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Income inequality in Central America, Dominican Republic and Mexico: Assessing the importance of individual and household characteristics

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Abstract

This study investigates the relationship between individual and household characteristics and income inequality in Central America, the Dominican Republic and Mexico from 1990 to 2002. A Theil decomposition exercise of individual and household income inequality is used to determine factors important for the level of inequality. In addition, the use of a novel semi-parametric simulation methodology from DiNardo, Fortin and Lemieux (1996) provides counterfactual income distributions of individuals and households to assess the importance of changes in their demographic, education and labour market characteristics over time.

The results are very heterogeneous reflecting the differences across countries over the period. Individual characteristics can explain more of individual income inequality than household characteristics can explain for household income inequality. Regional differences, education and labour market characteristics have the greatest effects upon the level and changes of income inequality in Central America, the Dominican Republic and Mexico. Declines in the agricultural sectors of the countries and shifts to urban areas reflect the structural changes taking place in the economies, and these factors are important determinants of inequality change. In addition, the rise of the informal sector of employment with its lower benefits and job security has contributed increases in income inequality. However a significant proportion of inequality levels and trends across households and individuals could not be explained by individual or household characteristics. The explanatory power of the results for individual

income inequality corresponds with other work conducted for individual income earners within and outside the countries included in this study. In contrast the inability of household characteristics to explain much, if any, household per capita income inequality is not consistent with findings from similar studies. Further work is needed to conduct an in depth investigation into the links between household income inequality and individual income inequality.

Introduction[1]

This study investigates the relationship between individual and household characteristics and income inequality in what the Economic Commission for Latin America and the Caribbean (ECLAC) names the northern subregion of Latin America, defined here as including Central America, the Dominican Republic and Mexico over the 1990s and into the new millennium. The relative importance of these characteristics as determinants for income inequality is assessed statistically.

Latin America has the highest levels of income inequality of any region in the world. This has been one of the most pervasive characteristics of the region for the past 50 years (de Ferranti et al. 2003). Within Latin America, the subset of countries in Northern and Central Latin America and in the Caribbean suffers from some of the lowest levels of social development with high poverty rates, high, intransigent social inequality and a majority of the populations in each country living in conditions of social exclusion and vulnerability.

Despite the improvements in growth and structural reforms and a decrease in poverty rates, consistent improvements in social development remain elusive. Income inequality has failed to show any consistent decline across countries. In addition, the achievement of the first Millennium Development Goal (MDG), that is the reduction, by

[1] The author would like to thank Ana Sojo, Marco Sánchez, Pablo Sauma and Juan Carlos Moreno for their invaluable assistance and comments, and Roger Wilkins from the Melbourne Institute of Applied Economic and Social Research for access to his code for the simulation routine.

half, of the population living in extreme poverty, is unlikely to be met by the 2015 deadline for many countries in the region, if progress in economic and social development continues at its current rate (ECLAC, 2002).

The need to reduce inequality in the region has been a focus of research for some time and for several reasons. Firstly, a broad consensus within the policy community, albeit with some dissenters, has concluded that extreme levels of inequality, as experienced by Latin America and the northern subregion, diminish the capacity of an economy to reach higher rates of economic growth. Secondly, high inequality in incomes and wealth is associated with higher poverty levels, greater social vulnerability, and high inequality in access to markets for physical and human capital. High inequality also causes greater social instability, tension and conflict. Finally, surveys have shown that most people believe that inequality per se is a bad thing in a society (de Ferranti et al. 2003).

Whilst the presence of high inequality within the region seems easily identifiable from any number of empirical or anecdotal sources, the major causes of inequality are far more difficult to isolate. There has been a plethora of research into the nature and causes of inequality, both theoretical and empirical. In addition, there has been much work undertaken into identifying these causes in Latin America and the northern subregion, given the extremely high levels of income inequality and the lower development status of its countries.

A cohesive summary of the evolution of the main ideas and research is provided with the purpose of identifying the current 'state of the art' with regard to the nature and causes of income inequality, and in addition the work done for Latin America and the northern subregion.

The opportunity to augment this knowledge by further investigating the links between microeconomic individual and household characteristics and income inequality is the subject of this study, that is hardly the first to discuss this topic, but it does provide a positive contribution to the current body of work in several ways. Whilst there has been work conducted on Latin America, the choice of the northern subregion provides a picture of a diverse set of countries, with heterogeneous characteristics.

One of the goals of this work is to investigate the significant determinants of income inequality. In this respect the focus is concentrated upon demographic, education and labour market characteristics through the use of detailed nationally representative household surveys. There is a trade-off inherent in this focus for whilst the analysis conducted here needs no structural model, it cannot explicitly test for the influence of changes to returns to the various household and individual factors. Neither can it, like most similar studies, account for residual effects or for economic shocks.

In addition this study conducts separate analyses of individual versus household income inequality. The effect of individual factors upon individual income inequality can differ from the effects of household factors upon household income inequality, especially so for the northern subregion and the heterogeneous mix of countries considered. These differences can occur because household level variables often fail to capture the detailed intra-household dynamics taking place. Individual analyses on the other hand, can exclude many important household aggregation properties affected through the household pooling of resources and economies of scale.

The analysis in this study consists of a Theil decomposition exercise of individual and household income inequality. In addition, the use of a novel semi-parametric simulation methodology provides counterfactual income distributions of individuals and households to assess the importance of changes in various demographic, education and labour market characteristics over time. The methodologies are complementary. The Theil decomposition analyses static levels of inequality and results provide the choice of factor groupings for the counterfactual simulation analysis. The counterfactual simulations are conducted to measure the effects of changes in household characteristics upon changes in income inequality across a 12 year window from 1990 to

2002.[2] The use of this alternative semi-parametric methodology developed by DiNardo, Fortin and Lemieux (1996) allows the counterfactual simulations to capture the effects across the entire distribution of income and avoids the more restrictive analysis based simply upon a scalar measure of inequality. The derivation of a counterfactual distribution can allow the reproduction of any numerical summary measure of inequality for familiarity, simplicity and comparison to other research. Although similar methodologies exist (specifically the recent work by Bourguignon, Ferreira and Lustig, 2005) this is the first time this methodology has been applied to the northern subregion of Latin America.

The main findings of the study complement other available evidence in similar work. Generally, across the subregion similar changes in household or individual factors have influenced the observed levels of income inequality. An increase in education levels for the populations accompanied by a widening of the distribution of education levels has often been a force of increased inequality, despite the benefits of the horizontal shift in the education distribution. Structural economic changes continue to cause changes in sectors of economic activity within the northern subregion, especially the continuing decline in the agricultural sector. This in turn has caused a migration to urban areas away from rural zones and widened the differences in incomes between urban and rural areas. The shift in occupational structure towards the informal sector, particularly in terms of the increased female participation in the labour market, provides lower benefits, lower job and income security and a lack of institutional support. This increases income inequality by widening the differences between incomes of those in formal or informal employment.

However, the results also show that household characteristics fail to explain much, if any, inequality change in household per capita incomes. Individual characteristics are more successful determinants of changes to individual income inequality and this reflects the importance of the labour market as a medium of transmission of inequality in the northern subregion. But the unobservable components, including prices effects of changes in returns to the characteristics, explain the majority of inequality in the northern subregion.

The outline of the study is as follows. Chapter one provides an overview of the evolution and current ‘state of the art’ with regard to theoretical and empirical research into income inequality. Chapter two gives an outline of the methodology used in the study. Chapter three provides an in-depth analysis of the data to clarify the association of income inequality and the various household characteristics. In Chapter four, a conventional Theil decomposition is conducted to measure the extent of the effect of various individual and household characteristic cross-sectional differences upon the absolute level of per capita household-income inequality. Chapter five provides the results of the simulation of counterfactual distributions of income to measure the extent to which changes in household and individual characteristics have affected changes in inequality. Chapter six summarizes the main conclusions of the study. Technical details of the statistical procedure and data are given in appendices.

[2] The actual years under investigation for each country in the northern subregion vary. For specific details of the years for each country, see Appendix I.

I. Theoretical and empirical review of factors that contribute to income inequality

This chapter provides a synthesis of the previous work carried out to analyse the nature of income inequality, including a focus on Latin America and the northern subregion in particular. There is a very large amount of research conducted about income inequality and a definitive review of the research is beyond the scope of this study. Instead, a detailed summary of the main areas of work and the seminal papers in each area is presented to obtain a cohesive overview of the 'state of the art' for research into inequality. The chapter concludes by summarizing the main points in the review and illustrating the opportunity for this study to place itself distinctly within the literature.

The concept of inequality is quite broad. Sen (1999) defines inequality as the differences in the capacity of individuals to follow lives of their choosing. Some researchers have tackled this multidimensional nature of inequality and its problematic theoretical and practical issues (see, for example, Atkinson and Bourguignon, 1982; Bourguignon and Chakravarty, 2003; Dowrick et al., 2003; Maasoumi, 1999; Phelan, 2002). One of the most common measures of inequality used in the literature is income inequality and the study of the income distribution. Székely and Hilgert (2000) argue that there are two justifications for an emphasis on income inequality:

> "The first is that income distribution is regarded as an important determinant of growth and economic development. The other is that the level of income inequality is informative about the access to economic opportunities and about the extent to which development is shared by different sectors of the population. It is even usually regarded as a measure of social justice per se, and implicitly, when countries have low levels of inequality, they are thought of as countries that are doing 'something right."

This study takes a conventional approach of analysing the nature and causes of income inequality, although it is noted that income inequality is not an ideal proxy for the broader concept of inequality defined by Sen.

The existing literature can be grouped into two broad areas. Literature studying macroeconomic effects and their relationship with inequality has exploded in popularity in the last 20 years. The second area is literature that concentrates on the relationship between inequality and microeconomic factors. These areas are far from well-defined and are strongly interdependent, but serve here as a useful guide to provide some order in the analysis of the existing literature.

1. The macroeconomic analysis of income inequality

Studies investigating the macroeconomic analysis of inequality have several characteristics in common. Research in this area usually concentrates on macroeconomic aggregates such as Gross Domestic Product (GDP), interest rates, economic growth, unemployment and various social, political and institutional variables. Empirical studies within this area usually consist of cross-country international cross-section analyses. Common to these studies is their definition of income. Income is defined in almost all cases as GDP per capita. Inequality is studied as the difference between countries of income per capita.

Simon Kuznets (1955) was one of the first modern economists to study inequality in the macroeconomic context of development. Using data from the United States, the United Kingdom and Germany in the late 19^{th} and early 20^{th} centuries, he suggested that there was an inverted U-shape between output per capita and inequality. He argued that inequality initially increased as a country developed, due to the increasing differentials in incomes between urban centres as the source of new industries, and rural agriculture. As the country develops, structural change within the economy occurs and higher incomes are passed onto other sectors which lead to a decrease in inequality.

The field of economic growth often involves determining differences in incomes across countries and over time. The key determinants of growth can be couched in terms of determinants of inequality in per capita output across countries. In the course of the evolution of growth theory, numerous explanations for the inequality in per capita income have arisen. The simple neo-classical growth model of Solow (1956), for instance, put forward the idea that inequality across countries changed only in the transition between steady states due to factors such as savings and population growth rates. Later theorists generated models of sustained cross-country inequality based upon other factors such as differences in human capital accumulation (Lucas: 1988, Mankiw, Romer and Weil: 1992), and rates of technological change and research and development (Romer, 1986; Aghion and Howitt, 1992). These theoretical models explained differences across countries but supposed that the per capita income within countries was equally distributed. That is, the models explain inequality between countries but not inequality within countries. The most popular empirical test of these models is the Barro type regression. Derived from the work of Barro (1991), they involve the regression of the variable of growth of per capita income on a host of possible determinants within a cross-country data set.

More recently, macroeconomists have directly addressed the issue of within-country inequality and have considered the effect of within-country inequality on economic growth.[3] Theorists have developed several models using within-country inequality as a determinant of growth. The majority of work in this area suggests that inequality is harmful for growth. Persson and Tabellini (1994) build a model in which economic growth is adversely affected by inequality and political institutions creating a distributional conflict within the economy. Alesina and Rodrik (1994) also put forward a model based on political redistribution and the median voter hypothesis. Aghion and Bolton (1997), Benabou (1996) and Galor and Zeira (1993) all create models where economic growth is negatively related to inequality due to the existence of capital market imperfections. The lack of access to credit for those at the bottom of the income distribution leads to lower than potential growth as this part of the population have higher marginal returns to capital investments because their endowments of capital are low and diminishing marginal returns to capital are supposed.

The main argument for the positive effect of inequality upon growth comes from Mirrlees (1971). He argues that incentive effects for those at the bottom of the income distribution encourage greater productivity in labour and investment and lead to higher growth.

Empirical tests of the effect of within-country inequality on economic growth is usually assessed by a regression of growth on a series of determinants which include an inequality index measure (usually the Gini index) based on income inequality information from national surveys. The standard for this work for an international data set is the data set of Deininger and Squire (1996) which has been adopted and extended by UNU/WIDER (2004). Deininger and Squire (1996) use their data set to find that there is a strong negative relationship between income growth and inequality particularly inequality in terms of assets. This negative relationship has also been found in empirical tests from Perotti (1996). One study that challenges this orthodoxy is the work of Forbes (2000) who uses panel data methods on a version of the Deininger and Squire data set to find that inequality has a significantly positive effect on economic growth. However the methodology is subject to criticisms and the outcomes are questionable (Aghion et al., 1999). Other studies that conclude a positive relation between inequality and growth are Barro (2000) and Li and Zou (1998).

Addressing the causation between economic growth and inequality, Lundberg and Squire (2003) conduct an empirical exercise to assess the simultaneity within the data. They find that there is reason to suspect that the determinants of inequality and growth do not have a one-way causation.

The inter-relationship between growth and inequality is further complicated by the consideration of the issue of poverty. The relationship between poverty and growth has been empirically investigated by several authors including Dollar and Kray (2002) and Ravallion (2001). Most applied work in this area has found that there is a negative relationship between growth and poverty, with higher rates of growth being more effective at decreasing poverty. These empirical studies are not without their critics but the conclusions have been readily adopted by some international organisations and policy think-tanks as confirmation of the positive effects of higher growth upon the poverty rate (ECLAC, 2004a; 2004b; de Ferranti et al. 2003).[4]

The task of disentangling the linkages between growth, inequality and poverty and strongly identifying the differences in concepts has been addressed by Bourguignon (2004) and Ravallion (2004). Whilst Ravallion concentrates on the fact that researchers are often ambiguous about the definition of inequality that is used (relative inequality versus absolute inequality),[5] Bourguignon

[3] A comprehensive review of the effects of inequality on growth is given in Aghion et al. (1999).

[4] Deaton (2004), Kakwani, Parkash and Son (2000) provide a good critique of the work for the relationship between growth and poverty.

[5] Absolute inequality is defined as the absolute income difference of each member of the distribution from the mean, whilst Relative inequality is defined as the proportional income difference of each member from the mean (Ravallion, 2004, p. .5).

illustrates the arithmetic relationship between inequality and poverty as two different measures of the income distribution and their link to economic growth.

Trends in global income inequality and poverty have also been studied by Bourguignon and Morrisson (2002), Milanovic (2002), Quah (1997) and Sala-i-Martin (2002) amongst others. The results are tentative but indications are that there is a possible bi-modal distribution of income across countries. The question of whether inequality has increased or decreased over time is contentious but the consensus in these papers is that the poverty rate has decreased or remained steady over time.

In terms of linking macroeconomic policy shifts to inequality changes, an example is the work by Ganuza et al. (2002). Here the editors produced a study for Latin America assessing the effects of trade liberalisation on inequality and poverty during the 1990s. Using microsimulation methods they produce counterfactual results for progress without trade liberalisation. The authors use household survey data and effects of inequality and poverty are supposed to be transmitted through the labour market. They find that around half the countries under the simulation have increased inequality due to trade liberalisation, but the effects are generally small. Other work by Ganuza et al. (2004) and Sanchez (2005) also focus on the macroeconomic and structural effects of changes in the economy upon poverty and inequality in various Latin American countries. These studies offer the ability to marry macroeconomic and microeconomic effects through the use of simulation models and especially Computable General Equilibrium (CGE) models. The advantage of these models is the ability to incorporate the microeconomic effects of changes in distributions with the macroeconomic effects of policy and structural shifts in the economy.

In summarising the work on the macroeconomic analysis of inequality, it can be seen that common macroeconomic factors tend to be focused upon capital markets, both physical and human, technological change and institutional and political factors. The later work which extends the analysis to inequality within countries indicates that inequality has some negative effects upon growth although the strength of the empirical relationship is contentious. However there is stronger and more consistent agreement on the positive effects of growth upon poverty rates. Therefore under the macroeconomic perspective, the issue of inequality is one that some would argue, is a much lower priority than the reduction of poverty purely through an emphasis on growth.

But how certain are these conclusions without a microeconomic inequality analysis? Criticisms of a solely macroeconomic analysis can be made. Firstly, the empirical tests of cross country growth determinants and the tests of the relationship between growth and inequality may suffer from endogeneity of the variables on the right-hand side of the equation, omitted variable bias and possible problems with the function form of the equations governing the relationship between inequality, growth and the determinants under examination.

In addition, although the use of within-country inequality measures is an improvement, the inclusion of the measure as a scalar index measure, gives only a summary of the inequality within each country and the choice of index measure (whether Gini index, Theil index, Atkinson measure or other) gives rise to problems in the assumptions and interpretation of such a measure for every aspect of the distribution. The reliance on the measures from secondary data sets also can leave the researcher unaware of the full limitations of the data set being used which Atkinson and Brandolini (2001) warn is a large problem with the use of the UNU/WIDER data set.

Thirdly, the concentration on macroeconomic links to income inequality omits any consideration of the microeconomic effects that may exist. Given the likelihood that combinations of macroeconomic and microeconomic conditions affect inequality, strong conclusions about the causes of inequality based purely upon macroeconomic factors may be premature. Whilst the problems of finding adequate data often prohibit accounting for microeconomic effects, the a priori conclusion that they are negligible is incautious.

2. The microeconomic analysis of income inequality[6]

Microeconomic studies into inequality have several characteristics. Firstly, the aim of such studies is to assess the importance of various microeconomic, household and individual characteristics upon inequality. Secondly, these studies use microeconomic data sources. This means that data is gathered at an individual or household level. Inequality is defined in terms of income inequality as it is more objective and well defined in terms of data collection (although some studies analyse other types of inequality including land inequality and health inequality).[7] Thirdly, the studies usually consist of cross-section analyses and decompositions[8] within one country. Another characteristic of these studies is the use of a single summary measure of inequality. These studies are closer in theme to the analysis undertaken in this study and more detail is provided about some of the work that has been conducted in this area.

a) Demographic characteristics

Firstly the ability of microeconomic characteristics to explain inequality is dependent upon the region and the type of study conducted. Brandolini and D'Alessio (2001) use a decomposition of the Mean Log Deviation (MLD) to analyse changes in household income inequality in Italy from 1977-1995. Various variables such as family structure, size of household, age, sex, and region were included, but the authors conclude that the demographic characteristics seem to have no effect on inequality. Beblo and Knaus (2000) decompose the Theil index for the founding member countries of the European Union but find that household differences in the countries account for a tiny fraction (around 2%) of inequality. They conclude that socioeconomic characteristics play only a small role.

Other studies have found a more prominent role for family type and demographic characteristics. Cowell and Jenkins (1995) use US data for the 1980s and whilst employing some innovations on the standard decomposition methodology, find that demographic characteristics explained roughly 20%-30% of income inequality. Jenkins (1995) studies inequality in the United Kingdom for 1971-1986. Using the MLD decomposition, he concludes there are four influences at work in the English economy, two of which are household based (age of the head and changes to household type), and two of which are changes to social security and the industrial structure of the United Kingdom over the period. Garner and Terrell (2001) in their Theil decomposition of the income distribution in Slovakia from 1988-1996, also found that although overall inequality was within the household groups under study (around 5/6 of inequality within-group) the demographic characteristics in the family structure, particularly the number of children, pensioners and the size of the household, explain a large proportion of the between-group inequality.

b) Labour market

Székely and Hilgert (2000) decompose income inequality in terms of Gini accounting methods, for 35 countries in 6 regions around the world. Differences in fertility and family formation were found to be large for Latin America, the US, Europe and Asia. But the authors also found that labour market inequalities were very important in these regions.

Alejos (2003) uses the regression decomposition technique from Fields (2000) to decompose inequality of incomes in Guatemala in 2002. Half of the inequality is explained by the various household factors but the labour market/occupational factors and the education measures are the greatest determinants, each accounting for 12%-15% of the total inequality.

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6 Unless otherwise mentioned the inequality analysis is conducted on household per capita income with no equivalence scale.

7 See Becker, Philipson and Soares (2003) and Deaton (1999) for examples using health inequality.

8 See Appendix III for details of inequality indexes and decomposability.

c) Education

Gindling and Trejos (2004) also use a Fields' decomposition for income inequality in Costa Rica between 1980 and 1999. Using determinants constructed at the individual level (as opposed to the household level), they find education an important factor in the determination of income inequality. Employment factors also played a role here in combination with the changes in the returns to education that occurred.

Morley (2001) united labour market factors and educational factors with external events in his explanation of the income distribution problem in Latin America and the Caribbean. He isolates distinctive features about the income distributions in Latin America that differ from other regions and serve to explain some of the trends in inequality seen in Latin America in the last 20 years. These include one-time shifts upwards in inequality in the late 1980s in Argentina, Chile and Mexico as a result of recessions and trade liberalisation. The bottom 90% of the income distribution for households in Latin America does not differ significantly from the distribution of the US and so much of the wide dispersion can be accounted for by the behaviour of the top 10% of incomes. There is a negative relationship between the level and variance of education in Latin America and the large inequality cannot be totally explained by education differences, without the complementary effect of rising returns to high skilled workers. Morley's Theil decomposition exercise of the income distribution for the countries of Latin America showed that education and occupational characteristics of individuals are the most significant determinants of inequality. Demographic characteristics such as age, sex and region do little to explain inequality. It must be noted however that the decomposition exercise tests each variable (education, occupation etc) one at a time and doesn't account for interrelations between the factors.

The discussion of poverty in relationship to the income distribution is justified in his book by the argument that to rank distributions, absolute income inequality must be considered in addition to relative income inequality. As poverty is a property of the absolute inequality, it is considered.

Complementary work for Mexico by Lopez-Acevedo (2000) reviews the inequality for this country in the 1980s and 1990s. One novel interpretation here of the decomposition approach is the idea of gross and marginal decompositions. Using a number of characteristics including education level, occupation characteristics, and demographic characteristics such as age, sex and region, she conducts decomposition of wage inequality by a gross method, where each variable is considered separately, and a marginal method, where the subgroups are split by more than one variable (e.g., a decomposition by sex alone as opposed to a decomposition with education differences and sex differences together). She interprets the difference between the gross and marginal results as the effect of the interaction between the possible factors. This interaction effect can be up to 50% of the gross effect of the chosen variable upon inequality of wage incomes.

The main findings for Mexico from this study are that whilst around half of total wage inequality is explained by the decomposition, the variation in education explains 24%-34% of the differences in the total inequality measured. The disequalizing effect of education is greater as earnings increase.

d) Interactions between characteristics

Hausman and Székely (1999) study various interactions between inequality and the family in Latin America. Their paper explains the inequality in Latin America in terms of the gender balance in the countries for labour market participation. A major factor behind household inequality is the female labour market participation rate. They advance the argument that the persistent inequality in Latin America is a product of fertility choice in the first instance where higher incomes for females make the opportunity cost of having children higher. This in addition with a higher education for females will provide lower fertility rates and increased labour market participation. The exception is a partial dependence upon the income and education of the husband (if present) as a husband with

high income will be a disincentive for labour market participation of the wife given the more traditional family structure in Latin America as compared to the changing structures in developed countries. Poor families are larger as the opportunity cost of working is lower, given the lower returns in the labour market due to lower education levels. Given that the education of children is strongly positively related to the education of the parents, there is persistence in inequality. The root cause of all the incentive effects here is the rising returns to education in the economies.

The interrelationship between the various educational, labour market and demographic characteristics of the household in Latin America has been explored in research projects by various agencies including the Inter-American Development Bank (IADB), the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and the World Bank.

Attanasio and Székely (2002) pursue the household decision making process in Latin America in a research project for the IADB. The fertility rate decrease is related to the increase in education by the use of synthetic panels.[9] The link between education, lower fertility and increased female participation is illustrated. However in this study this outcome is complemented by measures of family savings where inequality is driven by access to capital from differences in savings capabilities. Poorer households have larger families to substitute for low personal savings.

The World Bank study by de Ferranti et al. (2003) confirms several findings introduced by other research. The identifying characteristics of Latin America including the resistance of changes to inequality in the region despite growth and technical change in the last 50 years and the historical roots of poor infrastructure, volatile political regimes and land use policies set a background for the study. The characteristic of much income inequality driven by the top 10% of the distribution is also confirmed and is unique compared to the rest of the world.

Whilst the study recognises education as a major factor in inequality, it concludes that the reason is not solely due to the variance in education level but also the quality of education. Another factor derived from Theil decompositions is family size. However other demographic characteristics such as age, sex and region are not significant effects upon income inequality. The study also highlights labour market gaps such as the large proportion of informal employment and land inequality as the major sources of the persistence in income inequality in Latin America.

ECLAC (2004a) consider inequality within the broader context of social development in the region of Latin America during the 1990s and argue that the prevalence of income inequality is not solely a result of macroeconomic effects. Education and the size of the household once again are found to be significant factors affecting the income distribution. Properties of the head of the household such as employment and educational status are also strong indicators of poverty and therefore presence in the lower end of the income distribution.

e) Summary

The current microeconomic literature provides a broad view of the major ideas about the transmission and persistence of income inequality in the world but in particular in Latin America. Despite the enormous amount of variety in the microeconomic studies for the effects of household and individual characteristics upon inequality, some common conclusions arise from the body of work.

The historical circumstances and infrastructure systems in a country or region provide a strong environment about which improvements, or persistence in income inequality can take place. Like a production possibility frontier for economic production, history, structure and institutions are the social development possibility frontier for social and economic development. Unfortunately,

[9] In this case the synthetic panel is the use of subgroups over different time periods, but whilst panel data follows the same individuals over time, the subgroup composition changes. Therefore the subgroup is observed over time but the individuals may change, hence the name synthetic panel.

Latin America remains constrained by the failure of its frontier to expand as quickly as other more developed regions of the world.

On the basis of the empirical evidence so far, the particular transmission mechanisms for inequality, particularly in this region, revolve around incentives and responses of individuals in terms of household changes, education, and labour market factors. Therefore these factors provide a framework for the design of targeted policies to reduce inequality in the region, and many policies do concentrate on these areas, such as the Opportunities program for improved education in Mexico.

The structure of the household is important in future labour market participation but is itself a factor of current income level and education level. Education levels tend to be dependent upon the education of the parents and so the relative status of the household within the income distribution exhibits persistence. The gains from increased labour market participation appear to trade-off against the losses in traditional forms of household structure, which are also tied to education level but in addition to the broader cultural structure. The social environment of the country is particularly important in regulating the pace of change of the household structure over time.

II. A methodology for the analysis of the entire distribution: simulations of counterfactual distributions

The current evidence provides a rather complex picture of inequality of incomes and the methods of transmission. However, the strength of the effects of microeconomic characteristics differs somewhat between the studies. With some studies having microeconomic factors that explain as little as 20% of inequality, it is appropriate here to consider alternative methodologies for decomposing income inequality by microeconomic factors.

One of the main disadvantages of traditional decomposition methods is their basis upon a single scalar quantity to represent inequality. The Gini, Theil, Atkinson and other common measures of inequality, use one number to describe the entire distribution (usually of incomes). Naturally, this kind of summary measure provides a concise and compact way of describing the income distribution, but the loss of some information about the distribution is inevitable and the choice of index is subjective. Decompositions of scalar measures "…therefore waste information on how the entire distributions differ" (Bourguignon et al., 2002: 10, emphasis in original).

Scalar inequality measures are also subject to some bias. For example the Gini index tends to provide greater emphasis or importance upon the middle of the income distribution whilst the Theil tends to focus more upon the lower tail in its measure (Shorrocks,

1984). The decomposition methodologies must be used with caution. The work of Morduch and Sicular (2002), from surveys in rural China, promotes caution in the interpretation of decomposition exercises precisely because, as they show, different decompositions can give quite different conclusions about which microeconomic factors may have greater importance in the determinant of income inequality.

Recent innovative methodologies have taken account of the entire income distribution instead of one scalar measure. The method of DiNardo, Fortin and Lemieux (1996), hereafter referred to as DFL, is used in this study in Chapter V, but a brief overview of the methodology is given here and the appendix IV contains a more rigorous description..

The DFL methodology is an exercise in microsimulation and the generation of counterfactual income distributions. A counterfactual income distribution is developed by constructing a "what if" counterfactual scenario for the change in income distribution over time.[10] A distribution of income is supposed to have changed over time due to various possible determinants, including household characteristics, education and labour market characteristics, among others. In each time period there is an income distribution and a vector of each of the various chosen determinants.

The use of the following notational form assists in understanding the concept behind the DFL methodology:

$$f(y_t) \equiv f(y, t_y = t, t_z = t)$$

The left hand side of the equation is the income distribution probability density function (PDF) for a country at time t (for example at year 2002). The right hand side of the equation defines the income distribution at time t to be a combination of the income at time t_y and individual or household characteristics at time t_z, that determine the income distribution (in other words the factors for which the income distribution is conditional upon).

The DFL methodology involves replacing the characteristics for this distribution with the characteristics from a different time period. For example, if $t_y = 2002$ and $t_z = 1990$, this counterfactual would give the simulated distribution of 2002 income, if the characteristics of the households were the same as those in the 1990 sample and the households received incomes according to the 2002 schedule.

The difference between the simulated distribution and the actual distribution can be represented visually by kernel density estimates, or numerically by the difference in any choice of scalar measures such as the Gini index or the Theil index. The measured difference is the effect from changing the proportion of individuals with certain characteristics. Therefore the proportion of inequality change that remains unobserved after this exercise represents a combination of two factors. The first is the price effect which is the effect from the returns to certain characteristics (such as the returns to education level) and the second is the residual effect which is the effect from other residual factors.

The reweighing of the sample and replacement of characteristics from a different time period can be done in two ways. One alternative is that the proportion of individuals with a certain characteristic can be calculated and replaced directly. For example, the 1990 sample may contain 40% of individuals who have tertiary education whilst the 2002 contains 60% of individuals with tertiary education. The individuals in 2002 who have tertiary education are down weighted from 60% to 40% to correspond to the distribution in 1990. However doing this exercise directly is time consuming when the number of variables and outcomes for each variable increases. It also fails to

[10] The change in the distribution need not be restricted over the time dimension. Any two different distributions can be used. For example, the different distributions between countries as in Bourguignon et al., (2002).

consider the interaction between the variables. The use of a probability model such as the logit or probit model can overcome this problem. By specifying a model, not of income determination, but of the probability of being in a certain sample (such as the 2002 sample) given the set of characteristics, the equivalent of a non-parametric exercise is achieved. The non-parametric equivalence requires that the variable outcomes are a full set of dummy variables.

Whilst the methodology is semi-parametric due to the use of the probability model, it maintains the advantage of not having to specify a theoretical model of income determination, which can be subject to specification problems and omitted variable bias. The DFL methodology's weakness is that it does not give parameter estimates or measures of price effects[11] but the effects of changes in the demographic, education and labour market characteristics are the effects of interest in this study.

DiNardo, Fortin and Lemieux (1996) applied the methodology to an analysis of the changes in the US wage distribution between 1979-1989 due to changes in labour market factors including union membership and the level of the minimum wage. They find that the de-unionization of the workforce contributed to the rise in wage inequality over the period. In addition, the decrease in the real minimum wage also contributed to the rise in inequality. Daly and Valletta (2000) applied the DFL methodology to the wage distribution of the US between 1969 and 1998 and study the effects of changes in family composition and in particular, female labour force participation. They found that female labour force participation mostly concentrated upon affecting changes in the upper tail of the income distribution, but the changes in US family composition over the period could explain around 75% of the changes in the income distribution.

Another study to employ the DFL technique is the work of Johnson and Wilkins (2004) who analyse the effects of changes in family composition upon the Australian income distribution between 1981 and 1998. They find that about half the increase in income inequality can be explained by family structure whilst some of this effect was offset by changes to other demographic characteristics such as age and educational qualification.

Other research has employed methodologies similar to the DFL technique. Bourguignon, Ferreira and Lustig (2005) collect a volume of papers that use a common counterfactual microsimulation methodology developed by the editors Bourguignon and Ferreira. The methodology involves replacing the household characteristics in one time period (for example the year 2002) with characteristics from another time period (for example, 1990) and measuring the difference in the income distribution. This is done by constructing a parametric model of household income determination as a function of various household and individual characteristics —some of which are supposed to be endogenous and others to be exogenous. Changing the vector of characteristics between the time periods shows the effect of changes in the demographic, education and labour market characteristics, changing the estimated parameters, which are interpreted as prices or returns, gives the price effect; changes in the error structure of the parametric equations give the unobservable effect.[12]

A typical paper in the volume is that by Legovini, Bouillón and Lustig (2005) who apply this methodology to the study of education effects on income inequality in Mexico between 1984 and 1994. By estimating earnings functions and reweighing the income distribution in Mexico in 1994, they construct a counterfactual distribution for 1994 by applying the estimated earnings equation across groups of different regions and then use the weights of the 1984 sample to reweigh the 1994 sample. The counterfactual distribution has a regional distribution that matches the 1984 sample,

[11] In Mincerian-type wage determination equations the parameters are usually interpreted as the returns to the individuals characteristics.

[12] This unobservable effect is due to the error structure of the equations and does not include price effects which are specified explicitly. In this sense it is different to the unobservable effect of the DFL methodology which captures both residual and price effects.

but the income is that observed for observations in 1994. This is repeated for different groups of characteristics or parameters depending upon which effect is measured. They conclude that around 40% of the increase in income inequality is explained by the level and returns to education. Another one fifth of the change is explained by regional differences. The changes in the distributions are measured by calculating Gini indexes for the actual distribution and the simulated distribution and comparing the difference.

An earlier version of this methodology was applied to study education effects on income inequality in urban Brazil from 1976-1996 by Ferreira and Paes de Barros (2000). They find that decisions in labour market participation, labour market experience and declining returns to inequality explain the small observed fall in inequality over the period, in addition to the large increase in poverty.

Jenkins and Van Kerm (2004) decompose changes in the income distribution density by using the additive property of density functions and breaking the sample into the various characteristic subgroups, then calculating subgroup shares and subgroup densities to apply in a counterfactual distribution. The method is non-parametric and the emphasis is upon subgroup sample weights and not individual sample weights as in DiNardo, Fortin and Lemieux (1996). They find that the subgroup changes had minor effects on income inequality within the UK during the 1980s.

Whilst the Bourguignon, Ferreira and Lustig (2005) methodology allows the researcher to quantify the three different effects (effects of changes in the characteristics, price effects and unobservable effects) upon the income distribution, the necessity to specify a parametric model of income determination requires care with specification of the functional form and arbitrary decisions have to be made about which factors are exogenous and which are endogenous. The error structure must also be well specified. The DFL methodology, whilst not giving estimates in the normal sense, allows a freedom from the need to fully specify a model of income determination. Given the complex nature of household income, this eliminates any mis-specification problems. The DFL methodology also differs from the technique of Jenkins and Van Kerm (2004) by considering individuals (or individual households) in the reweighing rather than the "…broad-brush documentation of the sources of distributional trends…" (Jenkins and Van Kerm, 2004).

III. Overview of Central America, Dominican Republic and Mexico

Both the decomposition of the Theil coefficient and the DFL decomposition methodology are employed at two distinct points in time. Whilst the Theil decomposition analyses the factors contributing to the level of inequality at each year and for each country, the DFL methodology assess the changes over this 'window' between 1990 and 2002. However in terms of the DFL analysis, the counterfactual nature of the analysis implies that it cannot detect certain dynamic aspects of the macroeconomy such as major changes in institutional aspects and shocks that may have occurred within the 'window's' timeframe. An assessment of the dynamic aspects of the macroeconomy is not the purpose of the Theil decomposition or the DFL methodology, whereas an assessment of the microeconomic contributors to income inequality and the changes in those over the period is the purpose of this study. In this chapter an analysis of the data in the household surveys for the northern subregion is conducted to provide a detailed picture of the sociodemographic situation before conducting decompositions of the income distribution and inequality.

1. An analysis of the household survey data for Central America, Dominican Republic and Mexico in the 1990s

Using the household survey data for each country, this chapter provides detail about the changes that have occurred in individual and

household characteristics in the northern subregion. This provides a basis for analysis of the decomposition results considered in later chapters. The choice of two time periods at either end of the 1990-2002 'window' is a comparative static exercise. This provides an illuminating view of changes in households but it must be underlined that trends should only be interpreted with caution and there is assistance of other information such as the detail of the subregion provided in the first part of this chapter.

a) Income inequality and poverty rates

Table 1 shows the heterogeneity of the northern subregion in terms of economic growth and income inequality. Between 1990 and 2002 Central America, the Dominican Republic and Mexico all experienced low and volatile growth. The Dominican Republic, Panama and Costa Rica had the best growth records in the region at 2.9 percent, 2.1 percent and 2 percent average annual per capita rates respectively. Honduras and Nicaragua experienced negligible growth over the period increasing at an annual rate of just 0.1 percent. The fragile annual average growth rates are well below those expected of developing countries and remained one of the most difficult macroeconomic problems for the region in the 1990s.

Table 1

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: SUMMARY MEASURES OF HOUSEHOLD PER CAPITA INCOME INEQUALITY, POVERTY AND AVERAGE ANNUAL PER CAPITA GROWTH RATE, CA. 1990 AND 2002

(Ratios and percent)

Country	Year	Gini Index	Theil Index	Poverty Rate	Growth Rate
Costa Rica	1990	0.44	0.33	0.26	..
	2002	0.49	0.44	0.20	2.0
Dominican Republic	1992	0.59	0.65	0.61	..
	2002	0.55	0.51	0.44	2.9
El Salvador	1995	0.50	0.51	0.54	..
	2001	0.52	0.53	0.49	2.0
Guatemala	1989	0.57	0.68	0.69	..
	2002	0.54	0.54	0.59	1.1
Honduras	1990	0.61	0.81	0.81	..
	2002	0.60	0.72	0.77	0.1
Mexico	1989	0.53	0.65	0.48	..
	2002	0.51	0.54	0.39	1.4
Nicaragua	1993	0.58	0.67	0.74	..
	2001	0.58	0.77	0.69	0.1
Panama	1991	0.59	0.61	0.46	..
	2002	0.56	0.60	0.34	2.1

Source: Inequality and poverty measures are author's calculations based on household surveys for each country. For details of household surveys see Appendix I. Growth rate is the average annual percent rate of growth of GDP per capita between 1990 and 2002 measured at 1995 constant prices from the World Bank (World Development Indicators online database).

The growth pattern contrasts with the gains made in decreasing the poverty rate between 1990 and 2002,[13] and the mixed results for income inequality. Whilst the Dominican Republic, Guatemala, Honduras, Mexico and Panama all decreased income inequality according to both the

[13] All household income in this study is measured as household per capita income.

Gini index and the Theil index, Costa Rica and El Salvador increased income inequality over the period, with Costa Rica's income inequality rising by 5 points in the Gini index.

Despite the dramatic rise, Costa Rica maintains the lowest level of income inequality in both indexes with the Gini at 0.49 in 2002. Nicaragua records no change in the Gini index over the time period, but the Theil (which concentrates more upon the tails of the distribution) increased by 10 points in that index. Honduras, Nicaragua and Panama face the highest levels of inequality, with Gini's between 0.55 and 0.6.

The poverty rate, which is calculated as the simple proportion of the population below the poverty line, experienced its biggest declines in the Dominican Republic (17%), Panama (12%), Guatemala (10%) and Mexico (9%). In all cases this was matched by decreases in the Gini. The remaining countries had decreases in the poverty rate between 4 and 6%.

Table 2 shows the changes in inequality for primary income earners in each country of the northern subregion. Whilst inequality amongst primary income earners in the Dominican Republic, El Salvador and Honduras decreased between 1990 and 2002, for the remaining countries of the subregion primary income earner inequality increased. For Costa Rica and the Dominican Republic, the increase and decrease in primary income earner inequality respectively matches the same change observed in terms of the household per capita income inequality. However the level of inequality amongst primary income earners in both countries was lower than the inequality of the household per capita incomes according to both the Gini and Theil indicies.

Table 2

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: SUMMARY MEASURES OF INDIVIDUAL PRIMARY INCOME EARNER INEQUALITY, CA. 1990 AND 2002

(Natural ratios)

Country	Year	Gini Index	Theil Index
Costa Rica	1990	0.42	0.32
	2002	0.49	0.46
Dominican Republic	1992	0.55	0.61
	2002	0.49	0.47
El Salvador	1995	0.50	0.52
	2001	0.49	0.47
Guatemala	1989	0.50	0.53
	2002	0.59	0.69
Honduras	1990	0.56	0.75
	2002	0.53	0.55
Mexico	1989	0.53	0.63
	2002	0.60	0.71
Nicaragua	1993	0.50	0.52
	2001	0.55	0.76
Panama	1991	0.54	0.55
	2002	0.62	0.76

Source: Author's calculations based on household surveys for each country. For details of household surveys see Appendix 1.

There are frequent contrasts between individual income inequality and household income inequality in the northern subregion. In half of the countries, the change in primary income earner inequality shown in Table 2 differed in direction to the change in household per capita income inequality shown in Table 1.

Household per capita income inequality declined whilst individual income inequality increased for Guatemala, Mexico and Panama. The opposite effect was observed for El Salvador where individual inequality decreased whilst household per capita income inequality increased in the same period. For Nicaragua there were large increases in the Gini coefficient for primary income earners but not for household per capita incomes. In Honduras inequality in both individuals and households declined over the period, although the effect was greater for individual primary income earners.

The high inequality in the household per capita income distribution across the countries of the northern subregion is also prominent when the income is broken down into quintiles (see Table 3). The top 20% of the population in terms of household income per capita account for at least 41% of total income in each country of the northern subregion and up to 58% of total income for the Dominican Republic. In addition the changes in the income shares for the top quintile have decreased only marginally for Guatemala, Panama and Nicaragua, and to a slightly larger extent for Honduras, Mexico and the Dominican Republic. In terms of the bottom three quintiles, small gains were made for Mexico, Nicaragua and Panama whilst larger gains for these quintiles were made in the countries of Honduras and the Dominican Republic.

Table 3

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: INCOME SHARE OF POPULATION BY INCOME QUINTILE, CA. 1990 AND 2002

(Percent)

Country	Year	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Costa Rica	1990	5.0	11.6	16.9	24.7	41.7
	2002	4.2	10.2	15.4	22.8	47.3
Dominican Republic	1992	1.3	7.5	12.8	19.8	58.6
	2002	3.3	8.9	14.3	21.4	52.1
El Salvador	1995	5.7	10.9	15.0	21.2	47.3
	2001	4.1	9.4	14.9	22.2	49.6
Guatemala	1989	3.7	8.9	13.5	19.9	54.1
	2001	5.0	9.3	13.0	21.0	51.9
Honduras	1990	2.1	7.3	12.4	20.3	57.9
	2002	3.9	7.9	12.1	20.5	55.6
Mexico	1989	5.9	10.2	14.6	20.3	49.0
	2002	6.2	10.6	14.5	21.5	47.2
Nicaragua	1993	2.7	7.7	14.1	21.0	54.6
	2001	3.7	8.5	13.2	19.1	55.5
Panama	1991	1.5	7.6	15.2	23.2	52.5
	2002	3.4	8.4	14.3	22.3	51.6

Source: Author's calculations based on household surveys for each country. For details of household surveys see Appendix 1.

El Salvador and Costa Rica both had declines in terms of an equitable income share across the household per capita quintiles. In both countries, the proportion of income for the top 20% of the population increased over the period 1990-2002, by 1.8% for El Salvador, but by a huge 5.6% for Costa Rica. At the same time the share of income for the bottom three quintiles decreased markedly. This corresponds with the trends in the Gini index from Table 1.

It is interesting to note here that the bottom three quintiles have not exhibited much, if any, gain in income share over the time period and yet this at first seems to contrast strongly with the poverty decreases in Table 3. Poverty decreases have occurred because people have increased their real incomes. However if the upper income quintiles increase their real income faster than the lower quintiles, then the proportion of those in the lower quintiles will fall, even if the poverty rate decreases. In fact, in this case, a proportional increase in each per capita income will increase income inequality purely through the property of a proportion where 1% of a high income is much more in quantity than 1% of low income. Of course this is considering the use of absolute, not relative, income inequality.

b) Demographic structure

In this short period, the changes in family structure throughout the northern subregion have been relatively minor in most of the countries (see Table 4). The dominant family structure is the nuclear couple with children, which accounts for between 40%-60% of total households in the subregion over the period. The more traditional extended family structure is next with 25%-44% of households in extended family or composite family structures. Nicaragua, El Salvador and Panama are most likely to have extended or composite family structures, whilst they are least popular in Costa Rica and Mexico. Households without a conjugal nucleus also represent a very minor part of households in the subregion.

In terms of changes in the family structure, single households have increased in popularity slightly, whilst households without a conjugal nucleus have declined slightly in the majority of countries. There has also been a small trend away from traditional family structures to more nuclear structures[14] with decreases in extended families and corresponding increases in sole parents and couples without children. The proportion of single persons has also increased over the period, although they only represent between 0.9%-2.5% of the total households in the subregion.

The Dominican Republic, Guatemala and Honduras experienced the largest decreases in the proportion of extended families whilst Panama experienced the largest increase in this type. The first three countries, along with Costa Rica also experienced increases in the proportion of sole parent households.

To investigate any relationship between family structure and the income distribution, Table 5 shows the proportion of extended families and single person households in three quantiles of the income distribution; the bottom 20%, middle 60% and top 20% of per capita incomes. In Table 6, the exercise is repeated for 2 parent and sole parent families.

Within the northern subregion, extended families are generally over-represented in the bottom 20% of per capita incomes and under-represented in the top 20% of per capita incomes. The exception here is Guatemala in which almost 24% of extended families are within the top 20% of per capita incomes. For single person households, Table 5 shows that these households are greatly over-represented in the top 20% of per capita incomes. Generally around 40%-50% of single person households are present in the top 20% of per capita incomes. The Dominican Republic and Panama are exceptions where only just over one third of single person households were in the top quintile.

[14] Nuclear families include sole parent households, and 2 parent households with or without children. Sole parent households include households where the sole parent is male; however the vast majority of sole parents in each survey are female, see Table 7.

Table 4

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: HOUSEHOLD FAMILY STRUCTURE, CA. 1990 AND 2002

(Percent)

Country	Year	Single Person	No conjugal nucleus	Nuclear Families			Extended	Composite
				Couple without children	Couple with Children	Sole Parent		
Costa Rica	1990	1.1	2.8	3.0	59.7	7.3	23.6	2.5
	2002	1.8	2.8	4.4	55.6	9.8	22.7	2.8
Dominican Republic	1992	1.0	3.6	2.4	46.2	8.4	37.6	0.9
	2002	2.7	4.7	4.0	43.6	9.8	30.5	4.9
El Salvador	1995	1.2	4.1	2.2	43.6	8.1	37.8	3.0
	2001	1.7	4.0	2.4	41.4	9.1	39.5	1.9
Guatemala	1989	1.0	3.2	14.0	51.4	10.2	18.8	1.4
	2002	1.1	2.0	10.3	60.3	14.9	10.0	1.4
Honduras	1990	0.7	3.2	1.5	48.1	6.6	35.1	4.8
	2002	0.9	3.3	1.7	45.6	7.9	31.1	9.5
Mexico	1989	0.9	2.5	2.5	61.0	4.9	27.0	1.2
	2002	1.7	2.3	4.2	57.6	7.6	26.1	0.6
Nicaragua	1993	0.8	3.0	1.5	44.9	7.5	40.3	2.0
	2001	0.8	2.9	1.3	40.7	6.9	43.6	3.8
Panama	1991	2.1	4.2	3.5	46.0	8.7	32.6	2.9
	2002	2.6	3.9	4.0	42.8	8.2	36.7	1.9

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix I & Appendix II.

Table 5

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: EXTENDED FAMILIES AND SINGLE PERSON HOUSEHOLDS, DISTRIBUTION IN INCOME QUANTILES, CA. 1990 AND 2002

(Percent of income share)

Country	Year	Extended Families			Single person households		
		Bottom 20%	Middle 60%	Top 20%	Bottom 20%	Middle 60%	Top 20%
Costa Rica	1990	21.1	66.0	12.9	32.1	27.0	41.0
	2002	23.2	66.6	10.2	23.2	38.9	37.9
Dominican Republic	1992	18.9	65.7	15.5	30.0	34.7	35.3
	2002	23.0	62.5	14.5	17.6	49.3	33.1
El Salvador	1995	21.2	65.5	13.3	7.8	45.6	46.6
	2001	21.2	64.8	14.0	12.5	51.1	36.5
Guatemala	1989	20.3	56.9	22.8	16.3	30.8	52.9
	2002	23.7	52.4	23.9	10.9	37.1	52.0
Honduras	1990	20.0	64.3	15.8	33.5	24.8	41.7
	2002	20.3	64.5	15.2	4.0	43.4	52.6
Mexico	1989	25.9	63.3	10.9	4.4	39.5	56.1
	2002	25.7	63.8	10.5	4.8	46.4	48.8
Nicaragua	1993	18.2	66.5	15.3	24.3	27.1	48.5
	2001	21.0	62.2	16.8	10.6	41.3	48.1
Panama	1991	19.0	67.9	13.1	24.0	45.6	30.5
	2002	21.4	65.2	13.4	16.8	48.1	35.1

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix I & Appendix II.

In general terms across the subregion, the tendency has been to equalise the distribution of these households across the three quantiles between 1990 and 2002. However Honduras represents an outlier as within the single person households only 4% of households belong in the bottom 20% of per capita incomes in 2002, a huge decrease from over 33% in 1990. This has been compensated for by large increases in the presence of this type of household within the upper quantiles of the distribution. Over half of single person households in 2002 in Honduras belong in the top 20% of per capita incomes.

Two parent families are under-represented in the top of the income distribution and more likely to be within the lower quantiles of per capita incomes. In Honduras, two parent families increased their likelihood of being in the lowest 20% of per capita incomes from 17% of these families in 1990 to 26% of these families in 2002. In terms of sole parent families, these families were over-represented in the lowest income quintile for the countries of the northern subregion, except for El Salvador, Honduras, Mexico and Nicaragua. For Mexico and Nicaragua sole parents were over-represented in the top 20% of per capita incomes, but for all other countries, sole parents were under-represented in the top quintile and this represented generally decreased between 1990 and 2002.

Table 6

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: TWO PARENT FAMILIES AND SOLE PARENT FAMILIES, DISTRIBUTION IN INCOME QUANTILES, CA. 1990 AND 2002

(Percent of income share)

Country	Year	2 Parent Families			Sole Parent Families		
		Bottom 20%	Middle 60%	Top 20%	Bottom 20%	Middle 60%	Top 20%
Costa Rica	1990	19.4	62.9	17.8	22.0	55.3	22.7
	2002	18.3	61.7	20.1	24.3	59.3	16.4
Dominican Republic	1992	13.7	65.0	21.3	33.3	51.1	15.7
	2002	17.4	63.8	18.9	29.9	55.1	15.0
El Salvador	1995	23.0	58.9	18.2	19.2	59.7	21.2
	2001	23.8	57.3	18.9	17.2	62.9	19.9
Guatemala	1989	22.3	62.7	14.9	22.9	56.2	20.9
	2002	21.5	64.4	14.1	20.5	60.1	19.4
Honduras	1990	16.9	65.2	17.9	32.6	52.4	15.0
	2002	26.0	59.9	14.2	15.1	58.6	26.3
Mexico	1989	22.1	61.1	16.8	11.4	61.7	26.9
	2002	23.5	61.1	15.4	12.8	64.4	22.7
Nicaragua	1993	22.5	60.0	17.4	19.0	59.3	21.7
	2001	23.2	59.6	17.1	14.2	68.3	17.5
Panama	1991	21.8	60.6	17.7	21.0	64.9	14.1
	2002	21.5	61.7	16.8	25.4	58.4	16.2

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix I and Appendix II.

Table 5 and Table 6 show that single persons are much more likely to be in the top per capita income quintile compared to other family types. Other family types are under-represented in the highest per capita income quintile.

Table 7 shows that the vast majority of sole parent households are where the sole parent is female. Guatemala has the highest proportion of male sole parents with 20.78% of sole parent families male in this country in 2002. The changes in proportions over time are mixed with increases in female sole parents in the Dominican Republic, El Salvador, Mexico and Nicaragua and decreases in female sole parents in the remaining countries of the northern subregion.

Table 7

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: PROPORTION OF FEMALE SOLE PARENTS, CA. 1990 AND 2002

(Percent)

Country	Year	Sole Parent	
		Male	Female
Costa Rica	1990	13.4	86.6
	2002	9.5	90.5
Dominican Republic	1992	17.6	82.4
	2002	15.5	84.5
El Salvador	1995	12.3	87.7
	2001	11.8	88.2
Guatemala	1989	16.5	83.5
	2002	20.8	79.2
Honduras	1990	12.5	87.5
	2002	14.4	85.6
Mexico	1989	16.0	84.0
	2002	14.0	86.0
Nicaragua	1993	17.3	82.7
	2001	12.6	87.4
Panama	1991	19.2	80.8
	2002	17.1	82.9

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix 1.

Table 5 and Table 6 showed that nuclear families did not seem to be advantaged compared to extended family structures in terms of income distribution. However it is interesting to see if there is a concentration of nuclear type families in more urban areas which are often wealthier than their rural counterparts. Table 8 shows that the majority of nuclear families can be in either urban or rural areas depending upon the country. Guatemala and Honduras have the majority of nuclear families located in rural areas. However the general trend between 1990 and 2002 has been to increase the likelihood of nuclear families being in urban areas. Large increases have been observed by all countries in the northern subregion except for Mexico.

Table 9 shows the distribution of households in the northern subregion by region and sex. Except for Guatemala and Honduras, the majority of households live in urban areas and this trend has increased between 1990 and 2002. Whilst the majority of households have a male head, there has also been an increase in the frequency of female heads of households over the period in all countries except Nicaragua.

Table 8

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: NUCLEAR FAMILIES BY REGION, CA. 1990 AND 2002 [a]

(Percent)

Country	Year	Nuclear	
		Urban	Rural
Costa Rica	1990	41.7	58.3
	2002	57.5	42.5
Dominican Republic	1992	55.2	44.8
	2002	68.7	31.3
El Salvador	1995	52.8	47.2
	2001	57.1	42.9
Guatemala	1989	34.6	65.4
	2002	37.2	62.8
Honduras	1990	38.1	61.9
	2002	42.3	57.7
Mexico	1989	62.1	38.0
	2002	61.6	38.4
Nicaragua	1993	50.1	50.0
	2001	54.8	45.2
Panama	1991	52.4	47.6
	2002	62.5	37.5

Source: Author's calculations based on household surveys for each country.

[a] Nuclear families include sole parent households, and two parent households with or without children. For details of household surveys and family structure definition, see Appendix 1.

Table 9

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: HOUSEHOLD GEOGRAPHICAL DISTRIBUTION AND SEX OF HOUSEHOLD HEAD, CA. 1990 AND 2002

(Percent in each category)

Country	Year	Rural	Urban	Female Head of Household	Male Head of Household
Costa Rica	1990	55.8	44.2	15.5	84.5
	2002	41.0	59.0	22.5	77.5
Dominican Republic	1990	44.5	55.5	21.0	79.0
	2002	30.4	69.6	27.7	72.3
El Salvador	1990	45.3	54.7	24.2	75.8
	2002	41.2	58.8	29.1	70.9
Guatemala	1990	62.9	37.1	14.9	85.1
	2002	61.2	38.8	18.9	81.1
Honduras	1990	58.8	41.2	19.2	80.8
	2002	54.2	45.8	23.3	76.7
Mexico	1990	38.2	61.8	11.3	88.7
	2002	38.0	62.1	16.2	83.8
Nicaragua	1990	44.4	55.6	27.3	72.7
	2002	41.7	58.3	27.1	72.9
Panama	1990	45.3	54.7	21.1	78.9
	2002	37.6	62.4	21.8	78.2

Source: Author's calculations based on household surveys for each country. For definitions of different family structure variables see Appendix II.

c) Education[15]

In every country of the northern subregion, the majority of individuals in the 25-54 year age group have at most a primary level of education. The lowest levels occur in Guatemala and Honduras with 78% and 83% of individuals with education below secondary level. Over the period 1990-2002, the countries of the subregion have managed to improve education levels, although the proportion rose for those in Nicaragua and Panama with a primary education or less. At the same time, both countries increased the proportion of those with post-secondary education. Costa Rica, Guatemala and Mexico were the countries of the subregion that made the largest gains in terms of increased education level over the period (see Table 10).

Table 10
CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: LEVELS OF EDUCATION OF POPULATION, AGED 25-54 YEARS, CA. 1990 AND 2002
(Percent)

Country	Year	Primary or less	Secondary	Post-Secondary
Costa Rica	1990	70.1	22.5	7.4
	2002	63.8	24.9	11.3
Dominican Republic	1992	74.6	18.7	6.7
	2002	69.3	20.5	10.2
El Salvador	1995	71.5	10.9	7.9
	2001	66.6	10.2	9.4
Guatemala	1989	86.6	11.4	2.1
	2002	77.9	18.4	3.6
Honduras	1990	85.5	12.5	2.0
	2002	82.5	14.4	3.1
Mexico	1989	67.7	26.8	5.6
	2002	55.6	35.2	9.2
Nicaragua	1993	71.0	24.9	3.8
	2001	72.4	22.5	5.1
Panama	1991	49.6	37.6	12.8
	2002	50.1	37.0	12.9

Source: Author's calculations based on household surveys for each country. For details of household surveys and education definition, see Appendix 1 and Appendix II.

The pattern of education is largely consistent across the family structures of each country of the northern subregion. There is little difference in education between family types. Table 11 shows the levels of education for sole parents,[16] which is similar to that of Table 12 for all family structures.

Once again the vast majority of sole parents, like other family types, have a primary level of education or less. Also Mexico and Panama have the greatest proportions of those with secondary education although they are the only countries that have over 40% of those 25-54 who have secondary education. Costa Rica, the Dominican Republic, El Salvador and Panama have the greatest proportion of those with post-secondary education.

[15] For definitions of different education levels see Appendix II. The analysis is conducted for the 25-54 year age group as it is this part of the population whose age allows a measurement of access to all of the education levels. Inclusion of individuals less than 25 years gives rise to possible selection bias when younger individuals cannot be in upper education levels such as tertiary education.

[16] Although not shown here, there was no large difference with other family types and the level of education.

Table 11

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: LEVELS OF EDUCATION OF SOLE PARENTS, AGED 25-54 YEARS, CA. 1990 AND 2002

(Percent)

Country	Year	Primary or less	Secondary	Post-Secondary
Costa Rica	1990	67.3	24.0	8.7
	2002	59.9	28.9	11.3
Dominican Republic	1992	70.2	21.3	8.6
	2002	67.2	22.6	10.2
El Salvador	1995	69.0	12.7	9.7
	2001	64.1	13.9	11.3
Guatemala	1989	84.3	13.6	2.1
	2002	76.0	20.6	3.4
Honduras	1990	81.9	16.1	2.0
	2002	77.0	19.0	4.0
Mexico	1989	58.3	36.1	5.6
	2002	49.8	40.7	9.5
Nicaragua	1993	70.5	25.9	3.5
	2001	65.4	26.1	8.5
Panama	1991	46.1	41.3	12.6
	2002	45.2	40.2	14.6

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix I.

Table 12 provides an aggregate measure of household level of education. The proportion of the 25-54 year population within the household was calculated by education level. Table 12 shows that between 76%-93% of households have less than one in four members who have post-secondary education. Costa Rica, Panama and the Dominican Republic are those countries most likely to have a higher than 25% proportion of household members aged 25-54 with post secondary education. Over time, the proportion within the household with post-secondary education has increased.

Table 13 shows evidence that the returns to education increase with education level. Individuals with lower education levels dominate the lower income quantiles. The top 20% of income earners is dominated by those with higher education levels. The greatest differences exist in Mexico and Panama with over 30% of those with primary education or less in the bottom 20% of per capita incomes (see Table 13). Those with post-secondary education are far more likely to be in the top 20% of incomes.

Table 13 also shows that the returns to education have increased. This is evident because over the period 1990-2002, those with less education have been more likely to be in lower quantiles, than they were previously. Conversely, those with higher education have increased their likelihood of forming part of the upper income quantiles, especially the top 20% of incomes.

Table 12

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: DISTRIBUTION OF HOUSEHOLDS HOLDING POST-SECONDARY LEVEL OF EDUCATION BY QUANTILES, CA. 1990 AND 2002

(Percent)

Country	Year	Below 25%	25%-50%	50%-74%	75%-100%
Costa Rica	1990	85.4	3.8	7.2	3.6
	2002	77.7	5.6	10.7	6.1
Dominican Republic	1992	84.1	11.1	2.9	2.0
	2002	79.8	12.0	3.3	4.9
El Salvador	1995	90.6	6.2	1.7	1.5
	2001	86.9	8.8	2.0	2.4
Guatemala	1989	96.2	2.8	0.6	0.4
	2002	93.1	5.0	1.0	1.0
Honduras	1990	96.1	2.8	0.7	0.4
	2002	93.2	4.3	1.3	1.2
Mexico	1989	89.1	8.0	1.3	1.6
	2002	83.6	10.2	2.4	3.8
Nicaragua	1993	94.2	4.1	0.7	1.0
	2001	91.2	5.8	1.5	1.5
Panama	1991	78.0	13.8	4.4	3.8
	2002	76.5	14.4	4.4	4.8

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix 1.

Table 13

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: LIKELIHOOD OF PER CAPITA INCOME QUANTILE FOR INDIVIDUALS 25-54 YEARS WITH PRIMARY EDUCATION OR LESS AND WITH POST-SECONDARY EDUCATION, CA. 1990 AND 2002

(Percent of income share at each education level)

Country	Year	Less than Primary Level			Post secondary		
		Bottom 20%	Middle 60%	Top 20%	Bottom 20%	Middle 60%	Top 20%
Costa Rica	1990	26.6	62.7	10.7	2.2	36.6	61.2
	2002	28.8	63.8	7.4	2.9	36.3	60.9
Dominican Republic	1992	21.8	63.6	14.5	12.4	40.7	46.9
	2002	24.8	63.2	12.0	5.7	39.7	54.6
El Salvador	1995	26.2	62.8	11.1	0.2	26.0	73.8
	2001	26.3	59.8	13.8	2.2	26.6	71.2
Guatemala	1989	22.3	64.0	13.6	0.9	12.5	86.6
	2002	24.2	63.7	12.2	0.6	21.6	77.9
Honduras	1990	22.1	65.2	12.7	8.4	9.5	82.1
	2002	24.7	64.0	11.4	0.6	21.4	78.0
Mexico	1989	27.0	62.3	10.7	1.5	56.3	42.3
	2002	30.2	61.4	8.4	1.4	51.8	46.9
Nicaragua	1993	28.6	53.1	18.3	6.1	29.6	64.3
	2001	24.4	61.8	13.8	1.8	33.4	64.8
Panama	1991	28.8	63.4	7.8	3.1	42.3	54.6
	2002	32.4	58.4	9.1	2.3	41.9	55.8

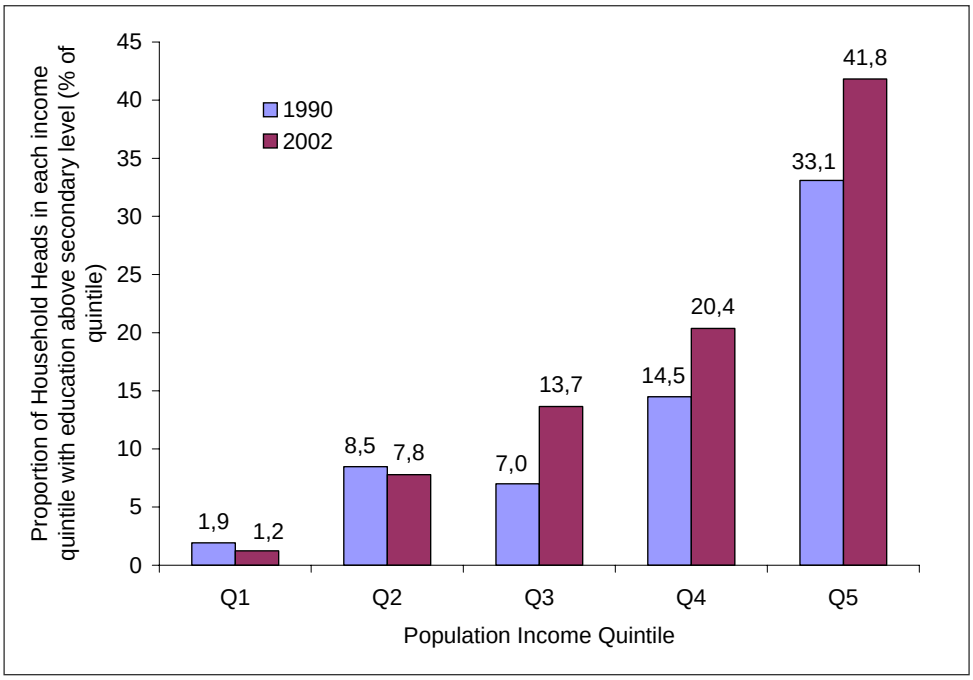
Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix 1.

The increase in returns to education is shown in Graph for the entire northern subregion. The presence of household heads in low per capita income quintiles has decreased over time, whilst the proportion in the high income quintiles, especially the top 20%, has increased dramatically.

Graph

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: PROPORTION OF HOUSEHOLD HEADS AT EACH PER CAPITA INCOME QUINTILE WITH POST SECONDARY EDUCATION, AVERAGE [a], CA. 1990 AND 2002

(Percent of income quintile)



Source: Author's construction from household surveys in each country. Proportion of total household heads in each quintile. For definitions of different education levels see Appendix II.

[a] Subregion total is simple average.

Table 14 examines the link between the households that have at most a primary education, and their family structure. However, there seems to be little contrast across family structures. Households without a conjugal nucleus, couples with children and sole parents are least likely to have a majority of members with primary education or less. Extended and composite families are more likely to have over 50% with primary or less education.

Table 15 shows the proportion of households within each family type that have a majority of members of prime age members with post-secondary education. Single person households and those without a conjugal nucleus are more likely to have a majority of members with post-secondary education. However, the trend differs between the countries of the northern subregion. Costa Rica, Panama and Mexico are the best performers in this area.

Table 14

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: PROPORTION OF HOUSEHOLDS WITH MORE THAN 50% OF MEMBERS AGED 25-54 YEARS HAVING AT MOST A PRIMARY EDUCATION, BY FAMILY STRUCTURE, CA. 1990 AND 2002

(Percent of each family category)

Country	Year	Single Person	No conjugal nucleus	Couple without children	Couple with Children	Sole Parent	Extended	Composite
Costa Rica	1990	71.9	60.1	57.7	50.7	52.7	64.4	60.7
	2002	61.6	42.9	47.5	39.3	38.9	52.1	57.1
Dominican Republic	1992	88.5	62.7	56.9	50.2	52.5	60.3	13.8
	2002	76.7	52.8	59.2	49.4	47.0	58.1	46.8
El Salvador	1995	62.5	37.7	40.8	31.5	34.3	38.5	29.0
	2001	53.3	31.1	37.8	21.7	21.9	29.3	23.1
Guatemala	1989	89.3	71.7	80.6	85.9	78.5	83.2	64.5
	2002	75.3	53.9	82.5	73.2	67.9	70.4	43.6
Honduras	1990	81.2	71.7	75.9	81.0	74.7	82.2	68.8
	2002	78.2	63.2	74.5	74.3	63.8	75.8	66.8
Mexico	1989	75.0	48.2	57.8	50.8	41.2	60.0	58.5
	2002	64.2	37.0	56.9	34.8	29.1	42.5	38.6
Nicaragua	1993	77.2	71.0	69.1	69.2	63.3	68.8	65.3
	2001	81.7	54.9	55.6	61.6	48.4	65.4	50.2
Panama	1991	48.2	21.9	33.2	30.5	23.1	28.1	21.0
	2002	56.7	33.0	37.9	28.2	23.2	35.9	35.9

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix 1.

Table 15

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: PROPORTION OF HOUSEHOLDS WITH MORE THAN 50% OF MEMBERS HAVING POST-SECONDARY EDUCATION, BY FAMILY STRUCTURE, CA. 1990 AND 2002

(Percent of each family category)

Country	Year	Single Person	No conjugal nucleus	Couple without children	Couple with Children	Sole Parent	Extended	Composite
Costa Rica	1990	11.0	10.5	13.3	13.0	13.3	4.6	7.1
	2002	17.8	20.9	14.5	19.6	18.6	7.9	8.1
Dominican Republic	1992	3.4	3.3	5.5	5.1	9.1	4.0	0.0
	2002	8.3	8.6	7.5	8.7	11.2	6.1	10.0
El Salvador	1995	4.9	4.3	2.8	3.7	5.0	2.0	4.4
	2001	7.5	3.4	5.2	5.2	4.8	3.2	4.7
Guatemala	1989	2.0	2.0	1.6	0.9	1.2	0.7	0.0
	2002	7.8	7.4	2.5	1.6	1.3	2.9	0.0
Honduras	1990	3.8	3.2	1.5	1.1	0.8	0.9	2.2
	2002	6.3	5.0	3.0	1.6	3.6	1.6	2.7
Mexico	1989	8.4	7.0	5.7	3.1	2.5	1.8	1.6
	2002	14.5	17.0	9.6	6.2	7.1	3.6	12.4
Nicaragua	1993	6.4	0.3	5.3	1.8	3.5	0.9	5.7
	2001	5.2	2.9	8.4	3.0	7.1	2.2	3.8
Panama	1991	9.6	11.4	9.2	9.1	8.2	6.0	10.3
	2002	12.8	13.2	9.2	10.6	12.3	6.2	7.1

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix I and Appendix II.

d) Labour market

The countries of the northern subregion are characterized by a large informal sector. The informal sector consists of self employed workers, employees of micro enterprises with less than six people, domestic service workers and those employed in unpaid family work and businesses. The professionals are excluded. Self-employed workers represent between 12% of those employed in Costa Rica in 1990 to 27% of employed workers in the Dominican Republic in 2002. Both the Dominican Republic and El Salvador have had the highest proportion of workers self-employed, over one fifth in each country. Costa Rica and Mexico have had the lowest proportions. However the proportion of self-employed workers increased over the period for all countries, except El Salvador.

For occupational categories in the informal sector other than the self employed, employment in these sectors was more likely for the countries of Costa Rica, El Salvador, Guatemala, Mexico and Nicaragua. The lowest proportions of informal employment apart from self-employed workers occurred for Honduras and the Dominican Republic.

Agriculture remains an important but decreasing source of employment in the northern subregion. Guatemala and Honduras still have a large proportion of employment in Agriculture in 2002, almost 40% of employment in each case. Costa Rica, the Dominican Republic and Mexico have the lowest proportions of agricultural employment at around 16%-17% of employment for these countries.

Guatemala and Nicaragua have the lowest levels of formal employment within the subregion, with less than one quarter of employment in this sector. Only the Dominican Republic and Nicaragua decreased the proportion of those employed in private sector positions whilst every country in the subregion decreased their public sector in terms of employment (see Table 16).

Table 16

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: OCCUPATIONAL STRUCTURE OF EMPLOYED INDIVIDUALS, CA. 1990 AND 2002

(Percent)

Country	Year	Formal Sector [a]		Informal Sector [b]				Agriculture
		Private	Public	Self employed	Micro enterprises	Domestic Service	Unpaid family	
Costa Rica	1990	29.6	17.0	12.1	9.0	4.3	2.0	26.1
	2002	37.2	14.0	14.3	12.3	4.3	1.8	16.0
Dominican Republic	1992	31.7	13.8	24.2	3.5	4.3	1.7	20.7
	2002	29.7	11.8	27.3	9.0	4.3	0.9	16.6
El Salvador	1995	24.0	8.7	20.4	12.5	3.9	3.4	26.5
	2001	28.0	8.5	20.2	11.7	4.7	5.0	21.4
Guatemala	1989	15.0	5.2	14.0	11.3	2.5	3.1	49.1
	2002	18.9	3.8	15.9	12.3	2.6	7.0	39.5
Honduras	1990	16.0	8.5	18.2	6.2	4.0	3.0	43.1
	2002	21.1	5.6	19.2	7.8	2.6	4.0	38.6
Mexico	1989	27.8	11.6	13.3	18.6	3.5	3.5	21.6
	2002	29.0	11.1	15.4	17.9	4.5	5.0	17.1
Nicaragua	1993	20.3	14.7	14.9	7.6	5.5	5.1	32.0
	2001	16.4	8.3	17.5	12.8	5.6	5.2	34.3
Panama	1991	25.8	22.4	13.7	4.9	5.8	0.9	26.5
	2002	30.4	16.1	18.3	7.2	5.6	0.8	21.5

Source: Author's calculations based on household surveys for each country. For details of household surveys, sector and employment definitions, see Appendix I and Appendix II.

a A person is employed in the formal sector if he or she is over 12 years of age and employed in the non-agricultural public or private sector, excluding the informal employment categories.

b Informal sector excludes those in professional occupations.

The employment structure of the northern subregion shifted away from agriculture over the period 1990 to 2002 and towards services sectors (see Table 17). Guatemala and Honduras and Nicaragua retain the biggest agricultural sectors in terms of employment with around 40% of persons in each case working for this sector. In terms of manufacturing, the sector is largest, around 17%, for El Salvador and Mexico in 2002 and smallest for Panama with only 9% in 2002. Mexico, Honduras and Guatemala were also the only countries of the subregion to experience increases in the share of the manufacturing sector. Both construction and transport and the storage and communications sectors account for little of the employment in the subregion. The commercial and hospitality sector accounts for up to one quarter of total employment in the Dominican Republic and El Salvador whilst Costa Rica, Mexico and Panama have the largest services sectors of the countries of the subregion.

Table 17

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: DISTRIBUTION OF EMPLOYED PERSONS BY SECTOR OF ECONOMIC ACTIVITY, CA. 1990 AND 2002

(Percent)

Country	Year	Agriculture and Mining	Manu-facturing	Construc-tion	Commercial, Hospitality	Transport, Storage, Communica-tions	Other Services
Costa Rica	1990	26.1	18.0	6.5	15.7	3.9	29.9
	2002	16.0	14.3	6.7	24.3	5.7	33.0
Dominican Republic	1992	21.0	16.8	3.8	21.1	5.9	31.5
	2002	16.8	14.3	6.2	26.0	7.5	29.2
El Salvador	1995	27.0	19.3	6.6	22.8	4.1	20.2
	2001	21.9	17.6	5.4	27.2	4.6	23.2
Guatemala	1989	50.1	13.7	4.0	13.2	2.6	16.5
	2002	41.6	15.5	5.0	21.7	2.0	14.3
Honduras	1990	43.7	13.5	4.9	16.5	2.4	18.9
	2002	39.0	15.9	5.2	20.0	3.2	16.6
Mexico	1989	27.4	16.2	6.5	16.7	3.6	29.6
	2002	17.1	17.3	7.5	20.3	4.3	33.4
Nicaragua	1993	32.6	11.6	3.2	21.8	3.6	27.1
	2001	35.1	11.3	4.9	23.2	3.6	21.9
Panama	1991	26.7	9.6	3.6	19.9	6.9	33.3
	2002	21.6	9.0	6.4	21.9	7.3	33.8

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix 1.

Table 18 shows the household working age to population ratio and unemployment rates for each country of the northern subregion. The open unemployment rate is highest for the Dominican Republic, Nicaragua and Panama and lowest for Guatemala, Honduras and Mexico. However given the difficulty with the unemployment rate as a measure of lack of full employment, considering measurement problems, and especially underemployment, the changes in the rate are the measure of interest here.[17] In Costa Rica, Guatemala, Mexico and Panama the unemployment rate increased over the period. The remaining countries experienced a decrease in unemployment between 1990 and 2002.

[17] Given these problems with the formal definition of unemployment, a more useful indicator is often the number of employed divided by the working age population.

The household working age to population ratio here is the proportion of household members of working age, divided by the total household population.[18] Except for Guatemala, the ratio in each country of the northern subregion has been increasing following a pattern of demographic transition in the region, meaning that there are more people of working age for the population of the household. Generally, over half of the population in each household is of working age.

Table 18

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: HOUSEHOLD WORKING AGE TO POPULATION RATIO AND UNEMPLOYMENT RATE (UE), CA. 1990 AND 2002

(Percent of unemployed labour force)

Country	Year	UE	Household working age to population ratio
Costa Rica	1990	4.6	55.5
	2002	6.4	58.7
Dominican Republic	1992	20.1	56.3
	2002	16.2	57.1
El Salvador	1995	7.7	52.4
	2001	7.0	53.2
Guatemala	1989	2.0	70.1
	2002	3.1	64.5
Honduras	1990	4.2	48.2
	2002	3.8	51.8
Mexico	1989	2.7	53.3
	2002	2.9	55.7
Nicaragua	1993	12.5	49.8
	2001	11.3	53.4
Panama	1991	16.1	55.5
	2002	17.6	57.4

Source: Author's calculations based on household surveys for each country. For details of household surveys and definitions, see Appendix I and Appendix II.

To determine the changes in female labour market activity over the period, Table 19 and Table 20 describe the proportion of females of working age who are economically inactive[19] (Table 19) or in formal education (Table 20) by their respectively levels of education. If changes in income inequality are due to changes in female labour force participation then this will be observed in the tables.

Table 19 shows increasing rates of economic activity for females across the northern subregion. At low education levels, females are less likely to be economically active. At post-secondary levels of education, the vast majority of females are in the labour force. Only one in five females was not economically active at this level of education in 2002.

[18] The dependency rate measures the ratio of total household members of working age divided by total members not of working age. The household working age to population ratio is similar to the dependency rate but instead uses the total household population as the denominator, making the measure more easily interpretable, especially for households where all members work and would otherwise have 0 as the denominator. Therefore the terminology 'household working age to population ratio' is used. The formula for converting between the household working age to population ratio (Ratio) and the dependency rate (DR) is given as: $Ratio = 1 \Big/ (1 + \frac{1}{DR})$.

[19] Economically inactive persons are those who are not employed or unemployed but are of working age.

Table 19

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: PROPORTION OF ECONOMICALLY ACTIVE FEMALES WITHIN EACH LEVEL OF EDUCATION, CA. 1990 AND 2002

(Percent in each education level)

Country	Year	Primary or less	Secondary	Post-Secondary
Costa Rica	1990	28.0	44.8	69.8
	2002	39.2	53.7	79.5
Dominican Republic	1992	44.8	63.1	88.0
	2002	50.5	69.0	85.9
El Salvador	1995	46.2	67.8	83.0
	2001	49.0	67.4	81.9
Guatemala	1989	26.5	63.0	82.2
	2002	50.6	68.0	84.2
Honduras	1990	33.7	65.5	68.5
	2002	39.7	63.6	79.1
Mexico	1989	28.3	48.7	71.7
	2002	44.7	54.8	78.4
Nicaragua	1993	49.1	64.8	78.8
	2001	49.6	70.1	79.7
Panama	1991	30.0	56.9	78.3
	2002	40.0	61.2	84.0

Source: Author's calculations based on household surveys for each country. For details of household surveys and family structure definition, see Appendix I and Appendix II.

Table 20 shows that the formal employment levels for women with less than post-secondary education are generally trending downwards over time, probably as a result of increasing informal employment. However post-secondary education is almost certain to lead to formal employment for females in the northern subregion where the majority of the countries have rates over 90% for this group of women. Table 20 also indicates that the decreasing trend in formal employment may not be due to a decrease in the numbers of females in formal employment. Instead it may be due to increases in female labour market participation from lower education levels or lower skilled female entrants who are more likely to enter the labour market through the informal sector. This would push down the proportion of females in the formal sector although the absolute numbers may not have fallen.

2. Summary of general trends and patterns amongst households

The northern subregion is characterized by a great deal of heterogeneity in the patterns and trends of individual and household characteristics in each country. As indicators for levels of social development, these characteristics show that Costa Rica, Mexico and Panama are the best performers. The countries that lag farthest behind are Guatemala, Honduras and Nicaragua. Persistent gains in reducing poverty rates are offset by mixed performance with regard to improving inequality in the northern subregion. At this preliminary level of analysis, inequality is most affected by the distribution between urban and rural areas, education differences and labour market factors.

Table 20

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: PROPORTION OF FEMALES IN FORMAL EMPLOYMENT WITHIN EACH LEVEL OF EDUCATION, CA. 1990 AND 2002

(Percent in each education level)

Country	Year	Primary or less	Secondary	Post-Secondary
Costa Rica	1990	31.7	61.6	93.8
	2002	24.4	49.8	93.4
Dominican Republic	1992	28.1	71.0	83.4
	2002	28.8	51.1	83.9
El Salvador	1995	11.8	50.7	85.4
	2001	12.1	44.8	89.7
Guatemala	1989	10.1	58.8	81.8
	2002	7.2	44.9	89.2
Honduras	1990	11.9	64.0	93.5
	2002	18.2	52.5	89.4
Mexico	1989	35.0	78.8	92.8
	2002	17.2	50.8	89.3
Nicaragua	1993	26.7	56.0	85.6
	2001	11.9	44.6	85.0
Panama	1991	24.9	65.1	92.9
	2002	13.2	49.9	93.5

Source: Author's calculations based on household surveys for each country. For details of household surveys and definitions, see Appendix I and Appendix II.

The small changes in family structures do not imply a large effect upon inequality. This is a consistent finding from demographic trends across the countries of the northern subregion. However the increase in female economic activity and increase in informal employment often in lower skilled occupations indicate that these factors could have larger effects upon inequality. One finding that begs further investigation is the rise in the proportion of sole person households and their over-representation in upper income quantiles of the income distributions in each country.

It is likely that the economic growth and labour market trends are closely interlinked with structural change occurring gradually in each economy. The diminishing agricultural sector is more prominent in those countries performing better within the subregion, especially Costa Rica, Mexico and Panama. This coupled with a move away from rural areas would explain high inequality levels between urban and rural areas as the rural population is still large.

Closely tied to this relationship is the pattern of education across the subregion. Whilst the proportion of individuals at the lowest education levels diminish only slowly, the distribution of education shows signs of widening in some countries of the subregion, with higher increases in post-secondary education over secondary level education. This will lead to inequality if the returns to education are high and if the increased education fails to translate into increased formal sector employment. As shown by the high proportion of post-secondary individuals in the top 20% of incomes, this is indeed the case. In addition the returns to education are rising due to the increase in the proportion of highly educated individuals in the top of the income distribution.

The use of the decomposition techniques in the next chapter can shed more light on the ability of the individual and household factors to explain the level and differences in inequality between the years 1990 and 2002.

IV. Theil decomposition of the level of income inequality

In this chapter a standard Theil decomposition is carried out to determine the contribution of different individual and household factors upon the levels of inequality for each country, in each of the two years.[20]

The Theil index has a range from 0 (no inequality) up to a value of the log of the number of observations, but empirically tends to stay within a range of 0 to 1. The Theil decomposition is one of many conventional techniques that involve the decomposition of the Theil index by population and income subgroups. This is because the Theil index is additively decomposable (Cowell and Jenkins, 1995). Inequality in terms of the Theil index can then be expressed as the sum of the inequality between the subgroups. This is called the between-group inequality. The remaining inequality not explained by this sum of all subgroup inequality is defined as the inequality within-groups.

Two decompositions are conducted for each country of the northern subregion. The first is conducted on household income per capita using subgroups based on household characteristics. The second is a decomposition for income earners based upon individual level characteristics. This then provides a broad picture of the differences between factors important for household per capita income inequality and individual primary earner inequality. In addition the identification of these factors is useful for their use in the DFL decomposition studying inequality changes.

[20] A full description of the Theil index and the Theil decomposition methodology is given in Appendix III.

1. Theil decomposition of household per capita and individual income inequality

In terms of the household decomposition, household per capita income inequality was separated into different groups according to the family structure, region of the household if urban or rural, the household working age to population ratio, the proportion of females in the household, the proportion of the household whose members aged between 25-54 years have a primary school education or less, the proportion of economically active members of the household who are unemployed and the proportion of employed members who work in the informal or agricultural sector.

The results given in Table 21 (column TOT) suggest that all of the household factors explain between 20%-65% of the total income inequality in each country of the northern subregion.[21] In general across the subregion, differences in household factors explain around half of the total income inequality in the subregion.

When considering each factor alone, it is clear that educational factors, urban or rural distribution and employment in the informal and agricultural sectors are most important determinants for the level of inequality in each country-year. Only in the Dominican Republic and Panama were these factors of little influence but in these cases the ability of all the factors to explain the level of inequality was low.

Table 21

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: CONTRIBUTION OF MAIN IDENTIFIABLE FACTORS TO HOUSEHOLD PER CAPITA INCOME INEQUALITY IN EACH COUNTRY EXPLAINED BY THE THEIL INDEX, CA. 1990 AND 2002 [a b]

(Percent)

Country	Year	Fam	Reg	% Fem	% Prim	Ratio	% UE	% Inf	Total
Costa Rica	1990	4.1	11.9	0.5	9.0	8.7	1.7	10.9	46.7
	2002	5.9	7.2	0.3	7.1	5.5	3.4	15.0	44.5
Dominican Republic	1990	2.4	2.9	0.2	3.0	2.8	4.5	3.6	19.4
	2002	5.7	4.4	0.5	4.4	5.6	3.3	4.6	28.4
El Salvador	1990	3.9	18.3	0.6	21.5	7.8	3.6	9.1	64.8
	2002	4.8	18.4	1.0	18.8	4.6	2.9	12.7	63.1
Guatemala	1990	3.4	19.7	0.2	20.8	1.7	0.2	19.7	65.6
	2002	4.2	17.1	1.8	14.2	3.8	0.2	11.0	52.3
Honduras	1990	4.3	14.8	0.5	11.8	16.5	0.2	11.3	59.5
	2002	4.8	20.1	1.5	10.4	9.8	0.1	19.2	65.8
Mexico	1990	8.0	12.1	0.7	19.6	7.6	0.3	4.5	52.6
	2002	8.4	11.4	0.5	11.7	5.9	0.1	7.7	45.6
Nicaragua	1990	5.1	12.8	0.4	11.5	6.1	1.3	8.4	45.6
	2002	8.6	11.6	1.4	10.2	6.9	1.4	10.9	51.0
Panama	1990	1.5	16.7	2.8	3.9	0.5	6.7	1.7	33.8
	2002	1.2	9.6	1.3	5.7	1.2	7.0	1.8	27.8

Source: Author's calculations based on household surveys for each country. For definitions of Theil index and methodology see Appendix III.

[a] Fam = Family Structure, Reg = Geographical Region, Ratio = Household working age to population ratio, % Fem = Proportion of household female, % Prim = Proportion of household aged 25-54 that have primary education or less, % UE = proportion of household economically active that is unemployed, % Inf = proportion of employed members of household that work in informal and agricultural sectors, For details of the variables see Appendix II.
[b] Identifiable factors are restricted by the household survey data.

[21] The remaining unexplained portion of inequality is explained by factors for which information is not provided in the household surveys.

Regional differences tended to be more important in Honduras, Guatemala and El Salvador. The importance of education as a large determinant of household per capita income inequality is not surprising, given the difference in the distribution of income shown for different levels of education in the previous chapter. The proportion of the household with primary education or less is most important as a factor of income inequality in El Salvador, Guatemala and Mexico. It is less important as a determinant in the Dominican Republic and Panama, accounting for only 4.4% and 5.7% of income inequality respectively.

Labour force characteristics of the household, including the proportion working in the informal or agricultural sector, also play a large role in income inequality in the northern subregion. However the proportion of the household unemployed had only minor effects on inequality. In terms of the proportion of the household in total informal or agricultural employment, the largest effects occurred in Costa Rica Guatemala and Honduras where at one time in each country, the proportion of the household in informal work explained over 15% of income inequality. The household working age to population ratio was important for Honduras where it explained over 16.5% of household inequality around 1990, but no so for other countries. Family structure differences also had only small effects on household income inequality and the proportion of the household that are female, did not have a significant impact on household inequality in either period, for any country of the northern subregion.

The decomposition of the Theil index for employed individuals was carried out for groups including family structure of the household that the individual belonged to, sex of the person, labour market characteristics including whether the person worked in the informal or agricultural sector, the sector of economic activity, regional differences, and the level of education of the employed person.

Table 22 shows that the proportion of inequality explained between groups of employed individuals, is much greater than the proportion between households for the countries of the northern subregion. In the majority of countries, the inequality between groups explained more than half the total inequality.

As was the case with the decomposition of household per capita income inequality, the individual income decomposition shows educational, regional and labour market factors to be the most important differences in explaining income inequality for individuals. Differences in education for income earners explained around one quarter or more of total individual primary income inequality except for the Dominican Republic, El Salvador and Nicaragua in 1990 and Panama in 2002. For Honduras, educational differences explained nearly one-third of total individual primary income inequality in both periods.

Regional differences were less important in explaining individual primary income inequality than they were in explaining household per capita income inequality. Differences in rural and urban areas explained 4%-20% of individual primary income inequality in all countries apart from the Dominican Republic in 1990.

Differences in the family structure of the individual income earner played a minor role in explaining income inequality in each country and period. Family structure differences were most important in Nicaragua where they explained up to 6.1% of primary income earner inequality. Differences in sex seemed unimportant in explaining inequality in all of the countries of the northern subregion with sex only accounting for over 3% of total inequality in the final period for Guatemala and Mexico, and for Panama in the first period.

Table 22

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: CONTRIBUTION OF MAIN IDENTIFIABLE FACTORS TO INDIVIDUAL PRIMARY INCOME INEQUALITY, EXPLAINED BY THE THEIL INDEX, CA. 1990 AND 2002 [a b]

(Percent)

Country	Year	Fam	Reg	Sex	Edu	Inf	Sec	Total
Costa Rica	1990	3.0	6.3	2.7	26.0	12.0	8.7	58.7
	2002	3.3	3.5	3.0	30.1	21.6	3.5	65.1
Dominican Republic	1990	1.3	1.1	1.4	5.4	0.2	1.4	10.7
	2002	1.3	5.6	1.0	21.6	7.6	4.6	41.7
El Salvador	1990	3.0	9.5	3.4	23.9	10.2	8.1	58.2
	2002	2.1	7.5	2.6	25.3	12.3	7.2	57.0
Guatemala	1990	0.8	10.2	0.4	27.6	12.0	10.3	61.2
	2002	1.3	9.4	5.9	26.4	14.6	7.7	65.3
Honduras	1990	1.4	7.9	1.7	25.2	8.4	4.4	49.0
	2002	1.0	12.5	0.2	32.3	13.8	14.1	73.8
Mexico	1990	2.6	6.1	2.6	19.1	2.1	4.3	36.9
	2002	2.0	11.9	5.4	26.0	12.2	7.5	64.9
Nicaragua	1990	0.3	10.3	0.0	15.9	3.5	9.3	39.3
	2002	4.0	6.4	0.5	26.1	7.2	7.9	52.1
Panama	1990	5.5	20.9	4.7	22.9	0.4	21.1	75.5
	2002	6.1	11.9	1.5	19.1	1.3	18.2	58.1

Source: Author's calculations based on household surveys for each country. For definitions of Theil index and methodology see Appendix III.

[a] Fam = Family Structure, Reg = Geographical Region, Inf = if individual employed in informal or agricultural sectors, Sex = Sex of individual, Sec = Sector of economic activity, Edu = education level of individual. For details of the variables see Appendix II.

[b] Identifiable factors are restricted by the household survey data.

Labour market characteristics had a large effect on individual primary income inequality for the northern subregion, through the combined differences in industry and differences in formal or informal employment. Industry differences had the smallest effects in Costa Rica, the Dominican Republic, El Salvador and Mexico. They had larger effects in Guatemala, Honduras and Panama; explaining at least 10% of total individual primary income inequality.

Differences across occupational groups tended to be larger determinants of individual income inequality if industry differences only explained a small amount of inequality in each country. These are obviously related and the combined effect of both groups is a significant determinant of individual primary income inequality.

2. Summary of results

The Theil decomposition results confirm the major determinants of income inequality for the northern subregion that were outlined in Chapter III. They are also consistent with the literature reviewed in Chapter II.

The ability of the characteristics to explain more individual income inequality than household income inequality is interesting, but not surprising. One factor is the limitation of the survey data's ability to capture household aggregates that express the intra-household dynamics that are taking place. Another explanation is that inequality tends to be centred on the labour market and individual inequality and characteristics better capture these differences. Household income inequality includes non-labour market factors which are more difficult to capture, but also perhaps less important in determining the level of income inequality. Evidence of the large role for the labour

market in income inequality determination is captured by the combination of characteristics that were the most important determinants in the Theil decompositions.

In both decompositions, education and rural/urban differences played a major role in the proportion of between-group inequality. The high results for education correspond with the results of ECLAC (2004), Lopez-Acevedo (2000), and de Ferranti et al. (2003), although de Ferranti et al. (2003) is the only one to strongly emphasize the regional differences. The strong education and labour market factors influence in the individual income earner decomposition is in line with the findings of Alejos (2003), and Morley (2002), who also conducted decompositions on wage earners.

In terms of household decomposition, the literature in Chapter II highlighted links between education and factors such as the size of the household (ECLAC, 2003a) and family structure (Jenkins, 1995). In the household decomposition conducted here, the family structure variable captures the size of the household. The results of the household Thiel decomposition failed to show that differences in family structure and household working age to population ratio are important determinants of the level of household per capita income inequality. However, it is possible in this case that since the structural changes in family composition have not been observed over a long time period —the interval is only 12 years wide— they do not allow considerable variations to have an effect.

Another point worthy of mention is that the importance of employment differences between the formal and informal sectors combined with the effects of industry differences is consistent with a priori expectations and the conclusions drawn from de Ferranti et al. (2003) or ECLAC (2004a), where the latter emphasizes the increasing income differential between formal and informal sectors of the labour market in Latin America (p. 129).

V. Decomposition of changes in individual and household income inequality: results from the DFL methodology

Whilst the Theil decomposition conducted in the previous chapter is meaningful for identifying household and individual characteristics that contribute to income inequality, the DFL methodology is used here to assess the impacts of changes in the household and individual characteristics upon changes in income inequality over the 'window' of 1989-1990 to 2001-2002.

As explained in Chapter II, the methodology is simply a comparative static exercise using a simulated distribution, and does not map the entire dynamic process of the interaction between the various demographic, education and labour market characteristics and the income inequality. This would require a fully specified recursive dynamic model. However, the DFL methodology can provide great insight into the effects of changes in various individual and household factors upon changes in income inequality.

The DFL methodology was carried out for each country of the northern subregion. It shows effects of the changes in household and individual characteristics upon income inequality by replacing the household or individual characteristics of the latest sample (for the example of Costa Rica this is the 2002 sample) with the household or individual characteristics of the sample from the first period (1990 for Costa Rica). Comparing the differences between the actual (2002)

income distribution and the simulated distribution (2002, with 1990 characteristics) gives the effect of the changes in the household and individual characteristics. In essence the question that is being asked is: "what is the effect upon the income distribution of 2002 if we hold the household or individual characteristics as they were in 1990?"

To measure the effects of different characteristics, the exercise is carried out by first changing all of the characteristics, and then comparing this counterfactual with the effects of changing all of the characteristics except the one in question. For example, to measure the effects of a change in education, the counterfactual distribution including education (holding all characteristics and education at 1990 values) is compared to holding all characteristics, except education at 1990 values (that is, holding education at 2002 values and changing all other characteristics to reflect 1990 values).

Measuring the effects of several changes requires the sequential elimination of the relevant variables from the counterfactual and assessing the results obtained from the difference between the inclusion of the variable and the exclusion of the variable. The results of isolated effects can be sensitive to the ordering by which the variables are removed from the reweighing. However, a simple way of checking this sensitivity is to reverse the order of the sequential elimination. The results of the reverse ordering are given in Appendix V.[22]

Changing the characteristics of one sample to match the characteristics of another sample can be done in two ways. The first is to directly reweigh the individual characteristics and the alternative is the use of a probability model such as the logit or probit models. For example, if there are 60% of households headed by women in the 2002 sample, but only 40% in the 1990 sample, the resampling is done by reweighing the observations in the 2002 sample downwards so that the proportion of households headed by women is 40%. This can also be thought of as up-weighting the proportion of households headed by males. Observations that do not include entries for the characteristic in question (in this case male or female) are left in the sample without any reweighing. Therefore the implicit reweighing ratio here is 1, to maintain the observations at their original level and only change those observations whose effects are to be isolated.

However, instead of reweighing each observation by each outcome of each variable separately, the use of a probability model facilitates the process more quickly. By specifying a logit model of the probability of being in a particular sample, for example the probability of being in the 2002 sample, given the set of household characteristics, the same reweighing can take place if the independent variables in the logit equation are specified as dummy variables for each outcome of each variable. In this case the family structure variable contains seven dummy variables, one each for single persons, non-nuclear households, couples without children, couples with children, sole parents, extended households and composite households.

The population weights in each sample are then changed according to the results from the logit regression and the characteristics of each observation. More detail about this is given in Appendix IV. It should be noted here that the logit estimation is not a model of labour force participation or household per capita income generation. However the procedure is categorized as semi-parametric due to the use of the logit model.

The DFL routine was run separately for both household per capita income distribution and individual income distributions. In each case the characteristics were grouped into four major categories: family structure, demographic effects, education effects and labour market effects. For example, in the case of the demographic effects, for households this includes the variables for geographical location, the proportion of the household that is female and the household working age to population ratio. For the individual DFL routine, the demographic effects include the

[22] The results from the reverse ordering displays some sensitivities but do not significantly change the results and conclusions given later in the chapter.

geographical location and the sex of the individual. The groupings in total contain all of the variables created and used in the Theil decompositions.

The grouping of variables is done for two reasons. Firstly, the DFL methodology is a semi-parametric methodology and no parameter estimates are produced. Secondly the possible correlation between the characteristics can confound the results from the comparison of the distributions. For example if regional distribution is correlated with sex of the household member and the sex variable is removed, part of the effect will remain in the counterfactual distribution for regional distribution. The high probability of correlations means that in this case, only the differences and changes amongst the broad groups of variables have been identified.

The choice of variables for each group was based partly on the results of the Theil decompositions such that the largest contributing factors to inequality were education, labour market and regional factors and these are separated into different groups in the DFL routine. The groups were therefore split into labour market characteristics, education characteristics, demographic characteristics and the family structure. Variables from the Theil decomposition were included in the most appropriate corresponding group.

The reweighing is carried out for all categories and then creating reweighed income distributions by sequentially eliminating the categories one by one. Therefore, the sequence is counterfactuals for: all categories, all categories minus labour market, all minus labour market and education, and then an assessment of the family structure compared to the original income distribution.

The difference between the actual income distributions over the period (the difference between the 1990 income distribution and the 2002 income distribution for example) that is unobserved by the counterfactual distribution is due to the sum of any price effects and other residual effects. The residual effects in this unobserved component of the change include factors such as once structural shocks. The price effects that are captured in the unobservable component are the name for the returns in the labour market to each characteristic.

After obtaining the counterfactual incomes distribution for each case, the results are presented in Table 23 and Table 24 below, in terms of changes in the Gini index between the actual income distribution for the latest survey year in each country, and the counterfactual income distribution sequences.

For each country the first column is the actual change between the Gini indexes of the observed samples. Therefore, in the case of the household per capita income distribution for Costa Rica, the Gini Index rose 0.049 points between 1990 (the first survey year) and 2002 (the last survey year. The two final columns represent the proportion of change that was given by the change in characteristics and the proportion given by unobservable effects. As the counterfactual distribution gives the results of the household or individual characteristics upon inequality if only those characteristics are changed, but the income schedules are held constant, the unexplained difference between the counterfactual and actual income inequality change must be due to the unobservable effects such as changes in the income schedule. The results when the sequence of elimination is reversed are shown in Appendix V.

1. Results for household per capita income inequality

Table 23 shows the actual changes in household per capita income inequality over the period, with only Costa Rica and El Salvador having increased inequality whilst the other countries experienced decreases. The effect from changes in all of the household characteristics was mixed, causing a net increase in inequality in half the countries of the northern subregion, and a net decline in the other half. For Costa Rica, the Dominican Republic, Guatemala and Panama, the positive

entries show that household characteristics increased inequality in these countries. In addition their effects were low, explaining only a small proportion of the total change in household per capita income inequality.

Table 23

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: CHANGES IN GINI INDEX OF HOUSEHOLD PER CAPITA INCOME INEQUALITY DUE TO CHANGES IN HOUSEHOLD CHARACTERISTICS BETWEEN CA. 1990 AND 2002

(Gini index units)

Country	Obs	All	Fam	Dem	Ed	LM	% Pop	% Unobservable
Costa Rica	0.049	0.018	0.013	-0.007	-0.001	0.013	36.1	63.9
Dominican Republic	-0.038	0.028	0.049	0.007	0.001	-0.029	-73.9	173.9
El Salvador	0.023	-0.001	-0.001	-0.004	-0.003	0.006	-6.2	106.2
Guatemala	-0.033	0.004	-0.004	0.005	0.001	0.002	-11.7	111.7
Honduras	-0.023	-0.005	0.000	-0.002	-0.005	0.002	21.8	78.2
Mexico	-0.015	-0.004	-0.001	0.005	0.007	-0.015	26.1	73.9
Nicaragua	-0.004	-0.002	0.000	-0.004	0.005	-0.003	41.1	58.9
Panama	-0.025	0.011	0.001	-0.007	0.007	0.010	-43.4	143.4

Source: Author's calculations based on household surveys for each country. A positive entry means that inequality has increased. A negative entry means that inequality has decreased. Obs = observed change, All = change when all factors reweighed, Fam = change when family structure reweighed, Dem = change when demographic variables reweighed including sex, region Ed = change when level of education variable reweighed, LM = change when labour market factors are reweighed including sector of economic activity, presence in the informal or agricultural sector and economic activity. %Pop = the proportion of the total change explained by reweighing all household characteristics. %Unobservable = the proportion of the total change that is unexplained by the changes in the household characteristics and therefore is due to a combination of price and residual effects.

In Costa Rica, the changes in household characteristics explain just over 36% of the total change in inequality, but the majority of the observed change in inequality is due to unobservable effects. For the Dominican Republic, Guatemala and Panama, changes in household characteristics led to increases in inequality whilst the actual observed change was a decline in inequality. Therefore unobservable effects have counteracted the increases, to give an observed fall in inequality. For example, in the Dominican Republic, changes in household characteristics increased inequality by almost 75% of the observed decrease. Unobserved effects such as price effects acted to decrease inequality by 174% of the observed change, far outweighing the effects from the changes in household characteristics. In the cases of Guatemala and Panama, a similar pattern occurs with unobservable effects acting in the opposite direction to the changes in household characteristics and by a much greater amount, to bring the net result of a decline in per capita income inequality. This was more pronounced in Panama than in Guatemala.

In El Salvador, Honduras, Mexico and Nicaragua, changes in the characteristics of the households led to simulated decreases in per capita income inequality. In Honduras and Mexico, 21%-26% of the actual change was explained by household characteristics however this means that around three quarters of the actual change was caused by unobservable effects. In Nicaragua, changes in household characteristics caused around 46% of the observed decrease in inequality, the remaining 55% due to unobservable effects. In El Salvador, the observed inequality change was an increase of 0.022 units of the Gini. However the counterfactual simulated a decline in inequality due to the changes in household characteristics. Though the decline was small in terms of the amount of the actual change in inequality (only 6.2% of the observed 0.022 total) the effects of changes in household characteristics were once again outweighed by the unobservable changes.

Looking across the countries of the northern subregion by each characteristic group, changes in family structure had mixed effects on household per capita income inequality. In half the

countries it increased inequality (Costa Rica, the Dominican Republic, Honduras and Panama) and in half the countries the changes decreased inequality (El Salvador, Guatemala, Mexico and Nicaragua). Family changes tended to be more important in Costa Rica, the Dominican Republic and Guatemala. Changes in demographic effects increased inequality in the Dominican Republic, Guatemala and Mexico, but led to declines in inequality in the remaining countries of the northern subregion. And changes in education characteristics of households led to increases in per capita income inequality in all countries except for Costa Rica, El Salvador and Honduras. Labour market characteristic changes led to increases in inequality in all countries except for the Dominican Republic, Mexico and Nicaragua.

2. Results for individual primary income inequality

Table 24 gives the results for the DFL simulations for individual primary income inequality and simulated effects of changes. The changes in all individual income earner characteristics increased individual income inequality in every country of the subregion. And except for the Dominican Republic, El Salvador and Honduras, the effect of changes in individual income earner characteristics explained more than half the total change in inequality over the period. For these countries the effects of changes in these characteristics failed to explain any of the change in individual income inequality.

In Costa Rica individual income earner characteristic changes explained nearly 85% of the observed increase in inequality. In Guatemala, Mexico and Nicaragua they explained 50%-65% of the total changes. In Panama, changes in individual income earner characteristics increased individual income inequality greater than the observed increase between 1990 and 2002. Over 113% of the total observed change was the effect of these characteristics. This means that in Panama, unobservable effects actually caused a decline in individual income inequality. For the Dominican Republic, El Salvador and Mexico, the changes in the characteristics of individual income earners decreased individual income inequality and they were outweighed by the increases caused by price and residual effects. However for the remaining half of the region, individual income earner characteristics explained the majority of the observed change in individual primary income inequality.

In terms of the individual groups of characteristics, Table 24 shows that changes in family structure increased individual income inequality in every country of the subregion except for Guatemala. However family structures represented only a very minor effect on the individual income inequality changes in the northern subregion. Demographic changes were more important in terms of changes in inequality. Changes in demographic characteristics including sex and region increased inequality in the majority of countries except for Costa Rica and Nicaragua. Changes in the education levels of primary income earners increased inequality in every country of the subregion except for Mexico.

Changes in the labour market including changes in industry and changes in formal/informal employment also increased inequality of individual primary earner incomes in all countries except for the Dominican Republic where there were small negative effects. Labour market changes in the remaining countries were one of the most important groups of characteristics in terms of the ability to explain changes in income inequality.

Table 24

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: EFFECT OF CHANGES IN GINI INDEX OF INDIVIDUAL PRIMARY INCOME INEQUALITY DUE TO CHANGES IN CHARACTERISTIC GROUPS BETWEEN CA. 1990 AND CA. 2002

(Gini Index Units)

Country	The results of changes in individual primary income factor groups and their effects on the Gini Index							
	Obs	All	Fam	Dem	Ed	LM	% Pop	%Unobservable
Costa Rica	0.071	0.060	0.003	-0.001	0.005	0.053	84.5	15.5
Dominican Republic	-0.059	0.013	0.001	0.006	0.007	-0.001	-21.8	121.8
El Salvador	-0.009	0.033	0.001	0.000	0.001	0.031	-369.2	469.2
Guatemala	0.085	0.052	-0.001	0.009	0.013	0.031	61.1	38.9
Honduras	-0.033	0.017	0.001	0.000	0.011	0.004	-51.4	151.4
Mexico	0.076	0.049	0.002	0.011	0.000	0.037	64.8	35.2
Nicaragua	0.049	0.025	0.002	0.001	0.015	0.006	50.6	49.4
Panama	0.082	0.093	0.001	0.000	0.008	0.085	113.7	-13.7

Source: Author's calculations based on household surveys for each country. A positive entry means that inequality has increased. A negative entry means that inequality has decreased. Obs = observed change, All = change when all factors reweighed, Fam = change when family structure reweighed, Dem = change when demographic variables reweighed including sex, region Ed = change when level of education variable reweighed, LM = change when labour market factors are reweighed including sector of economic activity, presence in the informal sector and economic activity. %Pop = the proportion of the total change explained by reweighing all individual income earner characteristics. %Unobservable = the proportion of the total change that is unexplained by the changes in the characteristics of individual income earners and therefore is due to a combination of price and residual effects.

3. A summary of the different results

The results of the DFL analysis combined with the results from the Theil and the analysis of the data in Chapter III show that there is much heterogeneity in both the changes in the characteristics of the households and individuals, and the changes in inequality across the countries of the subregion.

Studying the results country by country, in Costa Rica, the Theil coefficient showed around half of the levels of inequality explained in each period by household or individual effects. The most important household and individual characteristics were regional, labour and education effects. The DFL counterfactual showed only a minority of the household per capita income inequality increase was explained by population characteristics, but a large majority of the individual income inequality was explained by population characteristics. Family structure and labour market changes were important determinants of household per capita income inequality, whilst labour and education dominated the change for individual incomes. An increase in the informal sector and decreasing agricultural sector were most likely the cause for the importance of the size of the labour effects in terms of changes in inequality. Education inequality has widened, and this interacted with the increasing returns to education (shown through the unobservable price effect). An increase in the tertiary educated can widen the income distribution for individuals, whilst households can buffer this effect since the majority of the increase in tertiary educated households was in nuclear families where some of this associated skill wage premium is distributed amongst family members. Thus, the change increased inequality for the individual income earners, whilst causing a net decline in income inequality in the household per capita incomes of Costa Rica.

El Salvador, like Costa Rica, experienced an increase in inequality of household per capita incomes but it is here the similarity ends. Individual income inequality decreased in El Salvador over the period. Population characteristics explained the level of inequality in El Salvador quite

well given the results of the Theil decomposition. However, the changes in population characteristics caused mixed results, accounting for a decline in household per capita income inequality over the period, and an increase in individual income inequality far greater than the observed individual income inequality decrease. Education levels in El Salvador decreased inequality, for both households and individuals, and this is most likely due to the decline in those with primary educations or less. Changes in labour market characteristics increased income inequality in households. This can be explained by a fall in the agricultural sector and a rise in the movement to urban areas. In contrast, the equalising effect for individual primary incomes is due to the fact that the formal sector increased over the period providing better incomes. The increase in returns to education would only increase individual income inequality and so other unobservable effects must explain this resulting decline. Given they are unobservable; the reasons behind this component of change remain hidden.

In Guatemala, changes in population characteristics explained over half of the level of income inequality for both households and individuals. Once again, education, labour force and regional factors are important determinants here. Although Guatemala experienced a decrease in household per capita income inequality between 1990 and 2002, individual inequality increased greatly. In both cases, changes in population characteristics increased income inequality. Therefore changes in the unobservable price effects were different between the household and the individual.

In terms of population characteristics for households, family structures decreased inequality. Demographic effects were sensitive to the order of elimination with demographic changes increasing inequality in one sequence, and then providing a small decrease in the reverse elimination sequence. The rise in education has led to increased inequality. Declines in the agricultural sector, a large increase in the informal sector and a fall in the ratio of working age persons to household population for household income per capita also explain the inequality increase. The effect of changes in family structure is to decrease inequality through the large fall in extended and composite family structures matched by a large rise in smaller, more nuclear family structures.

In Honduras, a key conundrum is the effect of education upon household per capita income inequality and individual primary income earner inequality. Whilst individual and household characteristics explained a good deal, over half, of the level of income inequality, they had differential effects on the changes in income inequality. In households, the population characteristics caused a decline in inequality of per capita incomes, but in individuals they caused an increase in income inequality. Education is a case in point. Across households education decreased inequality, whilst between individuals education increased inequality. The education level increased between the two years with fewer individuals having only primary education or less. The increase in education level lowers inequality across households as the benefits from increased education are shared amongst members. In the individual case the changes in education increased inequality because of the high returns to education levels. This does not mean that returns to education increased though, because the unobservable components lowered inequality. In Honduras, the share of income for those at the lowest education levels decreased, but so did the income share for those at the highest income level. Therefore the returns to education increased in the middle of the income distribution, providing an equalizing effect upon individual income inequality. Labour effects were inequality increasing for households but were confounded for the individual effects with some differential results between orderings of the elimination. This is due to the effects of an increase in the agricultural sector, an increase in the formal sector, but also an increase in the informal sector.

For Mexico, education, regional factors and labour market factors explained most of the inequality levels both for households and individuals. Whilst household per capita income inequality fell over the period, individual primary income inequality rose. The population

characteristics differed between household and individual inequality. They decreased household inequality whilst increasing individual income inequality. Demographic effects increased inequality in both households and individual incomes; this could be due to the fall in urban nuclear families. Growth of the informal sector and reduction of the agricultural sector, can provide a strong increase in individual inequality as observed in the DFL counterfactual. The decline in inequality in households due to labour market population changes may be a factor of household aggregation. Education effects increase inequality in household per capita incomes, due to the strong fall in primary level educated households and strong rise in secondary educated households. Education changes decreased inequality for individuals but the effect was very small, and the widening of the education distribution that increased household inequality has not had a strong influence within the sample of individual primary income earners

In Nicaragua, family structure played a minor role in the level of household per capita income inequality. This was reflected in the changes in household income inequality. Inequality in household per capita incomes decreased by a small amount (0.004 units) and family structure changes explained only 1% of this effect. Demographic and labour effects were more important for decreasing household inequality whilst education was inequality increasing. The increase in income inequality of both households and individuals by education is due to a widening of the distribution of education. There was a fall in the proportion of those with secondary educations. At the same time, the proportions of those with primary education or less, and those with tertiary educations increased. Declines in formal employment and a rise in informal and agricultural employment increased individual income inequality. Household income inequality was influenced by the decline in unemployment and the effects agriculture sector increases upon household incomes.

Panama experienced decreased inequality of household per capita incomes and increases in individual income inequality. Changes in population characteristics had a positive effect on individual income inequality; the effect on household income inequality was smaller. Labour market population characteristics increased inequality due to the decline of employment in the agricultural and formal sectors and the rise of employment in the informal sector. Education increased inequality due to the widening of the education distribution with the increase in those with low education or high education levels and a decline in the proportion with secondary education.

Within the Dominican Republic, the ability of population characteristics to explain the level of income inequality according to the Theil coefficient was low. In the DFL counterfactual analysis household and individual characteristics predicted increases in income inequality despite the observed decrease for both households and individuals. Employment decreased inequality. Although the agricultural and formal sectors fell over the period and the informal sector rose, the strong decrease in unemployment between 1990 and 2002 for the Dominican Republic may be the factor driving the decrease for the household per capita income inequality. In terms of the individual inequality, although the effect seems contrary to the changes in the occupation structure, the size of the effect was small. Education increased inequality at the same time that the proportion of those with low education decreased. An increase in the regional movement to urban areas could be the signal for the inequality increasing effects of demographic characteristics under the counterfactual simulation.

There are several interesting aspects to the counterfactual exercise. Firstly the results show that population effects do not explain much, if any, of the observed change in household per capita income inequality. This is the first time such a methodology has been employed for Central America, the Dominican Republic and Mexico and most of the observed change in household income inequality remains unexplained. Results were somewhat improved for the counterfactual analysis of individual income inequality. In three of the eight countries population effects failed to explain any observed change in individual income inequality, however in the remaining countries

analysed, the effects of the population explained over half the observed change in income inequality of individuals between 1990 and 2002. The population characteristics also increased inequality in all countries of the northern subregion at the individual level, whilst the results were more mixed at the household level. These factors, combined with the strong effects of labour market population changes, indicate that not only the level, but the changes in inequality are driven by changes in the labour market. Whilst these results may merit further investigation for at the individual income earner level, they indicate that at the household level, different methods and combinations of household or external characteristics require consideration.

The preliminary analysis and Theil decomposition of the level of inequality reinforce the conclusion that individual income inequality was better explained by population characteristics than household per capita income inequality. Within the counterfactual population effects, changes in family and demographic effects had little influence on individual incomes, they tended to be only a slightly greater source of change for household income inequality. This can be explained by the fact that family and demographic changes would have a smaller effect on labour market income inequality than on household income inequality.

An interesting feature of the DFL simulations is that in this short period of comparison education changes do not exert a large influence upon inequality, either in individual or in household per capita incomes. They are larger and increase inequality for individual incomes, but have smaller effects upon household per capita incomes. In addition, education changes have negative effects on household income inequality in three of the countries of the subregion. The stronger influence of education changes upon individual income inequality is due to the improvement in education levels. It causes an increase in inequality, as the bulk of the population remains at low education levels and the returns to education remain high. The mixed effect of education changes for household per capita income inequality reflects the distribution of the benefits of education amongst the households, compensating for other family members with lower education levels.

An explanation for the low effect of changes in the education distribution upon changes in inequality lies with the large unexplained effects. Changes in education had little influence on changes in inequality at both the individual and household level. However the unobservable effects had a large influence on these inequality changes. The unobservable effects contain the price effect of education, that is, the influence of the changes in returns to education upon inequality. As shown in Chapter III with the distribution of education by income quantile, the returns to education are changing and increasing, and these price effects are likely a large component of the unobserved effects. Therefore education can still have a large influence in changes to inequality, but the changes in returns to education are a stronger source of change in inequality than the distribution of education.

The findings from the individual level counterfactual exercise are similar to the other work done with DFL simulations in more developed countries. However the weak results of the household level counterfactual simulation contrast previous work. DiNardo, Fortin and Lemieux (1996) and Daly and Valletta (2000) use the same methodology for US wage earners and household per capita incomes respectively. The results in both cases emphasize the effects of changes in labour market characteristics. Johnson and Wilkins (2004) using household income data for Australia also emphasize the importance of labour market characteristics. Other differences between the results in this study and the results of the studies in the US and Australia are that the size of the population effect is generally greater in the US and Australian work for households, explaining around 50%-75% of total inequality increases that occurred in each of the countries. In the DFL results for the northern subregion, the population characteristics are similar for just over half the countries at the individual level, but generally small, if not insignificant and often in a different direction to the actual change for the household level analysis. One probable reason for this difference is the fact

that both the US and Australia are developed nations and have lower absolute inequality of incomes. Combined with stronger institutions and more macroeconomic stability than the northern subregion, changes in household and individual characteristics are less likely to be overwhelmed by macroeconomic shocks and instability influencing price effects, compared to the northern subregion.

Comparing the results in this chapter to the results in Legovini, Bouillón and Lustig (2005) who used a similar but parametric model-based procedure for Mexico between 1984 to 1994, the authors find that over half of the observed in individual and household income inequality was explained. But they also found that the unobservable effects, namely the price effects, in each case were nearly twice as important as the population characteristics.

VI. Conclusion

In this study, analysis was undertaken to determine the ability of household and individual characteristics to explain both the level and changes of income inequality between the years 1990 and 2002. To select some determinants of the level of income inequality a Theil decomposition was carried out, while the use of the innovative DiNardo, Fortin and Lemieux (1996) methodology allowed the simulation of counterfactual income distributions. This was done for individuals and households to study of the impact of changes in various individual and household characteristics upon changes in income inequality.

The analysis reveals a very heterogeneous mix of countries within the northern subregion, with different trends in inequality and household characteristics. Some common features can be drawn from the results of the study. Firstly, the analysis and chosen household characteristics failed to explain much, if any, of the observed changes in household per capita income inequality between 1990 and 2002. The vast majority of the changes were instead explained by unobservable price and residual effects. Population characteristics were better at explaining changes to individual income inequality.

Whilst education levels have increased, the education distribution in much of the northern subregion has widened increasing income inequality. But the results show that these population differences in education are not as great as might be expected in terms of determining changes in income inequality. Specifically, a large component of the unobservable effects not captured by counterfactual methodology is likely to be increasing returns to education. Declines in

the agricultural sectors of the countries and shifts to urban areas reflect the structural changes taking place in the economies, and these factors are important determinants of inequality change. In addition, the rise of the informal sector of employment with its lower benefits and job security has contributed increases in income inequality.

This study shows that further work may be fruitful investigating the links between household income inequality and individual income inequality using different methodologies and combinations of household and individual characteristics. A structural model of the relationship such as the work of Legovini, Bouillón and Lustig (2005) provides a good starting point. In addition, the domination of unobservable price and residual effects upon changes to income inequality at the household level implies that additional areas of effect need to be considered. Specifically, these would include factors such as shifts in macroeconomic characteristics that influence the unobservable effects and returns to the household characteristics in each country of the subregion. Research efforts in this direction have already commenced (see for example Sánchez, 2005) and policy analysis can then be conducted in this light. From the evidence in this study, it is clear that policies will be ineffective in changing inequality in the countries of the northern subregion without considering the effects of macroeconomic characteristics and the returns of adjustments to households and individuals in each of the countries.

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Appendix

Appendix I

Household survey details

This appendix provides details of the household surveys for Central America, Dominican Republic and Mexico used in the analysis in Chapters II and III.

Country	Year	Name of survey	Survey Details				
			Period	House-holds	Population	Weighted Households	Weighted Population
Costa Rica	1990	Encuesta de Hogares de Propósitos Múltiples	1990 Jul	8 513	36 269	634 314	2 804 409
	2002	Encuesta de Hogares de Propósitos Múltiples	2002 Jul	11 094	44 138	1 011 816	3 997 883 742
El Salvador	1995	Encuesta de Hogares de Propósitos Múltiples	1995	10 190	39 562	660 607	2 640 967
	2001	Encuesta de Hogares de Propósitos Múltiples	2001 Jul-Dec	1 746	7 966	1 424 810	6 875 174
Guatemala	1989	Encuesta Nacional Socio-Demográfica	1989 Apr-Jun	2 701	10 276	2 257 604	9 205 153
	2002	Encuesta Nacional sobre Empleo e Ingresos-ENEI	2002 Oct - Nov	17 167	72 232	24 650 169	101 855 729
Honduras	1990	Encuesta Permanente de Hogares de Propósitos Múltiples	1990 Sep	4 191	22 810	969 364	5 205 100
	2002	Encuesta Permanente de Hogares de Propósitos Múltiples	2002 Sep	5 720	22 144	2 362 387	9 148 124
Nicaragua	1993	Encuesta Nacional de Hogares Sobre la Medición de Niveles de Vida	1993 Feb-Jun	9 270	33 262	1 610 789	5 829 376
	2001	Encuesta Nacional de Hogares Sobre la Medición de Niveles de Vida	2001 Apr-Jul	8 597	46 534	860 017	4 695 313
Panama	1991	Encuesta de Hogares	1991 Aug	6 611	33 772	1 155 124	6 009 080
	2002	Encuesta de Hogares	2002 Aug	10 108	42 266	23 484 752	98 096 311
Dominican Republic	1992	Encuesta Nacional de Fuerza de Trabajo	1992 Apr	4 209	23 203	892 481	4 808 072
	2002	Encuesta Nacional de Fuerza de Trabajo	2002 Oct	4 455	24 452	614 742	3 373 971
Mexico	1989	Encuesta Nacional de Ingreso-Gasto de los Hogares	1989 3rd trimester	11 953	53 002	1 473 334	6 428 672
	2002	Encuesta Nacional de Ingresos y Gastos de los Hogares	2002 3rd trimester	16 046	71 665	1 438 186	6 272 353

Appendix II

Variable construction

This appendix provides details of definitions for the variables constructed from the household survey data in the analysis in Chapter II onwards.

Income

Income is calculated as household per capita income per month. Total household income per month, adjusted within the surveys, is divided by the number of members of the household. Each member is weighted equally and no equivalence scale is used.

Income is converted for each country to 2001 or 2002 US dollars (depending upon the last year of the survey). This is done by first converting each local currency to 2001 or 2002 values using adjustments from the Consumer Price Index for each country (CPI). Adjustments to US dollars are made according to the official exchange rate at 2001 or 2002 for each country compared to the US. Both exchange rate data and CPI data come from the World Development Indicators 2004 (World Bank).

Income Share

The income share per quintile is calculated after ordering households by per capita income. The share is calculated across the households at a national level. After the ordering, shares are calculated from households within each quintile.

Poverty Line

Details about the Poverty Line for each year are taken from the ECLAC Social Panorama 2002-2003 Table 16 which gives monthly poverty line and indigence line values per capita in local currency units for each period. As with the income per capita, poverty line values are converted to 2002 US dollars after using the CPI to convert to 2001 or 2002 local currency units and then using 2001 or 2002 exchange rates to convert to US dollars.

For both the income and poverty line details, the years are not strictly comparable across countries due to the different final survey periods, either 2001 or 2002 for each country of the northern subregion.

Weights

Household weights are given within the survey and these are used in all analysis and are unadjusted in this study.

Geographical Distribution

Geographical distribution is a dummy variable taking a value of 1 if the household is located in an urban area and 0 if the household is in a rural area..

Sex of Individual

Sex of individual is given as a dummy variable taking a value of 1 if the sex of individual is male and 0 if the sex is female.

Proportion of Household Female

This is a categorical variable measuring the proportion of household members, not including domestic employees that are female. It is categorised into 4 divisions for each household of less than 25%, 25%-50%, 50%-75% and between 75% and 100%.

Family Structure

Family Structure definitions are adapted from ECLAC Social Panorama 2004 (forthcoming) and Arriagada (2002). All family structure definitions do not include domestic live-in employment. One person households are households with only one member. Nuclear families consist of one or

both parents with or without children. A two-parent nuclear family consists of two parents with or without children present. A single-parent nuclear family consists of one parent with or without children present. Extended families consist of one or both parents present, with or without children and with other relatives. Composite families consist of one or both parents present, with or without children, with or without other relatives, but with non-relatives. Whilst the numbers in the Social Panorama are presented only for urban areas, the total of both urban and rural is used in this study.

Education Level

Educational definitions are adopted from the International Labour Organisation (ILO) Key Indicator of the Labour Market (KILM) number 14. Whilst the KILM 14 lists 7 possible categories of education, the major attainment levels are Primary, Secondary and Tertiary education. In addition the option for education "Less than primary" is included. "Less than primary education" is defined as less than 3 years of formal education. Primary level education consists of 3-6 years of education. Secondary education includes high school, teacher training schools and schools of a vocational or technical nature. It also includes all post-secondary but non-tertiary education. Tertiary education is provided by universities, colleges and higher professional schools. It requires a minimum educational qualification for admission (usually completion of secondary education).

The 4 broad groups are used due to comparability problems between countries of the northern subregion. In addition the age group is restricted to the core age group of those aged 25-54 years as it is this part of the population whose age allows a measurement of access to all of the education levels. Whilst other research on education has included education levels for populations aged 15 years or older, this gives rise to a selection bias when the normal course of education excludes those aged 15-18 years from tertiary education.

In addition, averages for the education of the household are determined by dividing the total number of members with that level of education by the total number of members of the household. This is done for the proportion of members with education primary or less, the proportion with secondary education and the proportion with tertiary education or more.

Proportion of Household with Primary Education or less

This is a categorical variable measuring the proportion of household members aged between 25-54 years, not including domestic employees, that have an education of primary level or less. It is categorised into 4 divisions for each household of less than 25%, 25%-50%, 50%-75% and between 75% and 100%.

Sector of Economic Activity

The industry of employment is derived from the definitions of ECLAC (2003b). Sectors are divided into 6 major groups, agriculture; manufacturing; construction; comercial activities, hotels and restaurants; transport, utilities and communications; and other services.

Occupational Sector

Occupational category definitions are taken from ECLAC (2003b). Here the occupational category is divided into several distinct areas. Firstly the occupations are divided into agricultural and non-agricultural areas. Within the non-agricultural area there is a formal sector and an informal sector. A person is included in the informal sector if they are employed, over 12 years, in a non-agricultural sector, and either working for profit (excluding professionals and technical workers), or the person works in a microenterprise (employing 5 people or less, and excluding those with a tertiary education), or are a domestic servant or do unpaid household work. A person falls within the formal sector if they are employed, over 12 years, in a non-agricultural sector, earning income in the public or private sector and does not fall into the category of informal employment. Within the agricultural sector a person is included if they work in the agricultural sector, and are over 12 years. Informal employment is derived from the ILO KILM number 7 definition of formal and informal work. Informal employed persons are all persons who, regardless of their employment status, are employed in an informal enterprise either as a primary or secondary job. For Nicaragua

1993 and Guatemala 2002, the informal sector included enterprises with less than 6 persons instead of less than 5 persons. For the Dominican Republic 1992 and Mexico 1989 surveys do not contain information for microenterprises which form part of informal unemployment and therefore it is likely to be underreported for those years.

Labour Force Status

The Labour Force Status is derived from the ILO KILM number 1. Persons in the labour force include persons over 12 years employed or unemployed during the survey period. Persons not in the labour force are the remainder of the population and are called inactive persons. The Labour forces status is therefore one of three groups, employed, unemployed or inactive. The inactivity rate is proportion of the population not in the labour force, divided by the total population. A person is defined as employed if he or she has done at least one hour of paid work in the last week.

Proportion of Household unemployed

This is a categorical variable measuring the proportion of household members economically active, not including domestic employees that are unemployed. It is categorised into 4 divisions for each household of less than 25%, 25%-50%, 50%-75% and between 75% and 100%.

Household working age to population ratio

The household working age to population ratio is calculated for each household as the proportion of the household of working age divided by the total household population. This is differs to the usual definition of the dependency rate which is the number of working age members divided by the number of non-working age members.

Unemployment Rate

The Unemployment rate is derived from the ILO KILM number 8. Unemployed persons are those who are available and looking for work and have not had any employment over the period surveyed. It does not include any individuals who are not in the labour force during the period. It does not include those individuals engaged in unpaid domestic work or study. The unemployment rate is the ratio of unemployed people to the labour force.

The unemployment rate measured here is a calculation based on the labour force status variable (which has been recoded to match age groups and labour force options) and is the total number of unemployed persons divided by the total number of the labour force (employed + unemployed persons) for those above 12 years.

Proportion of Household in informal employment

This is a categorical variable measuring the proportion of employed household members, not including domestic employees that are employed in the informal or agricultural sector, as defined by the occupational sector variable. It is categorised into 4 divisions for each household of less than 25%, 25%-50%, 50%-75% and between 75% and 100%.

Appendix III

Measures of inequality and poverty

The Gini index is given as:

$$Gini = \frac{1}{2n^2\overline{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| y_i - y_j \right|$$

where n is the number of observations and y is the income. The range of the Gini is between 0 and 1. A Gini of 0 gives perfect equality and a Gini value of 1 is perfect inequality.

The Theil Index for each individual household is given by the formula:

$$I = \sum_{i=1}^{N} (\frac{y_i}{\mu}) \cdot \ln(\frac{y_i}{\mu})$$

where y_i is the household per capita income of individual *i*, μ is the mean household per capita income, and N is the total population. The range of the Theil is from 0 to $\ln(N)$, but the value usually lies below 1 due to the insensitivity of the index to sample size.

Whilst the Gini weights incomes in the middle of the distribution higher, the Theil concentrates more on the tails of the distribution. The Theil also satisfies the axiom of additive decomposability which the Gini index cannot (Champernowne and Cowell 1998).

The property of additive decomposability arises from the fact that the Theil Index is one index within the Generalised Entropy family of inequality indexes that have been investigated by Cowell (1985), Bourguignon (1979), and Shorrocks (1984) amongst others.

The Theil index can be decomposed by income share, into selected exhaustive and mutually exclusive subgroups, where inequality (I) can be measured as the sum of inequality across the groups (I_b) and inequality within groups (I_w).

For the Theil index the shares are defined as:

$$I = I_w + I_b$$

$$I_w = \sum_{j=1}^{J} (\frac{y_j}{Y}) \cdot I_j$$

$$I_b = \sum_{j=1}^{J} (\frac{y_j}{Y}) \cdot \ln(\frac{y_j}{Y} . \frac{P}{p_j})$$

where I_w is the weighted sum of inequality of each subgroup I_j where the weights are the respective income shares and I_b is the inequality across the groups which is simply the natural logarithm of the ratio of the income share $(\frac{y_j}{Y})$ to population share $(\frac{p_j}{P})$, all then weighted by the relevant income share.

The proportion of inequality explained by one partition j is calculated as:

$$E = (\frac{I_b}{I}) \qquad \text{and} \qquad \sum E = 1$$

If all determinants of household income are known and partitioned, then the sum Inequality across all partitions will total 1.

The Kernel Density Estimate is given as:

$$\hat{f}^h(y) = \sum_{i=1}^{J} \frac{\theta_i}{h} K(\frac{y - y_i}{h})$$

where y is income, θ_i is the weight for household i, K is the kernel function and h is the bandwidth.

In this study the Epanechnikov kernel was used. The choice of optimal bandwidth is important as it determines exactly how the distribution is smoothed; this is similar to the choice of "bin" size in a histogram. The optimal bandwidth selector from Sheather and Jones (1991) was employed here.

Appendix IV

Microsimulation counterfactual methodology of Dinardo, Fortin and Lemieux (1996)

The following methodology draws on DiNardo, Fortin and Lemieux (1996). Each observation i for a country can be viewed as a vector (y_i, z_i, t_i) where y_i is income, z_i is a vector of possible determinants of income and t_i is the time period.

The joint distribution for country n is given as $F^n(y,z,t)$. The density of income at one point in time is $f_t^n(y)$ and is written as the integral of the income density conditional on household characteristics and the time period t_y, over the distribution of determinants $F^n(z \mid t_z)$ at time period t_z.

$$\begin{aligned} f_t^n(y) &= \int_{z \in \Omega_z} f(y \mid z, t_y = t) dF(z \mid t_z = t) \\ &\equiv f^n(y; t_y = t, t_z = t) \end{aligned} \tag{3.1}$$

Note Ω_z is the domain of determinants z and $n \in N$ so country n is part of the domain N of all countries.The notation in Equation 3.1 is used to express the counterfactual density when changes are made to the time periods of y and z.For example, the density $f^n(y; t_y = 2000, t_z = 2000)$ is the observed density of income for country n in the year 2000, conditional on determinants for the same year. The density $f^n(y; t_y = 2000, t_z = 1990)$ is the density that would result if the distribution of determinants had remained as it was in 1990.

In this case the density is:

$$\begin{aligned} f^n(y; t_y = 2000, t_z = 1990) &= \int f(y \mid z, t_y = 2000) dF(z \mid t_z = 1990) \\ &= \int f(y \mid z, t_y = 2000) \psi_t(z) dF(z \mid t_z = 2000) \end{aligned} \tag{3.2}$$

where the distribution is similar to the actual observed distribution in the year 2000 except with the addition of a reweighing function $\psi_t(z)$ where the subscript t denotes changes to the time period of the vector of determinants z.

$$\psi_t(z) = \frac{dF(z \mid t_z = 1990)}{dF(z \mid t_z = 2000)} \tag{3.3}$$

After obtaining an estimate of the reweighing function $\hat{\psi}_t(z)$ the counterfactual distribution can be estimated using kernel density estimation as:

$$\hat{f}^n(y; t_y = 2000, t_z = 1990) = \sum_{i=1}^{J} \frac{\theta_i}{h} \hat{\psi}_t(z) K\left(\frac{y - y_i}{h}\right) \tag{3.4}$$

where J is the sample size, h is the bandwidth, θ_i is the population weight of the observation and $K()$ is the kernel function.

Equation 3.3 is a ratio of two marginal densities and so rearranging according to Bayes' rule gives:

$$(3.5) \qquad \psi_t(z) = \frac{\Pr(t_z = 2000) \cdot \Pr(t_z = 1990 \mid z)}{\Pr(t_z = 1990) \cdot \Pr(t_z = 2000 \mid z)}$$

In equation 3.5 the unconditional probabilities cancel because the weights θ_i sum to one for each and so $\Pr(t_z = 2000) = \Pr(t_z = 1990)$.

There are alternative methods to calculating the conditional probability of being in a time period given the set of determinants. The proportion of households with each combination of determinants for the period can be calculated directly or the probabilities coule be estimated using a standard model like the logit or probit model. The specification of such a model would be:

$$(3.6) \qquad \Pr(t_z = t \mid z) = \Phi(\beta H(z))$$

where Φ is either the cumulative normal distribution (for the probit) or the cumulative logistic distribution (for the logit). $H(z)$ is the matrix of covariates that is a function of z. It usually consists of dummies of categorised variables and allows for fully interactive terms. After normalising the weights for each conditional, the ratio can be calculated and the counterfactual distribution estimated. This gives a counterfactual distribution using determinants from the same country but at another point in time.

Appendix V

Theil decomposition results shown as proportion explained by each factor in total inequality explained

Table V-1

CENTRAL AMERICA, DOMINICANREPUBLIC AND MEXICO: PROPORTION OF CONTRIBUTION OF MAIN IDENTIFIABLE FACTORS TO HOUSEHOLD PER CAPITA INCOME INEQUALITY IN EACH COUNTRY EXPLAINED BY THE THEIL INDEX, CA. 1990 AND 2002 [a b]

(Percent of total explained)

Country	Year	Fam	Reg	% Fem	% Prim	Ratio	% UE	% Inf	% of explained	Tot
Costa Rica	1990	8.8	25.5	1.1	19.3	18.6	3.6	23.3	1002	46.7
	2002	13.3	16.2	0.7	16.0	12.4	7.6	33.7	99.8	44.5
Dominican Republic	1990	12.4	14.9	1.0	15.5	14.4	23.2	18.6	100.0	19.4
	2002	20.1	15.5	1.8	15.5	19.7	11.6	16.2	100.4	28.4
El Salvador	1990	6.0	28.2	0.9	33.2	12.0	5.6	14.0	100.0	64.8
	2002	7.6	29.2	1.6	29.8	7.3	4.6	20.1	100.2	63.1
Guatemala	1990	5.2	30.0	0.3	31.7	2.6	0.3	30.0	100.2	65.6
	2002	8.0	32.7	3.4	27.2	7.3	0.4	21.0	100.0	52.3
Honduras	1990	7.2	24.9	0.8	19.8	27.7	0.3	19.0	99.8	59.5
	2002	7.3	30.5	2.3	15.8	14.9	0.2	29.2	100.2	65.8
Mexico	1990	15.2	23.0	1.3	37.3	14.4	0.6	8.6	100.4	52.6
	2002	18.4	25.0	1.1	25.7	12.9	0.2	16.9	100.2	45.6
Nicaragua	1990	11.2	28.1	0.9	25.2	13.4	2.9	18.4	100.0	45.6
	2002	16.9	22.7	2.7	20.0	13.5	2.7	21.4	100.0	51.0
Panama	1990	4.4	49.4	8.3	11.5	1.5	19.8	5.0	100.0	33.8
	2002	4.3	34.5	4.7	20.5	4.3	25.2	6.5	100.0	27.8

Source: Author's calculations based on household surveys for each country. For definitions of Theil index and methodology see Appendix III.

[a] Fam = Family Structure, Reg = Geographical Region, Ratio = Household working age to population ratio, % Fem = Proportion of household female, % Prim = Proportion of household aged 25-54 that have primary education or less, % UE = proportion of household economically active that is unemployed, % Inf = proportion of employed members of household that work in informal and agricultural sectors, % of explained = total of explained component of Theil, sums to 100. Any errors due to rounding. For details of the variables see Appendix II.

[b] Identifiable factors are restricted by the household survey data.

Table V-2

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: PROPORTION OF CONTRIBUTION OF MAIN IDENTIFIABLE FACTORS TO INDIVIDUAL PRIMARY INCOME INEQUALITY, EXPLAINED BY THE THEIL INDEX, CA. 1990 AND 2002 [a] [b]

(Percent of total explained)

Country	Year	Fam	Reg	Sex	Edu	Inf	Sec	% of explained	Tot
Costa Rica	1990	5.1	10.7	4.6	44.3	20.4	14.8	100.0	58.7
	2002	5.1	5.4	4.6	46.2	33.2	5.4	99.8	65.1
Dominican Republic	1990	12.1	10.3	13.1	50.5	1.9	13.1	100.9	10.7
	2002	3.1	13.4	2.4	51.8	18.2	11.0	100.0	41.7
El Salvador	1990	5.2	16.3	5.8	41.1	17.5	13.9	99.8	58.2
	2002	3.7	13.2	4.6	44.4	21.6	12.6	100.0	57.0
Guatemala	1990	1.3	16.7	0.7	45.1	19.6	16.8	100.2	61.2
	2002	2.0	14.4	9.0	40.4	22.4	11.8	100.0	65.3
Honduras	1990	2.9	16.1	3.5	51.4	17.1	9.0	100.0	49.0
	2002	1.4	16.9	0.3	43.8	18.7	19.1	100.1	73.8
Mexico	1990	7.0	16.5	7.0	51.8	5.7	11.7	99.7	36.9
	2002	3.1	18.3	8.3	40.1	18.8	11.6	100.2	64.9
Nicaragua	1990	0.8	26.2	0.0	40.5	8.9	23.7	100.0	39.3
	2002	7.7	12.3	1.0	50.1	13.8	15.2	100.0	52.1
Panama	1990	7.3	27.7	6.2	30.3	0.5	27.9	100.0	75.5
	2002	10.5	20.5	2.6	32.9	2.2	31.3	100.0	58.1

Source: Author's calculations based on household surveys for each country. For definitions of Theil index and methodology see Appendix III.

[a] Fam = Family Structure, Reg = Geographical Region, Inf = if individual employed in informal or agricultural sectors, Sex = Sex of individual, Sec = Sector of economic activity, Edu = education level of individual. % of explained = total of explained component of Theil, sums to 100. Any errors due to rounding. For details of the variables see Appendix II.

[b] Identifiable factors are restricted by the household survey data.

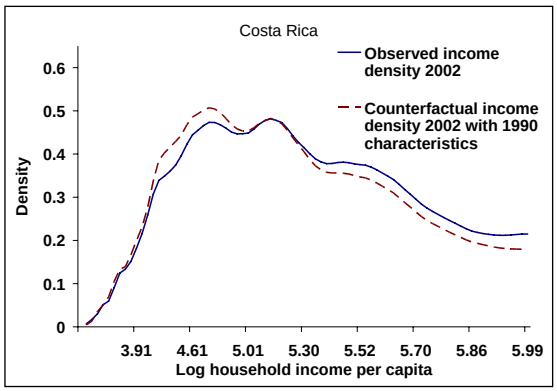
Appendix VI

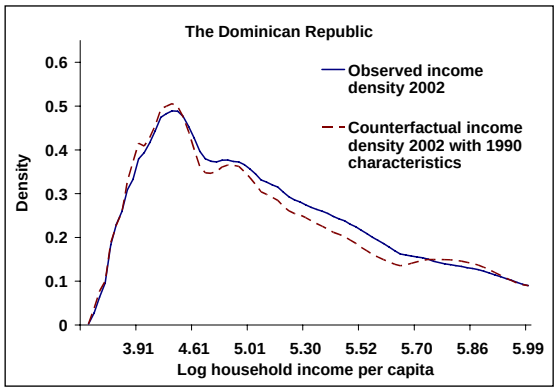
Kernel density estimates

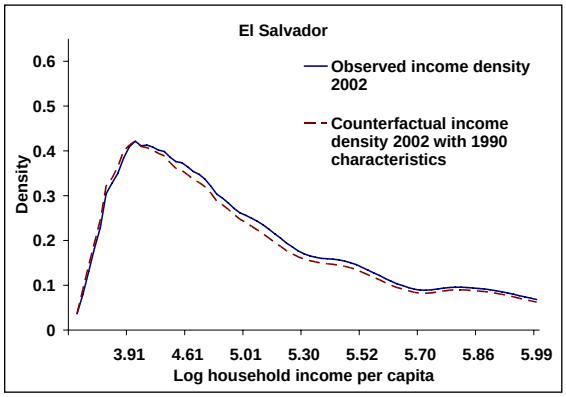
The DFL methodology allows for an entire simulated distribution to be constructed. This can be compared to the actual income distribution to see the results of changes to the distribution due to changes in the population characteristics. These graphs serve as a visual analogue to the numerical analysis from the Gini results in Table 23 and Table 24. Figure VI-1 shows kernel density estimates of the log household per capita income distribution for each country in the subregion. In each graph, the actual income distribution in the latest year (2001-2002) is presented with the counterfactual distribution that was simulated by replacing all categories of household characteristics with the characteristics from the first year in the 'window', ca. 1990. The natural logarithm of income was used to enhance visual clarity and allow comparison of the distribution to the normal distribution assuming that incomes in this case are log-normal. The incomes in the distribution were capped at a monthly rate of $400 US per capita. This was done for visual clarity as above this level of income the density of the distribution function rapidly approached zero but continued to high income levels due to high income outliers. The truncation of the graphs does not distort the overall shape of the distribution in each case. Figure VI-1 follows from the results of Tables 22 and 23, and shows that the majority of the populations in each country of the subregion are concentrated in the lower end of the household per capita income distribution. The countries with greatest mass at the upper incomes of the distribution are Costa Rica, Mexico and Panama. The simulated effect differs from the actual distribution to a larger extent in those countries that experienced larger population characteristics such as Costa Rica, the Dominican Republic, Nicaragua and Panama. There also seems to be a large difference in Mexico although the Gini results show that the effect of the population characteristics is lower. However, the Gini is a net result across the entire distribution and although the counterfactual distribution rises above the actual in the lower income level, it then falls below the actual distribution at the upper income levels and much of the change is therefore cancelled out.

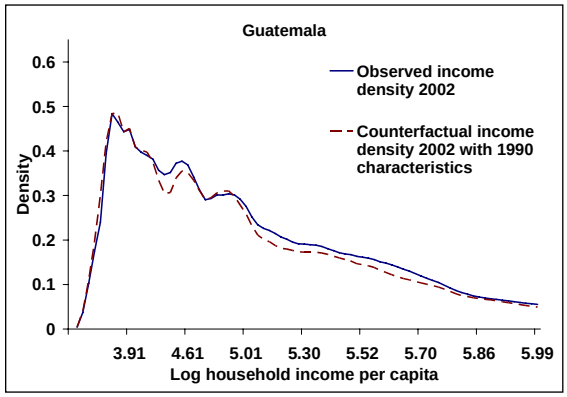
Figure VI-1

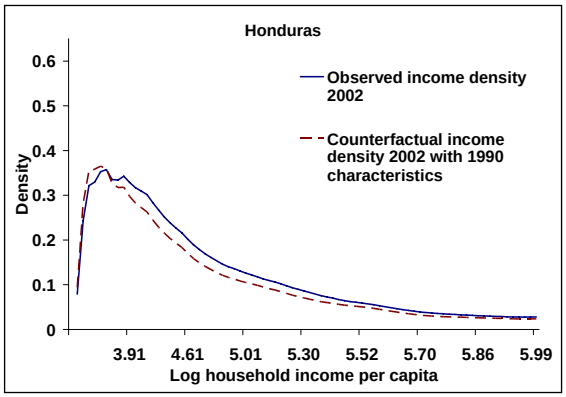
CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: ACTUAL AND SIMULATED KERNEL DENSITY ESTIMATES [A] OF THE HOUSEHOLD PER CAPITA INCOME DISTRIBUTION, 1990-2002

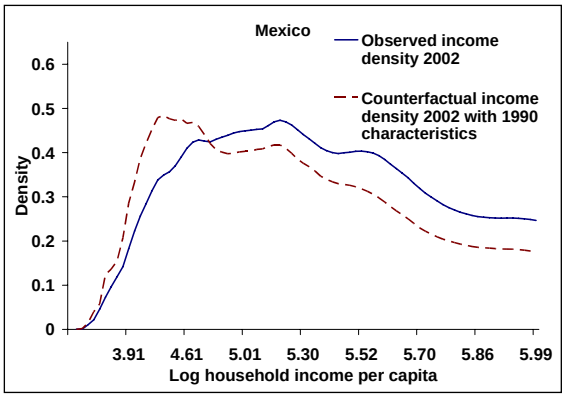


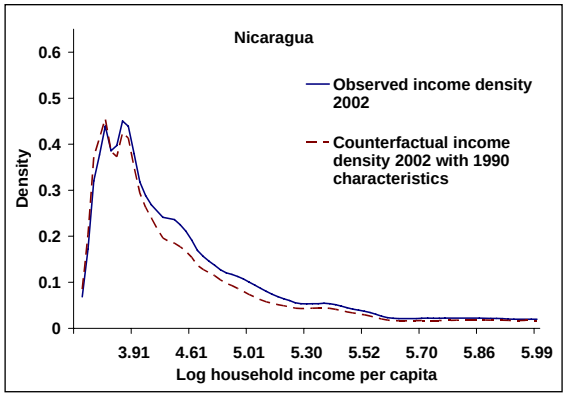


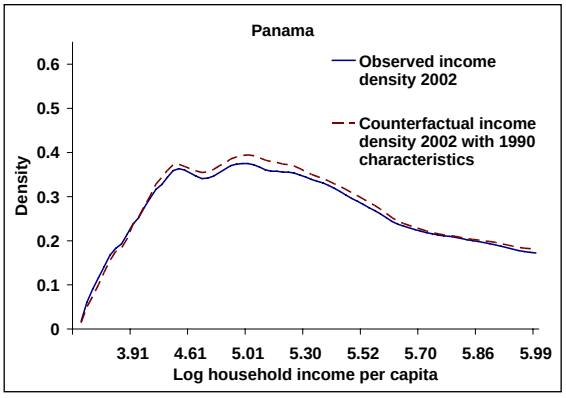












[a] For details of the kernel density estimation procedure see Appendix III.

Appendix VII

Table VII-1

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: EFFECT OF CHANGES IN GINI INDEX OF HOUSEHOLD PER CAPITA INCOME INEQUALITY DUE TO CHANGES IN CHARACTERISTIC GROUPS BETWEEN CA. 1990 AND 2002: REVERSE ORDER

(Gini Index Units)

Country	Obs	The results of changes in household factor groups and their effects on the Gini Index						
		All	Fam	Dem	Ed	LM	% Pop	%Unobser-vable
Costa Rica	0.049	0.018	0.013	-0.002	-0.002	0.009	36.1	63.9
Dominican Republic	-0.038	0.028	0.049	0.004	0.001	-0.026	-73.9	173.9
El Salvador	0.023	-0.001	-0.001	0.002	-0.006	0.004	-6.2	106.2
Guatemala	-0.033	0.004	-0.004	0.000	0.001	0.007	-11.7	111.7
Honduras	-0.023	-0.005	0.000	-0.003	-0.004	0.002	21.8	78.2
Mexico	-0.015	-0.004	-0.001	0.007	0.005	-0.014	26.1	73.9
Nicaragua	-0.004	-0.002	0.000	-0.001	0.003	-0.003	41.1	58.9
Panama	-0.025	0.011	0.001	-0.003	0.005	0.007	-43.4	143.4

Source: Author's calculations based on household surveys for each country. A positive entry means that inequality has increased. A negative entry means that inequality has decreased. Obs = observed change, All = change when all factors reweighted, Fam = change when family structure reweighted, Dem = change when demographic variables reweighted including sex, region Ed = change when level of education variable reweighted, LM = change when labour market factors are reweighted including sector of economic activity, presence in the informal or agricultural sector and economic activity. %Pop = the proportion of the total change explained by reweighing all population factors. %Unobservable = the proportion of the total change that is unexplained by the population changes and therefore is due to a combination of price and residual effects.

Table VII-2

CENTRAL AMERICA, DOMINICAN REPUBLIC AND MEXICO: EFFECT OF CHANGES IN GINI INDEX OF INDIVIDUAL PRIMARY INCOME INEQUALITY DUE TO CHANGES IN CHARACTERISTIC GROUPS BETWEEN CA. 1990 AND 2002: REVERSE ORDER

(Gini Index Units)

Country	Obs	The results of changes in individual primary income factor groups and their effects on the Gini Index						
		All	Fam	Dem	Ed	LM	% Pop	%Unobser-vable
Costa Rica	0.071	0.060	0.003	-0.001	0.019	0.039	84.5	15.5
Dominican Republic	-0.059	0.013	0.001	0.004	0.010	-0.003	-21.8	121.8
El Salvador	-0.009	0.033	0.001	0.000	0.006	0.026	-369.2	469.2
Guatemala	0.085	0.052	-0.001	0.006	0.009	0.039	61.1	38.9
Honduras	-0.033	0.017	0.001	0.000	0.019	-0.004	-51.4	151.4
Mexico	0.076	0.049	0.002	0.009	-0.001	0.040	64.8	35.2
Nicaragua	0.049	0.025	0.002	0.001	0.008	0.014	50.6	49.4
Panama	0.082	0.093	0.001	-0.001	0.006	0.087	113.7	-13.7

Source: Author's calculations based on household surveys for each country. A positive entry means that inequality has increased. A negative entry means that inequality has decreased. Obs = observed change, All = change when all factors reweighted, Fam = change when family structure reweighted, Dem = change when demographic variables reweighted including sex, region Ed = change when level of education variable reweighted, LM = change when labour market factors are reweighted including sector of economic activity, presence in the informal sector and economic activity. %Pop = the proportion of the total change explained by reweighing all population factors. %Unobservable = the proportion of the total change that is unexplained by the population changes and therefore is due to a combination of price and residual effects.

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