These plans should not only target schools, libraries and the head of the household, but also youth, homemakers, and the elderly. In this area, Guatemala is beginning to experience the positive effects of the mobile telecommunications revolution brought about by the 1996 General Law of Telecommunications, with the lowest tariffs and the highest penetration of cell phones per capita in the region, including in rural areas.

- Improve efficiency in the use of government funds now allocated to population by allocating them to needs of the population, which will open access to development. Redirect the present efforts towards population control and sexual education programs, by focusing on education and health initiatives in areas to which the population really lacks access: maternal and child mortality, child malnutrition, safe water sources and sanitation.
- Develop labor legislation that facilitates and provides incentives for the harmonization of family life and professional activity for all family members. The Labor Code (Decree No. 1441, published in 1971) tends to impose certain rigidities into the labor market that can hamper flexible and innovative work plans agreed to by employers and employees on a case by case basis. Freedom to enter into contract as well as legal and judicial respect of contracts can contribute to families' well-being and economic growth.

VII. Conclusions

This study aimed at shedding some new light into the discussion of the determinants of economic growth in Guatemala and how population and family fit in this process. In order to understand the process of growth better, four main theories of economic growth were tested: Neo-Classical, Human Capital, Malthusian, and Neo-Malthusian. The evidence suggest that in Guatemala, the process of economic growth supports Neo-Classical Theory and that human capital, because of the low levels of education that prevail in Guatemala, is only significant when measured in its "stock" form, i.e., years of experience. Population, when significant, enters positively in the process of growth, rather than negatively as Malthus has predicted. When analyzing the issue of population, more specifically number of children per family, with higher frequency data, we found that a higher number of children per household positively contributes towards family wealth but, in some cases, it also reinforces poverty. At the same time, the negative impact of population growth in the deforestation process seems to support some of the concerns raised by some environmentalist quarters. Still, population growth *per se* does not directly influence the growth process in this country. These conflicting results regarding population indicate that there are other causes rather than population at the root of the prevailing poverty levels in Guatemala. Policies such as those embraced by the government to control the

population are neither effective nor dollar efficient. They not only do not address the real causes of the problem of poverty, but they set the economy on a path that would lead Guatemala to the “aging population trap” that so many developed countries are facing today. A further corollary to this concern is the fact that in Guatemala the speed of aging population has fallen from 130 to 59 in the past thirty years. At this pace, Guatemala will not have the means to face the aging population problem. Developed countries today are encountering difficulties in meeting the financial burden that the aging population produces in an economy in spite of having savings, well developed social security systems as well as welfare programs. Guatemala lacks all of these.

Lack of functional institutions has been found to be an important obstacle for the Guatemalan population, especially the poor, to have access to economic opportunities. More specifically, these states of affairs often deprive people, among other things, from education, credit, housing, access to means of production, health services, and the market. These deficiencies are more dramatic among rural and Indigenous populations. The openness of the economy has been also found to have facilitated poverty alleviation, but more needs to be done.

In analyzing family structure and other household characteristics and their impact on savings, wealth, and poverty (as captured by NBI), we find that family structure, education, area, sex of the head of household, and levels of education are all important determinants of poverty and health. Yet, and only with the exception of households that have a college degree or higher, it is marriage that contributes the most to both wealth and lowering poverty. This is an indication that in Guatemala, as in most countries, family structure makes a difference in the economic growth process and, more specifically in poverty alleviation and human capital. In order to contribute to long-term real economic growth in Guatemala, economic policy makers must take into consideration how they will affect the family structure.

Families must play a more significant role in the economic decisions affecting both children and parents. Such an approach fosters greater freedom and responsibility, as well as flexibility. Yet, it is important to keep in mind that different groups of people need different types of help and that while policies that are oriented to preventing family ills are important, broken families remain a reality that needs to be addressed by both the public and the private sector.

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Annex I

Annual Data Description and Sources (1950-2006)

Variable	Source
Gross Domestic Product, constant prices (1958=100)	Banco de Guatemala (BANGUAT)
Gross Domestic Product, current prices	<i>Ibid</i>
Private Investment	<i>Ibid</i>
Gross National Product	<i>Ibid</i>
Remittances	<i>Ibid</i>
Consumption of Food <i>per capita</i>	<i>Ibid</i>
Exchange Rate	<i>Ibid</i>
Interest Rates Guatemala (deposit interest rates)	<i>Ibid</i>
Foreign Interest rates (US Prime interest rates)	<i>Economic Report of the President</i>
Informal Gross Domestic Product	CIEN, 1992. Cole, Julio, Schneider, Pablo, Rios, Carrol y Urizar, Carmen, "La Economía Informal en Guatemala", CIEN, 1992.
Population	Instituto Nacional de Estadísticas (INE), "Proyecciones de Población 2000-2020 en Base al Censo 2002."
Population growth (percentage change on population)	Calculated
Long run rate of growth of output <i>per capita</i> (calculated as a moving average based on three years)	Calculated
Population Density (Population / km)	Calculated
Labor Force	Instituto Nacional de Estadísticas, "Proyecciones de Población 2000-2020 en Base al Censo 2002."
Labor input (no school) (Proxi: percentage of labor force with this level of education)	<i>Ibid</i>
Labor input (primary) (Proxi: percentage of labor force with this level of education)	<i>Ibid</i>
Labor input (Secondary) (Proxi: percentage of labor force with this level of education)	<i>Ibid</i>
Labor input (Tertiary) (Proxi: percentage of labor force with this level of education)	<i>Ibid</i>
Fertility Rates	Bureau of Census, International Programs Center
Ageing Population	<i>Ibid</i>
Life Expectancy	<i>Ibid</i>

Annex I	
Annual Data Description and Sources (1950-2006)	
<i>(Continued)</i>	
Variable	Source
Speed of Aging of population (number of years for the percentage of population aged 65 and over to rise from 7% to 14%)	Calculated
Political and Institutional Stability (Proxi: Index of Economic Freedom composite. In some cases we use the components separately: Trade policy, fiscal burden, degree of government intervention, openness to foreign investment, degree of regulation of financial system, wages & prices flexibility, property rights, regulations, informal market.)	The Heritage Foundation
Average Years of Education	Loening, Joseph, "The Impact of Education on Economic Growth in Guatemala: A Time-Series Análisis Applying an Error-Correction Methodology", Diskussionsbeitrag, 87 des Ibero-Amerika Instituts, Göttingen, 2002
Illiteracy	<i>Comité Nacional de Alfabetización (CONALFA)</i>
Total land allocated to Agriculture (percentage of land used for agriculture)	World Bank Database
GINI ((Proxi calculated as highest 20% percentile/lowest 20% percentile)*100)	<i>Ibid</i> , Calculated
Road Extension	Ministerio de Comunicaciones, Infraestructura, y Vivienda
Investment	IMF Financial Statistics
Gross Nacional Income	<i>Ibid</i>
Household Consumption	<i>Ibid</i>
Government Expenditures	<i>Ibid</i>
Gross Fixed Capital Formation	<i>Ibid</i>
Savings	<i>Ibid</i>
Inflation of Guatemala (CPI)	<i>Ibid</i>
Inflation of USA (CPI)	<i>Ibid</i>
Forestall Area	<i>Instituto de Agricultura, recursos Naturales y Ambiente (IARNA)</i>
Total Bank Loans	<i>Boletín Estadístico del Banco de Guatemala (1950-2006)</i>
Total Consumption Loans	<i>Ibid</i>

Annex I	
Annual Data Description and Sources (1950-2006)	
<i>(Continued)</i>	
Variable	Source
Access to Domestic Credit (Proxy: ((Total Consumption loans/Total Bank loans)-1)	<i>BANGUAT. Boletines Estadísticos, Varios Números. (1950-2006)</i>
Foreign Debt Exposure ((Foreign Liabilities/Total Liabilities)-1)	<i>Ibid</i>
Net Assets held by banks	<i>Ibid</i>
Technology (τ_{US}) (Proxy: weighted US index. 1992=100) Specifically, the weights used were: 13% for transportation assuming complete transfer, 23% for agriculture assuming a 50% transfer in the sugar industry and for coffee, 12% for industry assuming complete transfer, and 24% for commercial, assuming a 10% transfer of foreign technology. The weight (w) thus is: $\tau_{US}*(0.13+0.23*0.5+0.12+0.24*0.1)$	<i>Annual Report of the President</i>
Domestic Research and Development (Proxi: 10% of Sugar Production)	Ministerio de Economia
Foreign Research and Development (Proxi: weighted US R&D based on the composition of Guatemala's GDP per sector and absorption of foreign technology. Specifically, the weights used were: 13% for transportation assuming complete transfer, 23% for agriculture assuming a 50% transfer in the sugar industry and for coffee, 12% for industry assuming complete transfer, and 24% for commercial, assuming a 10% transfer of foreign R&D. Thus the exact equation used was $USR\&D*(0.13+0.23*0.5+0.12+0.24*0.1)$	

Annex II	
Description of Data per “Lugar Poblado” (2002 and 2004)	
Variable	Source
<p>NBI (Proxi for Poverty and Income. Using the six components proposed by INE a composite per “lugar poblado” was constructed using factor analysis with a rotation, which was calculated using a Varimax methodology with Keiser normalization and the Anderson-Rubin procedure for scoring)</p> <p>NBI1 (percentage of households with NBI based on the quality of the house, CENSO 2002.) NBI2 (percentage of households with NBI based on the quality of the surroundings where the house lays (called “hacimiento” in Spanish, CENSO 2002) NBI3 (percentage of households with NBI based on the quality and access to improve water sources, CENSO 2002) NBI 4 (percentage of households with NBI based on the quality of sanitation facilities, CENSO 2002) NBI5 (percentage of households with NBI base on school enrollment, CENSO 2002.) BI 6 (percentage of households with NBI based on quality of the job held, CENSO 2002).</p>	Calculated, INE - Census of 2002 and ENEI 2004
<p>Wealth (Proxi: a composite was constructed by “lugar poblado” using factor analysis with a rotation, which was calculated using a Varimax methodology with Keiser normalization and the Anderson-Rubin procedure for scoring. It was based on the following factors: ownership of a home, whether the household was receiving rent from assets, whether the holding had savings, whether the household had received dividends in the past three months, whether the household had sold assets in the past three months, whether the household had received income from apartment’s rent in the past three months, and on whether the household had received remittances in the past three months.</p>	Calculated, INE- ENEI 2004
Marital Status	Census 2002 and ENEI 2004
Ethnicity	<i>Ibid</i>
Sex	<i>Ibid</i>
Age	<i>Ibid</i>
Relation with head of household	<i>Ibid</i>
Number of children	Calculated per “lugar poblado”, <i>Ibid</i>
Literacy	<i>Ibid</i>
Educational level	<i>Ibid</i>
School enrollment	<i>Ibid</i>
Occupation	<i>Ibid</i>
Covered by health insurance	<i>Ibid</i>
Dummy for area	Calculated: 1=urban area, 0=rural, <i>Ibid</i>
Dummy for Ethnicity	Calculated: Ladino=1, Indigenous=0, <i>Ibid</i>
Dummy for Unions and Marriage	Calculated: Unions & Marriage=1, Others=0, <i>Ibid</i>
Dummy for Marriage	Calculated: Marriage=1, Others=0, <i>Ibid</i>

Annex III

Determinants of Wealth and Poverty by Family Structure*

Variable	Coeff	Std Error	T-Stat	Signif	R ²
Married, Wealth					
1. Constant	3.515981336	0.368310871	9.54623	0.00000000	0.07
2. AGE	-0.067642875	0.009785061	-6.91287	0.00000000	
3. AGE2	0.000434636	0.000101211	4.29435	0.00001752	
4. SEX	-0.018390732	0.123002016	-0.14952	0.88114672	
5. RACE	0.000052997	0.003780453	0.01402	0.98881512	
6. NUMCHIL	-0.061451108	0.011190654	-5.49129	0.00000004	
7. INCOMCOMP	0.010383106	0.005515711	1.88246	0.05977356	
8. OCUP	-0.004990943	0.010079064	-0.49518	0.62047362	
9. REMIT	0.113279230	0.094589398	1.19759	0.23107703	
10. DUMURB	0.246817221	0.071136774	3.46962	0.00052120	
Married Poverty					
1. Constant	18.47008079	0.95002699	19.44164	0.00000000	0.31
2. AGE	-0.32861613	0.02517106	-13.05531	0.00000000	
3. AGE2	0.00353291	0.00027599	12.80074	0.00000000	
4. SEX	-0.53533589	0.34115172	-1.56920	0.11660093	
5. NUMCHIL	0.77647743	0.03417102	22.72327	0.00000000	
6. RACE	0.03089220	0.01145119	2.69773	0.00698145	
7. OCUP	0.49850197	0.02491742	20.00616	0.00000000	
8. REMIT	0.12402257	0.26945952	0.46026	0.64532659	
9. DUMURB	-3.68732991	0.24257118	-15.20102	0.00000000	
Unions Wealth					
1. Constant	2.493498550	0.528064692	4.72196	0.00000234	0.08
2. AGE	-0.042033196	0.015631306	-2.68904	0.00716580	
3. AGE2	0.000146792	0.000172938	0.84881	0.39598461	
4. SEX	0.039452201	0.157111612	0.25111	0.80172954	
5. RACE	0.002445501	0.006514634	0.37539	0.70737354	
6. NUMCHIL	-0.110132663	0.019972251	-5.51428	0.00000004	
7. INCOMCOMP	0.007520871	0.008751558	0.85938	0.39013360	
8. OCUP	0.005814911	0.016778028	0.34658	0.72890770	
9. REMIT	0.540384911	0.147325812	3.66796	0.00024450	
10. DUMURB	0.245044471	0.102985831	2.37940	0.01734085	
Unions Poverty					
1. Constant	15.77716647	1.26234504	12.49830	0.00000000	0.22
2. AGE	-0.23914226	0.03858571	-6.19769	0.00000000	
3. AGE2	0.00264047	0.00044528	5.92994	0.00000000	
4. SEX	-0.67904500	0.36096394	-1.88120	0.05994486	
5. NUMCHIL	0.66662107	0.05685037	11.72589	0.00000000	
6. RACE	0.02021983	0.01463660	1.38146	0.16713842	
7. OCUP	0.44238757	0.04002252	11.05347	0.00000000	
8. REMIT	1.33729874	0.40100288	3.33489	0.00085334	
9. DUMURB	-3.51886552	0.29240705	-12.03413	0.00000000	
Single Parents Wealth					
1. Constant	2.954853806	0.762478296	3.87533	0.00010648	0.08
2. AGE	-0.088686675	0.024358603	-3.64088	0.00027171	
3. AGE2	0.000638019	0.000240317	2.65490	0.00793308	
4. SEX	0.279073170	0.120176327	2.32220	0.02022230	
5. RACE	-0.007466896	0.006391733	-1.16821	0.24272147	
6. NUMCHIL	-0.055252319	0.033196057	-1.66442	0.09602770	
7. INCOMCOMP	-0.004486976	0.014028525	-0.31985	0.74908463	
8. OCUP	0.073132362	0.023794474	3.07350	0.00211562	
9. REMIT	0.456542960	0.142614800	3.20123	0.00136842	
10. DUMURB	0.261778217	0.170872371	1.53201	0.12551992	
Single Parents Poverty					
1. Constant	12.15356563	1.72319923	7.05291	0.00000000	0.30
2. AGE	-0.10558222	0.05450236	-1.93720	0.05272032	
3. AGE2	0.00155937	0.00054270	2.87339	0.00406097	
4. SEX	-0.85891430	0.32658887	-2.62996	0.00853960	
5. NUMCHIL	0.78679624	0.08226489	9.56418	0.00000000	
6. RACE	0.03822588	0.02582283	1.48031	0.13878969	
7. OCUP	0.57933791	0.04597664	12.60070	0.00000000	
8. REMIT	0.28577990	0.36718002	0.77831	0.43638626	
9. DUMURB	-2.70377339	0.48317430	-5.59586	0.00000002	

*Data for divorce and separated households is available upon request

Annex IV Determinants of Wealth and Poverty by Level of Education*

Variable	Coeff	Std Error	T-Stat	Signif	R ²
No-Education, Wealth					
1. Constant	2.049147297	0.495463310	4.13582	0.00003537	0.08
2. AGE	-0.061587914	0.015259410	-4.03606	0.00005436	
3. AGE2	0.000472434	0.000152764	3.09256	0.00198437	
4. SEX	0.267976806	0.094700944	2.82972	0.00465893	
5. MARDUM	-0.322693112	0.073904921	-4.36633	0.00001264	
6. RACE	-0.004823491	0.003971506	-1.21452	0.22454744	
7. NUMCHIL	-0.026630556	0.017783466	-1.49749	0.13426590	
8. INCOMCOMP	0.002897320	0.0008746549	0.33125	0.74045344	
9. OCUP	0.094959417	0.023007346	4.12735	0.00003670	
10. REMIT	0.341494676	0.107263603	3.18370	0.00145408	
11. DUMURB	0.112460829	0.089159613	1.26134	0.20718539	
No-Education, Poverty					
1. Constant	17.78268808	1.29313538	13.75161	0.00000000	0.20
2. AGE	-0.14067757	0.03875376	-3.63004	0.00028338	
3. AGE2	0.00132308	0.00039551	3.34522	0.00082218	
4. SEX	-0.96047224	0.24045674	-3.99437	0.00006487	
5. MARDUM	-0.75141198	0.20202558	-3.71939	0.00019970	
6. NUMCHIL	0.54300427	0.05110374	10.62553	0.00000000	
7. RACE	0.03597411	0.01218540	2.95223	0.00315486	
8. OCUP	0.28187499	0.06338007	4.44738	0.00000869	
9. REMIT	1.29001383	0.38942098	3.31265	0.00092418	
10. DUMURB	-3.22066486	0.26878751	-11.98220	0.00000000	
High School, Wealth					
1. Constant	3.290370305	0.986278186	3.33615	0.00084948	0.10
2. AGE	-0.015229130	0.030862293	-0.49345	0.62169165	
3. AGE2	-0.000346529	0.000361337	-0.95902	0.33754924	
4. SEX	-0.047241211	0.216385794	-0.21832	0.82718028	
5. MARDUM	-0.321274918	0.121099791	-2.65298	0.00797854	
6. RACE	-0.009245558	0.007790768	-1.18673	0.23533315	
7. INCOMCOMP	0.019737642	0.018703868	1.05527	0.29130158	
8. NUMCHIL	-0.095236343	0.041953636	-2.27004	0.02320528	
9. OCUP	0.003183690	0.025670120	0.12402	0.90129693	
10. REMIT	0.169760441	0.302959499	0.56034	0.57524729	
11. DUMURB	0.045773728	0.227907439	0.20084	0.84082095	
High School, Poverty					
1. Constant	14.83344898	1.79226635	8.27636	0.00000000	0.13
2. AGE	-0.11161124	0.05859769	-1.90470	0.05681859	
3. AGE2	0.00058651	0.00069465	0.84433	0.39848589	
4. SEX	-0.99177238	0.43072021	-2.30259	0.02130188	
5. MARDUM	-0.90876074	0.23159211	-3.92397	0.00008710	
6. RACE	-0.00412280	0.01500253	-0.27481	0.78346477	
7. OCUP	0.13820204	0.05112312	2.70332	0.00686511	
8. REMIT	1.15748605	0.53639596	2.15789	0.03093601	
9. DUMURB	-1.84645840	0.47898279	-3.85496	0.00011575	
10. NUMCHIL	0.36435411	0.09415585	3.86969	0.00010897	
College and Graduate Studies, Wealth					
1. Constant	3.337537795	1.251535742	2.66675	0.00765877	0.08
2. AGE	-0.050179831	0.034116089	-1.47086	0.14133025	
3. AGE2	0.000246997	0.000367021	0.67298	0.50096132	
4. SEX	-0.359626944	0.253181868	-1.42043	0.15548274	
5. MARDUM	-0.273268581	0.175319849	-1.55869	0.10907073	
6. RACE	-0.029156367	0.025619772	-1.13804	0.25510310	
7. NUMCHIL	-0.100609329	0.051992948	-1.93506	0.05298328	
8. INCOMCOMP	0.085286626	0.028065265	3.03887	0.00237469	
9. OCUP	-0.002192814	0.032723791	-0.06701	0.94657392	
10. REMIT	0.232021246	0.406614149	0.57062	0.56825879	
11. DUMURB	-0.016363460	0.390133772	-0.04194	0.96654398	
College and Graduate Studies, Poverty					
1. Constant	13.78616732	2.20244625	6.25948	0.00000000	0.02
2. AGE	-0.12733844	0.08364570	-1.52235	0.12792021	
3. AGE2	0.00129436	0.00099631	1.29916	0.19388930	
4. SEX	-0.31135505	0.43123331	-0.72201	0.47028791	
5. MARDUM	-0.27028161	0.28282767	-0.95564	0.33925383	
6. RACE	0.01886520	0.05074805	0.37174	0.71008473	
7. NUMCHIL	0.10056945	0.10526612	0.95538	0.33938412	
8. OCUP	0.05614312	0.04570580	1.22836	0.21931239	
9. REMIT	-0.32896898	0.45761469	-0.71888	0.47221631	
10. DUMURB	-0.75023793	0.91916667	-0.81622	0.41437699	

*Data for divorce and separated households is available upon request. MARDUM: married=1, not married=0

Annex V Determinants of Wealth and Poverty by Living Area*

Variable	Coeff	Std Error	T-Stat	Signif	R ²
Urban, Wealth					
1. Constant	1.671545922	0.228864046	7.30366	0.00000000	.10
2. AGE2	-0.000294417	0.000014886	-19.77876	0.00000000	
3. RACE	0.000428938	0.003740957	0.11466	0.90871463	
4. MARDUM	-0.305078601	0.039276312	-7.76750	0.00000000	
5. EDUC	0.073018986	0.015241147	4.79091	0.00000166	
6. SEX	0.171204861	0.057430096	2.98110	0.00287215	
7. OCUP	0.023237248	0.009336030	2.48899	0.01281080	
8. INCOMCOMP	0.024433493	0.005195135	4.70315	0.00000256	
9. REMIT	0.267695176	0.076005903	3.52203	0.00042825	
10. NUMCHIL	-0.108833978	0.009415880	-11.55856	0.00000000	
Urban, Poverty					
1. Constant	16.28051302	0.54444286	29.90307	0.00000000	.31
2. AGE2	-0.00037162	0.00003676	-10.10867	0.00000000	
3. RACE	0.03112191	0.00900046	3.45781	0.00054458	
4. MARDUM	-0.69900340	0.09268043	-7.54208	0.00000000	
5. EDUC	-1.19913226	0.03548859	-33.78924	0.00000000	
6. SEX	-1.07371803	0.13026050	-8.24285	0.00000000	
7. OCUP	0.20443324	0.02290681	8.92456	0.00000000	
8. REMIT	0.30191587	0.19091613	1.58141	0.11378529	
9. NUMCHIL	0.42749858	0.02585387	16.53519	0.00000000	
Rural, Wealth					
1. Constant	1.865573641	0.569632686	3.27505	0.00105645	0.04
2. AGE2	-0.000165150	0.000032278	-5.11656	0.00000031	
3. RACE	-0.010145123	0.006512658	-1.55775	0.11929147	
4. MARDUM	-0.284455239	0.092215160	-3.08469	0.00203764	
5. EDUC	0.054396814	0.040245193	1.35164	0.17649209	
6. SEX	-0.068036803	0.156725355	-0.43411	0.66420504	
7. OCUP	0.062274570	0.034189436	1.82146	0.06853750	
8. INCOMCOMP	0.002370443	0.012714205	0.18644	0.85209931	
9. REMIT	0.037716477	0.186520686	0.20221	0.83975202	
10. NUMCHIL	-0.040882922	0.023254459	-1.75807	0.07873593	
Rural, Poverty					
1. Constant	16.73363107	1.40756307	11.88837	0.00000000	0.25
2. AGE2	-0.00001917	0.00011992	-0.15985	0.87300138	
3. RACE	0.00453698	0.02237402	0.20278	0.83930778	
4. MARDUM	-0.38076050	0.26990293	-1.41073	0.15832388	
5. EDUC	-1.35173980	0.11871612	-11.38632	0.00000000	
6. SEX	-1.94631377	0.41914898	-4.64349	0.00000343	
7. OCUP	0.15635137	0.09528859	1.64082	0.10083488	
8. REMIT	1.83982219	0.50296481	3.65795	0.00025424	
9. NUMCHIL	0.57894521	0.06909333	8.37918	0.00000000	

*Data for divorce and separated households is available upon request. MARDUM: married=1, not married=0

Annex VI
Determinants of Wealth and Poverty by Sex of Head of Household*

Variable	Coeff	Std Error	T-Stat	Signif	R ²
Women, Wealth					
1. Constant	3.026527277	0.672276555	4.50191	0.00000673	0.07
2. AGE	-0.059813420	0.021446070	-2.78902	0.00528686	
3. AGE2	0.000312663	0.000224006	1.39578	0.16277993	
4. RACE	-0.012695402	0.008926537	-1.42221	0.15496557	
5. MARDUM	-0.359542269	0.138877101	-2.58892	0.00962763	
6. EDUC	0.020329746	0.038169066	0.53262	0.59429415	
7. INCOMCOMP	0.001849937	0.014166226	0.13059	0.89610137	
8. OCUP	0.065832465	0.023036192	2.85778	0.00426611	
9. REMIT	0.297207001	0.127593021	2.32934	0.01984128	
10. DUMURB	0.440980461	0.154467573	2.85484	0.00430583	
11. NUMCHIL	-0.068906319	0.031458395	-2.19040	0.02849558	
Women, Poverty					
1. Constant	16.61998785	1.29406895	12.84320	0.00000000	0.34
2. AGE	-0.11307416	0.04618505	-2.44829	0.01435381	
3. AGE2	0.00103771	0.00048682	2.13163	0.03303740	
4. RACE	0.01721318	0.02297050	0.74936	0.45364009	
5. MARDUM	-0.55904914	0.32386664	-1.72617	0.08431669	
6. EDUC	-1.08164326	0.07577326	-14.27474	0.00000000	
7. OCUP	0.21725287	0.05009260	4.33703	0.00001444	
8. REMIT	0.61997543	0.28180977	2.19998	0.02780842	
9. DUMURB	-1.85587826	0.39958378	-4.64453	0.00000341	
10. NUMCHIL	0.61054466	0.07065958	8.64065	0.00000000	
Men, Wealth					
1. Constant	2.944810877	0.285262437	10.32316	0.00000000	0.09
2. AGE	-0.062786143	0.007903442	-7.94415	0.00000000	
3. AGE2	0.000401705	0.000082251	4.88388	0.00000104	
4. RACE	0.000250076	0.003547088	0.07050	0.94379429	
5. MARDUM	-0.284674228	0.037748003	-7.54144	0.00000000	
6. EDUC	0.086097899	0.015220274	5.65679	0.00000002	
7. INCOMCOMP	0.019032591	0.005145838	3.69864	0.00021676	
8. OCUP	0.017614921	0.009550189	1.84446	0.06511645	
9. REMIT	0.206313311	0.083251223	2.47820	0.01320465	
10. DUMURB	0.235836943	0.062386574	3.78025	0.00015667	
11. NUMCHIL	-0.067163479	0.009857872	-6.81318	0.00000000	
Men, Poverty					
1. Constant	22.47323375	0.69060899	32.54118	0.00000000	0.39
2. AGE	-0.23143296	0.01886170	-12.27000	0.00000000	
3. AGE2	0.00214902	0.00020653	10.40559	0.00000000	
4. RACE	0.02813573	0.00932564	3.01703	0.00255266	
5. MARDUM	-0.58146561	0.09122163	-6.37421	0.00000000	
6. EDUC	-1.19855388	0.03742037	-32.02945	0.00000000	
7. OCUP	0.18084738	0.02418739	7.47693	0.00000000	
8. REMIT	0.45265920	0.24493042	1.84811	0.06458594	
9. DUMURB	-3.03353833	0.18741283	-16.18640	0.00000000	
10. NUMCHIL	0.55675828	0.02815796	19.77268	0.00000000	

*Data for divorce and separated households is available upon request. MARDUM: married=1, not married=0

Annex VII
Determinants of Wealth and Poverty by Race*

Variable	Coeff	Std Error	T-Stat	Signif	R ²
Indigenous, Wealth					
1. Constant	2.855707826	0.414397963	6.89122	0.00000000	0.08
2. AGE	-0.070045763	0.012273313	-5.70716	0.00000001	
3. AGE2	0.000541747	0.000128854	4.20435	0.00002618	
4. SEX	0.228868275	0.088534937	2.58506	0.00973616	
5. MARDUM	-0.265166202	0.054820319	-4.83701	0.00000132	
6. EDUC	0.049606742	0.022218417	2.23269	0.02556968	
7. INCOMCOMP	-0.001379175	0.006651937	-0.20733	0.83574877	
8. OCUP	0.013260906	0.014475239	0.91611	0.35960940	
9. REMIT	0.273821365	0.089845332	3.04770	0.00230602	
10. DUMURB	0.191486161	0.078696442	2.43323	0.01496499	
11. NUMCHIL	-0.055971611	0.012459095	-4.49243	0.00000704	
Indigenous, Poverty					
1. Constant	23.16332365	1.06915568	21.66506	0.00000000	0.29
2. AGE	-0.20785061	0.03127841	-6.64518	0.00000000	
3. AGE2	0.00198711	0.00034121	5.82375	0.00000001	
4. SEX	-0.87586883	0.23859283	-3.67098	0.00024162	
5. MARDUM	-0.64931735	0.15945453	-4.07212	0.00004659	
6. EDUC	-1.04119662	0.06059291	-17.18347	0.00000000	
7. OCUP	0.21876314	0.04267374	5.12641	0.00000030	
8. REMIT	0.49925381	0.30475970	1.63819	0.10138239	
9. DUMURB	-3.26662330	0.27334776	-11.95043	0.00000000	
10. NUMCHIL	0.43936154	0.03891068	11.29154	0.00000000	
Ladino, Wealth					
1. Constant	2.548901796	0.352558332	7.22973	0.00000000	0.09
2. AGE	-0.060917506	0.009539752	-6.38565	0.00000000	
3. AGE2	0.000324561	0.000099031	3.27736	0.00104783	
4. SEX	0.205580217	0.066777829	3.07857	0.00207997	
5. MARDUM	-0.224670476	0.046514262	-4.83014	0.00000136	
6. EDUC	0.057890449	0.018741596	3.08888	0.00200916	
7. INCOMCOMP	0.039246157	0.006864215	5.71750	0.00000001	
8. OCUP	0.024532296	0.010868880	2.25711	0.02400098	
9. REMIT	0.217240176	0.097645128	2.22479	0.02609515	
10. DUMURB	0.327929070	0.080779362	4.05956	0.00004916	
11. NUMCHIL	-0.058503079	0.013680991	-4.27623	0.00001901	
Ladino, Poverty					
1. Constant	22.11737888	0.71678959	30.85617	0.00000000	0.39
2. AGE	-0.20974075	0.02055103	-10.20585	0.00000000	
3. AGE2	0.00193635	0.00022481	8.61340	0.00000000	
4. SEX	-0.96381017	0.14482136	-6.65517	0.00000000	
5. MARDUM	-0.72564154	0.10454128	-6.94120	0.00000000	
6. EDUC	-1.14490561	0.04230562	-27.06273	0.00000000	
7. OCUP	0.17135106	0.02459245	6.96763	0.00000000	
8. REMIT	0.55476352	0.21522750	2.57757	0.00994983	
9. DUMURB	-2.65135778	0.21161861	-12.52894	0.00000000	
10. NUMCHIL	0.60809937	0.03594819	16.91599	0.00000000	

*Data for divorce and separated households is available upon request. MARDUM: married=1, not married=0

X. Glossary of Terms

Annual rate of population growth: the annual rate of population growth is the rate at which the population is increasing or decreasing in a given year expressed as a percentage of the base population size. It takes into consideration all the components of population growth, namely births, deaths and migration

Dependency ratio: dependency ratio is the ratio of population aged (45 to 64) + >65) to the population aged 15 to 64)

Fertility rate: the *fertility rate* is defined by the National Center for Health Statistics as the total number of live births per 1,000 women aged 15 to 44 years.

GINI coefficient: the Gini coefficient is a measure of inequality of income distribution or inequality of wealth distribution. It is defined as a ratio with values between 0 and 1: the numerator is the area between the Lorenz curve of the distribution and the uniform distribution line; the denominator is the area under the uniform distribution line.

Human Capital: human capital is generally defined as the stock of skills and knowledge gained by education, training, and experience that enhances a person's earning powers and that increases the efficiency of economic decision making.

Moral Capital: moral capital can defined as the gains obtain by an individual or society as a consequence of the habitual observation of a common set of known moral rules within a community of individuals.

Neonatal causes of death: neonatal causes of death are those that occurred during the newborn period which, by convention, is the first four weeks after birth.

Noncommunicable diseases: noncommunicable diseases are defined as chronic conditions that do not result from an acute infectious process. These conditions cause death or dysfunction in the quality of life, and they usually develop over relatively long periods. Generally, these conditions or diseases result from prolonged exposure to causative agents, many associated with personal behaviors and environmental factors. Noncommunicable diseases include injuries, cardiovascular diseases, cancer, respiratory diseases, digestive diseases, Neuropsychiatric Disorders, and Genitourinary Diseases.

Speed of aging population: speed of aging population is the number of years that it takes a country to face an aging population problem. It is calculated as the number of years for the percentage of population aged 65 and over to rise from 7% to 14%.

Social Capital: Social capital has been defined in several ways. One definition that encompasses most of them is "an instantiated informal norm that promotes cooperation between two or more individuals. These norms can range from a norm of reciprocity between two friends, all the way to complex and elaborately articulated doctrines like Christianity and Confucianism." (Fukuyama (2000, p.3.)