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The Opportunity Cost of Financing *Oportunidades*

A General Equilibrium Assessment for Poverty Reduction in Mexico

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Abstract

Despite the fact that Mexico has achieved macroeconomic stability after the financial crisis in 1995, it has failed to generate sustained high economic growth rates and to substantially reduce poverty and income inequality. *Oportunidades (Opportunities)*, Mexico's conditional cash transfer program, one of the three main pillars of the social development policy, has proven to be an insufficient tool for poverty reduction in a low and uneven economic growth phase and in the presence of informality. This research reviews *Oportunidades'* impact on education, health, and nutrition of household beneficiaries and it is aimed at assessing the opportunity cost of financing *Oportunidades* in the context of the regional setting of Chiapas. Pro-growth and pro-poor tax structures are also explored to finance alternative strategies to reduce poverty and enhance rural development and inclusive growth. An applied Computable General Equilibrium Model in a bottom-up approach in GAMS is used.

This study finds that the opportunity cost of financing *Oportunidades* is given by the forgone investments in the agricultural, construction, and manufacturing sectors. A 20%, 10%, and 5% increase in fixed investment in agriculture, construction, and manufacturing, respectively, accompanied by distributional changes in *Oportunidades* and other social transfers, pro-poor direct tax rate changes and a higher VAT rate, may notably enhance real GDP growth by 6%. This combination of policies may also reduce informality, may ensure formal labor income growth increases more than capital income, and may generate pro-poor growth, in relative and absolute terms, as total income of poor households grows above that of the rich, and may reduce poverty and income inequality. These policy measures cause poverty, measured by the Poverty Gap Index, to fall by 31%, *i.e.* from 0.31 to 0.21, and create a fiscal and investment flow that may induce a process of structural transformation and rural change. This process might take place if such investments are carried out to cope with poverty traps such as missing and imperfect markets and lack of public goods. Moreover, the growth elasticity of poverty shows that for every one-percentage increase in GDP, poverty declines by 2.92% on average. In the context of this policy set, *ceteris paribus*, the time needed to exit poverty, that is, the average time for the poorest to reach the poverty line, is 10 years.

On the other hand, a redistribution of *Oportunidades* and other non-conditional social transfers, in a budget-neutral manner, may also contribute to reduce poverty and income inequality. Such redistribution can be done by either extending the program's scope or by raising the amount of cash to be transferred by household. The latter might allow households to cope with liquidity constraints and save a larger share of income to invest in farming assets or other productive activities, leading them to break the intergenerational transmission of poverty. Likewise, a link between *Oportunidades* and the formal labor market established by implementing active labor market policies, such as apprenticeships, might entice poorer workers to acquire and/or improve their skills with the aim of earning higher wages and increasing their net disposable income, which would eventually allow them to escape from poverty.

Finally, a second-best strategy for inclusive growth and poverty reduction is given by a policy set composed of a 5% increase in fixed investment in construction combined with higher government consumption expenditure in agriculture, construction, and social services such as education and health, along with a 10% cut in public administration. This combination of policies fosters GDP by 4%. Furthermore, informality declines in all economic activities, with the exception of construction, educational and health services, and the total household income of the poorest grows much more than that of quintile 5. Total household income in quintile 1 rises by 10% while that in quintile 5, by 2%. As a result, poverty falls by 14% and the growth elasticity of poverty shows that for every one-percentage change in GDP, poverty goes down by 1.62%. In this context, the time required to exit poverty of households in quintile 1 is 27 years, assuming a sustained growth in real GDP per capita of 1.6%. Finally, this study shows that the withdrawal of *Oportunidades*, *ceteris paribus*, may have a significant negative impact on the poor.

Zusammenfassung

Obwohl Mexiko nach der Finanzkrise 1995 wieder makroökonomische Stabilität erreicht hat, ist es nicht gelungen, stabile hohe ökonomische Wachstumsraten zu generieren und die Armut und Einkommensungleichheit substantiell zu reduzieren. *Oportunidades* (‚Möglichkeiten'), Mexiko's Programm, das Geldauszahlungen an bestimmte Bedingungen knüpft (conditional cash transfer), ist eine der drei Säulen der sozialen Entwicklungspolitik. Allerdings hat sich das Programm in einem Umfeld ungleichen ökonomischen Wachstums und der Informalität als unzureichendes Instrument zur Armutsreduzierung erwiesen. Die vorgelegte Forschungsarbeit analysiert die Auswirkungen von *Oportunidades* auf Bildung, Gesundheit und Ernährung von Empfängerhaushalten und misst die Opportunitätskosten der Programmfinanzierung im Kontext des Regionalstaates Chiapas. Zudem werden Strukturen des Steuersystems, die Wachstum und Armen besonders zugute kommen, als alternative Möglichkeiten zur Finanzierung von Strategien zur Armutsreduzierung und Beschleunigung ländlicher Entwicklung und inklusiven Wachstums untersucht. Hierfür wird ein angewandtes berechenbares allgemeines Gleichgewichtsmodell (Computable General Equilibrium Model) in einem bottom-up Ansatz in GAMS genutzt.

Die Studie kommt zu dem Ergebnis, dass die Opportunitätskosten der Finanzierung von *Oportunidades* durch die entgangenen Investitionen in der Landwirtschaft, im Bau- und im produzierenden Gewerbe entstehen. Ein Anstieg der fixen Investitionen in der Landwirtschaft um 20%, 10% im Baugewerbe und 5% im produzierenden Gewerbe, zusammen mit Änderungen in der Verteilung von *Oportunidades* und anderen sozialen Leistungen, direkten steuerlichen Änderungen zugunsten der Armen und einer höheren Mehrwehrtsteuer könnten das reale Wachstum des Bruttoinlandsprodukts (BIP) um 6% erhöhen.

Die Kombination dieser Maßnahmen könnte zudem die Informalität reduzieren, formales Arbeitseinkommen mehr als Kapitaleinkommen erhöhen und Wachstum zugunsten der Armen generieren, sowohl relativ als auch absolut, da das gesamte Haushaltseinkommen armer Haushalte stärker ansteigen würde als das reicher Haushalte. So könnten Armut und Einkommensungleichheit gemessen am Poverty Gap Index um 31%, also von 0,31 zu 0,21, reduziert werden und einen Investitionsfluss kreieren, der einen Prozess der strukturellen Transformation und des ländlichen Wandels auslösen könnte. Diese Prozesse können stattfinden, wenn Investitionen gezielt Armutsfallen wie fehlende und imperfekte Märkte

sowie fehlende öffentliche Güter angehen. Zudem zeigt die Elastizität der Armutsreduzierung, dass jedes Prozent Anstieg des BIPs im Durchschnitt zur einer Reduzierung von Armut um 2,92% führt. Nach derzeitigem Stand würde die Zeitspanne, die benötigt wird, um Armut komplett zu beseitigen, *ceteris paribus* 10 Jahre betragen.

Andererseits könnte eine kostenneutrale Umschichtung von *Oportunidades* und anderen bedingungslosen sozialen Transfers auch zur Reduzierung von Armut und Einkommensungleichheit beitragen. Solche eine Umschichtung könnte entweder durch die Ausweitung des Programms oder durch eine Erhöhung des Geldbetrages, den die Empfänger erhalten, erreicht werden. Letzeres könnte Haushalten auch ermöglichen, Liquiditätsengpässe zu umgehen und einen höheren Anteil des Einkommens zu sparen und in produktive Aktivitäten zu investieren, was wiederum zu einem Bruch der intergenerationellen Weitergabe von Armut führen könnte. Ebenso könnte eine Verbindung zwischen *Oportunidades* und dem formellen Arbeitsmarkt, armen Arbeitern helfen, Fähigkeiten zu erwerben oder zu erweitern, um so höhere Löhne zu erhalten und das verfügbare Einkommen zu erhöhen. Solche eine Verbindung kann durch aktive Arbeitsmarktpolitik, wie z.B. der Schaffung von Ausbildungsplätzen, hergestellt werden.

Außerdem könnte eine Erhöhung der fixen Investitionen in das Baugewerbe um 5% kombiniert mit höheren Konsumausgaben der Regierung in der Landwirtschaft, dem Baugewerbe und sozialen Dienstleistungen wie Bildung und Gesundheit, sowie eine Reduzierung der öffentlichen Verwaltung um 10% eine second-best Strategie sein. Diese Kombination von Maßnahmen würde das BIP um 4% erhöhen. Außerdem würd dies eine Reduzierung der Informalität in allen ökonomischen Aktivitäten bedeuten – mit der Ausnahme des Baugewerbes, Bildung und Gesundheitsdienstleistungen – was das Haushaltseinkommen der Ärmsten um 2% mehr steigern würde als das des reichsten Quintils. Infolgedessen würde die Armut um 14% zurückgehen. Die Wachstumselastizität der Armut zeigt, dass für jedes Prozent Wirtschaftswachstum die Armut um 1,62% sinkt. Vor diesem Hintergrund würde die benötigte Zeit, um Armut im ärmsten Quintil zu beseitigen, 27 Jahre betragen, wenn ein kontinuierliches pro-Kopf Wirtschaftswachstum von 1.6% angenommen wird. Schließlich kommt die Studie zu dem Ergenis, dass eine Abschaffung von *Oportunidades*, *ceteris paribus*, signifikante negative Konsequenzen für die Armen hätte.

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Abbreviations and Acronyms

ABSORP	Absorption
AGRC	Agricultural sector
AIT	Average Intention to Treat
ATT	Treatment of the Treated
BANXICO	Central Bank of Mexico
CCTs	Conditional Cash Transfers
CDE	Constant Difference of Elasticities
CEFP	Center for the Study of Public Finances
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
CGE	Computable General Equilibrium
CIA	Conditional Independence
CNST	Construction sector
CONAPO	National Population Council
CONASAMI	National Minimum Wages Commission
CONEVAL	National Council for the Evaluation of Social Development Policy
CTR	Cost-Transfer Ratio
DID	Difference-in-Difference
DIRTAX	Direct tax revenue
DSTOCK	Stock changes
EDUS	Educational-service sector
EIGH-CHIAPAS	Chiapas Income-Expenditure Survey
ENCEL	Rural Household Evaluation Survey
ENIGH	National Income-Expenditure Survey
FIXINV	Fixed investment
GAMS	General Algebraic Modeling System
GDP	Gross Domestic Product
GDPFC2	Gross Domestic Product at factor costs
GDPMP	Gross Domestic Product at market prices (expenditure approach)
GDPMP2	Gross Domestic Product at market prices (revenue approach)
GIS	Geographic Information System

GOVCON	Government consumption
GPS	Generalized Propensity Score
HEAS	Health-service sector
HHD1	Household quintile 1
HHD2	Household quintile 2
HHD3	Household quintile 3
HHD4	Household quintile 4
HHD5	Household quintile 5
IADB	Inter-American Development Bank
ILO	International Labour Organization
INEGI	National Institute of Geography and Statistics
IMSS	Mexican Institute of Social Security
ISSSTE	State's Employees´ Social Security and Services Institute
ISR	Federal Income Tax Law
LES	Linear Expenditure System
MANU	Manufacturing sector
MING	Mining sector
MPS	Marginal Propensity to Save
NAICS	North American Industry Classification System
NETITAX	Net indirect tax revenue
OECD	Organization for Economic Co-operation and Development
OSER	Other-service sector
PADM	Public administration
PRVCON	Private consumption
RCT	Randomized Control Trial
REGTAX	Regional tax revenue
SAM	Social Accounting Matrix
SEDESOL	Ministry of Social Development
SHCP	Ministry of Finance
SIM	Simulation results
SNAM	System of National Accounts of Mexico
STPS	Ministry of Labor and Social Welfare

SUTVA	Stable Unit Treatment Value
TRDE	Trade sector
TSA	Treasury Single Account
UTIL	Utilities sector
VAT	Value-Added Tax

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1. Introduction

Macroeconomic stability has been the main goal of the economic policy in Mexico since the structural change towards a market-oriented economy took place in the 80's. The economic strategy has been focused, on the one hand, on fiscal and monetary discipline to avoid hyperinflation, devaluation of the currency and imbalances in the balance of payments; and, on the other hand, on liberalization of capital markets and trade. Despite the fact that the Mexican government has managed to substantially reduce the inflation rate[1] and achieve sound public finance, macroeconomic, and financial stability after the financial crisis in 1995, the GDP growth rate has been low and unstable whereas poverty and income inequality have remained at high levels.

A market-led economic strategy and the implementation of reforms based on the so-called *Washington Consensus* (Williamson, 1990) to liberalize and open up the economy after the debt crisis in the 80's, were introduced in Mexico as a panacea to achieve stability, overcome stagnation, and grow to reach a higher level of economic development. However, the neoliberal-oriented economic policy has had contrasting results. On the one hand, the theoretical assumption that the free market leads to an efficient allocation of resources in a competitive and Pareto-efficient[2] economy has failed to generate full employment due to imperfect and costly information and incomplete markets (Stiglitz, 1991). The low-level growth and the persistence of unemployment accompanied by a reduced role of the State and the inefficient allocation of capital have not led the Mexican economy to grow and reduce poverty and inequality. However, those reforms successfully achieved the intended goal of domestic macroeconomic and financial stability. The latter has proved to be an insufficient achievement to face development challenges such as the low growth-unemployment-poverty trap, regional asymmetries, and income inequality.

According to the General Law of Social Development, the national social development policy should have as a key objective the promotion of economic development with equity to create and preserve employment, raise the income level and improve its distribution (LGDS,

[1] It dropped from 46% in 1996 to 3% in the third quarter of 2013, according to preliminary data from the Mexican Central Bank.

[2] No individual can be made better off without making any individual worse off.

2004)[3]. However, to achieve this goal there has not been a systemic development strategy. In contrast, conditional cash transfers (CCTs), better known as the *Oportunidades* program (before known as *Progresa* during the administration of President Ernesto Zedillo), have been the main tool for poverty reduction since mid-90s. Before the implementation of *Oportunidades*, food subsidy programs were the main government instruments to reduce poverty. These programs consisted of price controls, price subsidies, and in-kind distribution. They could be of two types, either generalized or targeted. Their main objective was to increase food consumption of poor households. In 1996 there were 15 food subsidy programs: 4 were generalized and 11 were targeted in urban and rural areas. In this respect, Levy (2009) makes seven observations concerning these programs:

1) There was an imbalance in the allocation of the budget. 75% of the budget was allocated to urban areas, where less than 40% of the population was located.
2) There was an imbalance in the budget allocated to generalized and targeted subsidies. The former were mainly located in urban areas. Non-poor households received the vast majority of transfers.
3) Because of population dispersion it was costly to deliver in-kind food subsidies in rural and marginalized areas.
4) Administrative costs absorbed a substantial share of the total budget.
5) There was a lack of coordination between ministries and organizations that were implementing the programs, which gave rise to overlapping activities and problems to identify poor households because of the use of different methodologies.
6) Food subsidy programs and nutrition- and health-enhancing interventions were independent, *i.e.* they were not part of a comprehensive framework nor effectively focused on the most vulnerable household members. The lack of relationship and synergies between these programs reduced the impact on poverty reduction.
7) Lastly, there was not a systematic evaluation of the operation and impact of food subsidy programs. They were implemented with great inconsistency and lack of accountability.

Moreover, Levy (2009) also argues that these programs were ineffective and inefficient at least for two reasons: a) even if the food item was free of charge (*i.e.* a complete subsidy),

[3] It states nothing specific on poverty and inequality reduction as central objectives.

the impact was limited because consumption has bounds, *i.e.* is finite; and b) if the food item had a (positive) price, the impact was limited by the level of household income.

In this context, in mid-90s one of the main challenges was to design a cost-effective and efficient alternative strategy for poverty reduction. Hence, *Progresa*, nowadays known worldwide as *Oportunidades*, represented a new paradigm in the way to fight poverty, shifting from food subsidies to targeted cash transfers provided that beneficiary households send their children to school and attend regular "talks" on nutrition and hygiene. However, after more than fifteen years, despite their positive impact on education, health, and nutrition, and spillover effects, the empirical evidence shows that conditional cash transfers have been an insufficient tool for poverty alleviation in a phase of low and unstable economic growth. Almost half of the total population lives in poverty – 53.3 million people out of 117.3 million – according to the latest available data (CONEVAL, 2013). Moreover, the social development strategy has not yet managed to achieve a reduction of income inequality; it is still one of the highest within the OECD countries. Mexico is ranked in the penultimate position in the OECD income inequality ranking, just before Chile.

Clearly, there is a need to rethink the strategies of economic growth, poverty and income inequality reduction to implement a new alternative with a systemic approach, in which inclusive economic growth and its distributional pattern are oriented towards poverty and income inequality alleviation. In this respect, this dissertation is aimed at assessing the opportunity cost of financing *Oportunidades* in the regional setting of Chiapas for poverty reduction.

1.1. Problem Statement

Despite the fact that Mexico has achieved macroeconomic and financial stability over the course of the last eighteen years, the following issues remain as some of the key obstacles to reaching a higher state of economic development:

1. Rickety economic growth
2. High poverty
3. High income inequality
4. Low fiscal revenue

5. Distorted labor markets

1.1.1. Rickety Economic Growth

The structural adjustment of the Mexican economy carried out in the 80s and 90s was based on economic objectives of growth, low inflation, stable balance of payments, and a fair income distribution. It was believed that putting in place an austerity-oriented strategy would lead to achieve abovementioned goals (Williamson, 1990 & 2003). Therefore, restrictive fiscal and monetary policies were applied along with the privatization of public enterprises. From the fiscal side, public expenditure cuts and the elimination of subsidies were at the core of the strategy. On the other hand, from the monetary side, the Central Bank gained autonomy and established, as its primary objective, to maintain the stability of the purchasing power of the currency, relinquishing any responsibility to boost economic growth through the monetary channel. These policies of austerity, *ceteris paribus*, may help explain why economic growth has been low as public spending cuts discourage the overall growth of the economy (Vickrey, 1996).

Mexico´s economy is characterized by its low growth. The average Gross Domestic Product (GDP) growth rate in the period 1990-2010 was 2.6%, and if one focuses only on the last ten years the average growth rate was 1.9% while other emerging economies such as China and India grew at rates between 9% and 10%, or above. In general, the economic growth trend has been very uneven with two critical points: one, the domestic financial crisis in 1995 and, second, the international financial crisis in 2008-2009 in which Mexico´s GDP growth rate declined dramatically by 6.2%. One reason to explain this growth pattern is the low fiscal revenue-low public investment-low growth trap. The low fiscal revenue has limited the government´s capacity to invest and create employment with the corresponding positive effects, and positive externalities, on economic agents and sectors through the investment channel.

1.1.2. High Poverty

In Mexico there are two methodologies to measure poverty: first, the income poverty line[4]; and, second, the multidimensional approach (CONEVAL, 2010). In the first case, there are three poverty lines: food poverty, capabilities poverty and patrimony poverty. Box 1 below introduces the definition of each poverty line.

BOX 1.1 POVERTY LINES

- **Food poverty**: incapability to acquire a basic food basket, even if the entire income available to the household were used just to buy said basket.

- **Capabilities poverty**: insufficiency of the available income to acquire the food basket and to allocate the necessary expenditures in health and education, even if the total household income were devoted solely to these purposes.

- **Patrimony poverty**: insufficiency of the available income to acquire the food basket, as well as to make the necessary expenses in health, education, clothing, housing and transportation, even if the entire household income were used exclusively to acquire these goods and services.

Source: National Council for the Evaluation of Social Development Policy (CONEVAL)

At national level, according to the latest available data, in 2012, there were 23 million people in food poverty, about 33 million in capabilities poverty and 61.4 million in patrimony poverty, which accounts for 20%, 28%, and 52%, respectively (CONEVAL, 2013). In other words, almost half of the total population[5] is poor from an income perspective. In the same year, the percentages of population living in poverty, in urban areas, were 13%, 20.7%, and 45.5% for food, capabilities and patrimony poverty, respectively. In the case of rural areas, the percentages were 31%, 40.2%, and 63.6%. Poverty is predominantly located in rural areas, even though it has increased in urban settings in recent years. Moreover, at regional level, Chiapas faces the most severe poverty problem. According to the available data, in Chiapas in 2010, 48.6% of the population was in food poverty, 58% in capabilities poverty, and 78.1% in patrimony poverty. In contrast, in 1990, before the implementation of

[4] The National Council for the Evaluation of Social Development Policy (CONEVAL) uses the total current income.

[5] In 2012 the total population was estimated to be around 117.3 million people.

Oportunidades, the percentages were 46.2%, 55.1%, and 75.1%, respectively. From an income perspective, poverty has also increased in Chiapas during the period 1990-2010.

In the second case, the multidimensional poverty approach[6] points out that in 2012, at the national level, there were 53.3 million people (that is, 45.5% of the population) in multidimensional poverty[7]of which 41.8 million, or 35.7% of the population, were in moderate multidimensional poverty, and 11.5 million (equivalent to 9.8% of the population) were in extreme multidimensional poverty[8] (CONEVAL, 2013). In addition, 60.6 million people had an income below the wellbeing line[9] and 23.5 million people had an income below the minimum wellbeing line[10] (CONEVAL, 2013). In Chiapas, in the same year, there were 3.8 million people in poverty, 74.7% of the total population, of which 2.2 million were in moderate poverty and 1.6 million in extreme poverty, accounting for 42.5% and 32.2%, respectively.

Currently, *Oportunidades* covers around 5.6 million households across the country, which represents approximately 24.5 million people (SEDESOL, 2013), and it has a budget that accounts for 1.8% of the total programmable expenditure of the federal government or about 1% of GDP[11]. In recent years, the social policy has allocated more resources to social protection than to social security and public investment. Levy (2007) has shown that public programmable spending increased 110%, 21% and 0.8% in social protection, social security and public investment, respectively, in the period 1998-2006. Moreover, the social policy is mainly financed by two sources: oil rents and lower public investment (Levy, 2007). As a result, this has created a great dependence on revenue from oil exports putting at risk the

[6] The multidimensional poverty approach takes into account the following dimensions: current per capita income, average educational deficit, access to health services, access to social security, quality and size of the dwelling, access to basic services in the dwelling, access to food and degree of social cohesion. A person is in multidimensional poverty if she/he has at least one social deprivation and does not have enough income to meet her/his needs (CONEVAL, 2010).

[7] People deprived in at least one of the following areas: education, health, social security, quality of the dwelling, basic services in the dwelling and food (social deprivation) and an income below the welfare line (CONEVAL, 2010).

[8] A person is in extreme multidimensional poverty if he/she is deprived in three or more dimensions and does not have enough income to acquire a food basket (CONEVAL, 2010).

[9] The welfare line allows identifying the population that does not have enough resources to acquire the required goods and services to meet its needs (food and non-food) (CONEVAL, 2010).

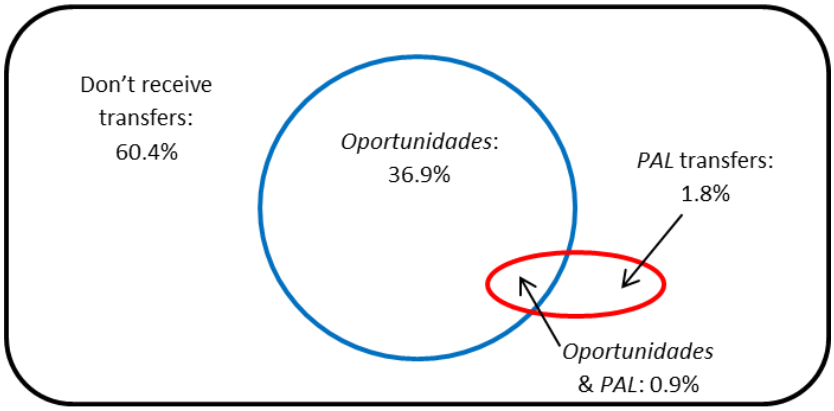
[10] The minimum welfare line allows identifying the population that, even using its total income to purchase food, could not acquire the indispensable for adequate nutrition (CONEVAL, 2010).

[11] These data correspond to the base year of this study, 2012.

sustainability and effectiveness of social programs and making the country very vulnerable to structural oil-market shocks.

The Inter-American Development Bank shows that 62% of the population with an income below the minimum wellbeing line does not receive *Oportunidades* transfers, (IADB, 2012). This organization estimates the exclusion and inclusion errors of the program. On the one hand, the exclusion error accounts for 77% in urban areas while it is of 34% in rural areas. With regard to the inclusion error, on the other hand, the IADB also points out that one of every five beneficiaries in urban areas, at national level, and one of every four, in rural settings, have an income above the wellbeing line, and should not benefit from *Oportunidades*. Moreover, 4.2 million households have an income below the minimum wellbeing line, of which 60.4% does not receive conditional cash transfers while only 36.9% gets them, 0.9% obtains *Oportunidades* and other transfers from the Food Program known as *PAL*, and 1.8% only receives *PAL* transfers. Figure 1.1 illustrates the distribution of households with an income below the minimum wellbeing line according to the social program.

FIGURE 1.1 DISTRIBUTION OF HOUSEHOLDS WITH AN INCOME BELOW THE MINIMUM WELLBEING LINE ACCORDING TO SOCIAL PROGRAM



Source: Social Protection Division, IADB (2012).

In sum, conditional cash transfers have been the core instrument to tackle poverty. However, despite all efforts, poverty remains at levels observed even before the implementation of Oportunidades, particularly when measured by the income poverty line's approach. This research seeks to assess the opportunity costs of financing such a program

with the aim of finding potential alternative strategies for rural growth and development and poverty reduction in the regional setting of Chiapas, Mexico.

1.1.3. High Income Inequality

Income inequality is still a severe problem in Mexico. Measured by the Gini coefficient, data shows that although it slightly fell in the period 2000-2008, it remains high especially when compared with other emerging and OECD countries. On the one hand, at the national level, the Gini was 0.509 and 0.498 in 2010 and 2012, respectively (CONEVAL, 2013). In Chiapas, on the other hand, the same indicator accounted for 0.541 and 0.535 in the same years. Moreover, the 2012 National Household Income-Expenditure Survey shows that the average current per capita income of decile X is around 21.62 times larger than that of decile I, another evidence of the huge income gap that still exists between the poor and the rich.

Inequality matters because it reduces welfare. The level of inequality may explain the impact of growth on poverty reduction (Bourguignon & Silva, 2003), (Klasen & Misselhorn, 2008). Therefore, it is important to implement a strategy for inclusive economic growth, that is, pro-poor growth accompanied by a pro-poor distributional change to address income and regional inequality so that growth may have a larger impact on poverty reduction (Klasen 2009).

1.1.4. Low Fiscal Revenue

Another relevant challenge in Mexico is the one related to fiscal revenue. The total federal government revenue (tax and non-tax) was 15.8% as a share of GDP in 2012 of which only 8.4% accounted for tax revenue (SHCP, 2014). This low tax revenue limits the capacity and potential of the federal government to carry out investment to encourage economic growth, employment creation and poverty reduction. The lower the revenue is, the lower the available resources for investment and transfers to subnational governments. The latter has serious implications on regional and municipal economic development since subnational governments depend significantly on federal transfers. They can only finance, on average, 7% of their total expenditure with their own-revenue while federal transfers account, on average, for 88% of their total revenue (Cabrera & Lozano, 2008). This pattern leads to a low-level equilibrium trap in which only a small share of the States' revenue might be used for

net and targeted investment (Nelson, 1956), causing a vicious circle of low economic growth and low income.

Moreover, the low fiscal revenue is also observed at subnational level, which creates a serious dependency of local governments on federal transfers and grants. In this regard, Chiapas has a very low own revenue accounting for 6.1% of its total revenue (Cabrera & Lozano, 2008). As a result, investment in infrastructure and the provision of pro-poor public goods and services in lagging municipalities is scarce, insufficient and/or deficient. If for some reason the federal budget allocated to Chiapas declines it might affect its expenditure on social programs and public investment to foster regional and territorial development.

The most recent meaningful fiscal reform was carried out in the mid-80s to introduce the value-added tax in the Mexican fiscal system. Since then, there have been a few reforms to increase or reduce some tax rates or create new taxes but there hasn´t been any comprehensive fiscal reform to raise the overall fiscal revenue (particularly the non-oil tax revenue); solve the evasion, elusion and inefficiencies of the tax collection system, construct an incentive structure to encourage informal enterprises and workers to join the formal sector, and eliminate the existing privileges in the special fiscal regimes. Mexico is the 7th largest oil-producing country worldwide, which may help explain the complacency of the federal government and the lack of sense of urgency among actors within the political system to debate and reach the necessary consensus to approve a comprehensive and sustainable fiscal reform.

1.1.5. Distorted Labor Markets

Mexican labor markets are mainly characterized by high mobility of workers between formal and informal sectors, a phenomenon that takes place permanently regardless whether the economy is growing at low or high rates (Levy, 2008). The interaction between social security and social protection distorts labor markets because they provide different benefits at different costs for workers (Levy, 2007). Hence, workers evaluate the aggregated wages they can earn and costs/benefits granted by the social security associated with the formal sector *versus* the aggregated wages they can earn and costs/benefits granted by the social protection in the informal sector. Perverse incentives are created, leading to a reallocation of

workers from the formal to the informal sector, due to the fact that social security benefits have a cost for workers (contributions, deducted from their gross wages) – that is interpreted as a tax – plus their low quality and inefficient provision in a context where social protection is provided at no cost. In other words, when salaried workers in the formal sector undervalue social security, the total benefits of working within the formal sector are considered to be lower than those in the informal sector, encouraging workers to move to informality (Levy, 2005), thus, distorting labor markets. As a result, the generation of these incoherent incentives leads to (1) lower mean productivity, (2) lower competitiveness in the formal sector, (3) larger informal sector, (4) regular mobility of low-wage workers from formality to informality (and vice versa), and (5) a failure of the social policy to reduce poverty and income inequality (Levy, 2007). As it has been illustrated by Levy (2008), the informal sector in Mexico is larger than the formal one, the former accounts for 58% of the composition of the labor force while the latter constitutes 38.4% of the labor force.

Another important negative effect of the process described above is that people in the informal sector do not pay taxes. This fact contributes to the persistence of the low fiscal revenue of the federal government hindering the provision of public goods and services and affecting public investment and economic growth. Furthermore, informality makes people more vulnerable to internal or external shocks. Firms in the informal sector face problems to grow and workers earn less, have an unstable income and don't have access to some benefits such as day care, disability insurance and occupational hazard insurance (Levy, 2007). If any domestic or external crisis occurs these low-income workers might face problems to meet their needs and/or find another job.

In addition, the unemployment rate has increased over the course of the last ten years, from 2.6% in the second quarter of 2000 to 5.3% in September of 2013. This upward trend in unemployment took place in the same decade in which the average GDP growth rate reached its lowest level in the last 20 years. In contrast, the unemployment rate in the capital city of Chiapas, Tuxtla Gutierrez, accounted also for 5.3% in the second quarter of 2013.

1.2. Hypothesis

Coherent incentives and a fiscal and investment flow for poverty and inequality reduction can be achieved by applying a pro-growth and pro-poor strategy to restore (rural) economic growth, to finance social policy and to finance the provision of public goods and services for regional development, and to raise household income in the regional setting of Chiapas.

1.3. General Objective

This dissertation is aimed at assessing the opportunity cost of financing *Oportunidades* in the context of the regional setting of Chiapas. Pro-growth and pro-poor tax structures shall also be explored to finance social policy and alternative strategies will be analyzed to reduce poverty and enhance rural development and rural growth. Standard economic analysis tools and a Computable General Equilibrium Model will be used to elaborate public policy recommendations for inclusive growth and poverty reduction in Mexico.

1.4. Specific Objectives

1. To evaluate the opportunity cost of financing *Oportunidades* and its implications for rural development and rural economic growth in the regional setting of Chiapas. Moreover,

2. Pro-growth and pro-poor tax structures are also assessed by applying standard economic analysis tools and modeling to substantially raise the federal non-oil tax revenue to finance the social policy for poverty and inequality reduction.

1.5. Research Question

The main research question to be addressed by this dissertation is:

- What is the opportunity cost of financing *Oportunidades* and its implication for rural development and rural growth?

In this context, this study includes the following secondary question to be explored:

- How to raise the tax revenue in a sustainable manner by applying a pro-growth and pro-poor tax structure to finance the social policy for poverty reduction in the regional setting of Chiapas?

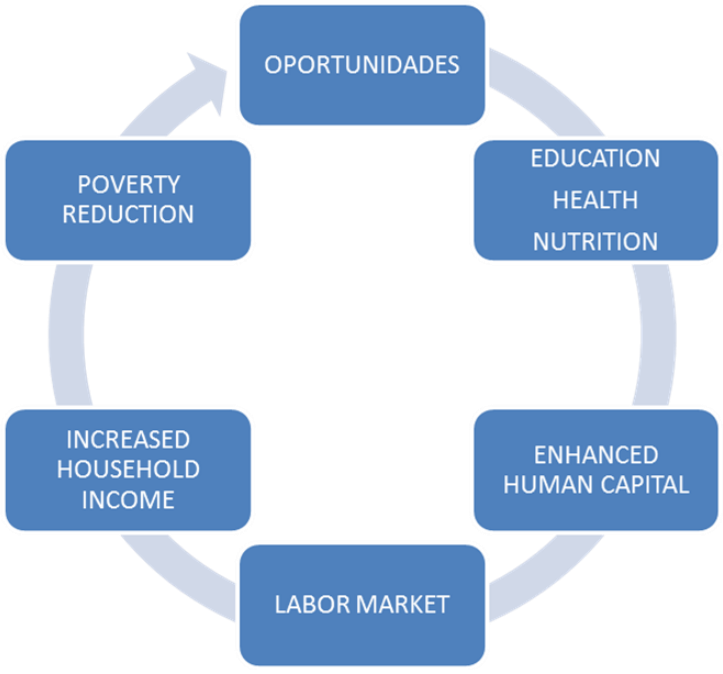
This research is organized as follows. Chapter one provides an introduction with the problem statement, hypothesis, general and specific objective, and research questions to be addressed by this thesis. Chapter two is focused on reviewing the leading literature about Mexico's conditional cash transfers, that is, *Oportunidades*, and their impact on beneficiaries' health, nutrition and education. It also includes the program's political economy and its effect on electoral behavior, its interaction with social policy and labor markets, and its impact on beneficiaries' capacity to invest. Chapter three introduces the theoretical framework in which this research is supported and the conceptual model that seeks to create a fiscal and investment flow for poverty reduction. Chapter four discusses data sources and the construction of a social accounting matrix for Chiapas. Chapter five is focused on the applied Computable General Equilibrium model, its assumptions and closures. In chapter six single and cumulative simulations and results are presented. Chapter seven discusses results and main findings concerning the research questions. Finally, chapter eight summarizes findings, concludes and suggests further research.

2. Literature Review

In 1997 the *Progresa* program is introduced in Mexico, which later adopts the name of *Oportunidades,* under the administration of President Vicente Fox (2000-2006), a pioneering conditional cash transfer program aimed at breaking the intergenerational transmission of poverty. The main goals of this program are (1) to improve the overall situation of households in extreme poverty on three areas, health, nutrition, and education; (2) to help children complete basic education; (3) to eliminate malnutrition, reduce mortality and fertility rates, and improve the overall health of household members by implementing a preventive and self-care approach and providing information on nutrition, hygiene, and sanitation; (4) to change the risks structure faced by households in poverty; (5) to encourage the participation of all household members to improve health, nutrition, and education; and (6) to redistribute the national income towards households in extreme poverty (Levy & Rodríguez, 2005). Moreover, this program is intended to transfer direct income cash conditioned to children and youth's school enrollment and regular attendance, regular health check-ups of the entire household beneficiaries, and regular attendance to talks on nutrition and health care.

Figure 2.1 shows the intended *Oportunidades'* mechanism for poverty reduction. *Oportunidades* seeks to improve the education, health, and nutrition of children and household members with the aim of enhancing their human capital, which allows them to join the labor market. By joining the labor market with better and/or new skills, household members are expected to earn higher labor income and reach a higher level of net disposable

FIGURE 2.1 *OPORTUNIDADES'* MECHANISM FOR POVERTY REDUCTION



Source: Author's analysis

income, leading them to break the intergenerational transmission of poverty.

At the beginning of the implementation of *Oportunidades*, it was executed as a Randomized Control Trial (RCT) for evaluation purposes. RCTs are a type of scientific experiment to test the impact of interventions in a randomly selected subpopulation; for a practical guide about how to conduct social experiments in development economics see (Duflo & Kremer, 2005) and (Duflo, Glennerster & Kremer, 2007). *Oportunidades* was the first large-scale social program in an upper-middle income country setting to apply an RCT. In this respect, Behrman and Todd (1999) evaluate randomization with the aim of finding out deviations at an early stage. The authors analyze and contrast the characteristics of treatment and control groups – focused on age, education, access to health care and income before both groups were exposed to *Oportunidades* benefits – to conclude whether both groups were really randomly assigned. They look at three variables: 1) continues; 2) discrete; and 3) binary. For each case they apply a Kolmogorov-Smirnov test, a Pearson chi-squared test, and a simply t-test, respectively.

Moreover, the authors point out that the main advantage of RCTs is that treatment and control groups share the same characteristics, which means that any differences between both groups, after an intervention, may be attributed to the implemented social program. However, they also argue that although selection bias can be avoided with RCTs, the following issues may emerge: a) randomization bias; b) contamination bias; and c) attrition bias. In addition, these kinds of social experiments may also be costly in terms of financial resources, time, and political cost. Nonetheless, the new generation of social experiments in development economics has had smaller budgets because the experiments have been carried out on a smaller scale (Duflo, Glennerster & Kremer, 2007). Other criticisms point out that RCTs also have a limited duration and only reflect the partial equilibrium effect of an intervention and, because of randomization bias, results often may not be generalizable (Burtless, 1995). In the end, Behrman and Todd find that treatment and control groups in *Oportunidades* are very similar, without any systematic difference when tests are executed at the locality level[12]. However, at the household level they find discrepancies causing many

[12] The authors justify the random assignment at the locality level arguing that because *Oportunidades* benefits are better provided at that level rather than at the household level.

more rejections of the null hypothesis than expected considering the significance levels. This result is relevant because household-level data was the preferable dataset at the time of the evaluation to assess the randomness in the samples of the program. To analyze in further detail RCTs, see also (Skoufias, Davis & Behrman, 1999), (Rosenzweig & Wolpin, 2000), and (Deaton, 2010).

Oportunidades is the response of the government to face a severe and persisting problem of structural poverty in Mexico, magnified after the financial crisis that took place in 1995. Its conception represents a new paradigm in the way poverty is addressed by targeting some pre-selected[13]municipalities – mainly located, initially, in the southern region of the country – and households in extreme poverty and marginalized. Nowadays, *Oportunidades* covers about 5.6 million households, that is, 24.5 million people around the country (SEDESOL, 2013). It represents the largest program of social policy in Mexico. The amount transferred to an average beneficiary household[14] in 2012, the base year of the present study, is MXN$1,554 a month (equivalent to USD$122[15] a month or approximately USD$4 a day).

A literature review of *Oportunidades* follows below. It is focused on health, nutrition, education, investment, political economy and electoral behavior, labor markets, and social policy. All of the relevant studies about the program's impact are focused on these fields.

2.1. The *Oportunidades* Program

The *Oportunidades* program is conceived as a key poverty reduction strategy within the framework of a comprehensive social policy. It has three components that are granted simultaneously: (1) basic health care for all household members; (2) support to improve food consumption and nutrition of household members; and (3) educational support to encourage children and youth to complete basic education (Levy & Rodríguez, 2005). These components are aimed at enhancing and strengthening human capital development. It is also thought of as an instrument for income redistribution through direct monetary transfers to beneficiary households.

[13] For a detailed explanation on how households were selected, see (Levy, 2005).
[14] An average *Oportunidades* household is a family with two children that receives an average scholarship per child, school supplies, food and energy support, and child support for one child (IADB, 2012).
[15] It is estimated using an average exchange rate of MXN$12.70 for one US dollar.

2.2. Health

In this topic the program transfers cash to a targeted household conditional on the household's participation in preventive health care, hygiene and nutrition-related talks, the use of nutrition supplements for children under 5 years old, for pregnant, and lactating mothers. *Oportunidades* has successfully contributed to reducing household members' susceptibility to illness. Consultations in hospitals have fallen 58% for children up to 2 years old and for adults older than 50 years old (Levy & Rodríguez, 2005). Also some studies have found that child malnutrition has significantly fallen about 17% and 14% for moderate and severe malnutrition, respectively, since the program's implementation (Levy & Rodríguez, 2005). Some benefits have also been observed in household members between 18 and 50 years old: their difficulties to tackle daily activities because of health problems have fallen about 19% and their ability to walk without getting tired increased about 8% (Levy & Rodríguez, 2005).

The empirical evidence shows that the program has managed to significantly raise the use of preventive health services such as prenatal care, immunizations, regular checkups, and nutritional surveillance (Levy & Rodríguez, 2005). For instance, regular checkups have increased around 59% and visits to hospitals for consultation because of any kind of illness have dropped about 29% (Lozano, 2006). Moreover, health coverage has increased among poor, extremely poor and marginalized households after the implementation of *Oportunidades* (Levy & Rodríguez, 2005).

2.3. Nutrition

Oportunidades has had a positive overall impact on nutrition. Hoddinott and Skoufias (2003) find that the amount of calories acquired from vegetables, animal products, grains, fruits, and others have increased about 7%. This trend has two main sources: an income effect, on the one hand, and the regular participation of household members in "talks" offered to provide information and orientation on healthy diets, nutrition and sanitation, on the other hand. The income effect caused by direct monetary transfers allows households to acquire products with higher nutritional content. And the "talks", in turn, "empowers" people with better information on the benefits of a more diverse diet. Moreover, these talks may also have spill-over effects in the community (Hoddinott & Skoufias, 2003).

Another relevant benefit is about the significant reduction in the probability of stunting as a result of increasing food consumption. Caldés, Coady and Maluccio (2004) assess the cost-efficiency of *Oportunidades* by using a cost-transfer ratio (CTR). CTRs not only include costs related to transfer the money to the beneficiaries, but also costs of activities which may enhance the effectiveness of the program, such as targeting and monitoring. This study is focused on cost levels and the structure of costs. The authors find that fixed costs are typically a more relevant component at earlier stages of the program; however, average fixed costs tend to converge toward zero over time. Moreover, they argue that the program's benefits outweigh its costs since higher nutrition and decreased stunting levels have been observed. In this respect, Behrman & Hoddinott (2000) also argue that the fall in the probability of children being stunted and the program's positive impact on child growth may be attributed to the increased consumption of nutrimental supplements.

Angelucci and Attanasio (2009) also explore the *Oportunidades*' effect on consumption. Their study focuses on the urban component of the program and its impact on household consumption. They point out and deal with methodological problems in the urban component of *Oportunidades*, for instance, the fact that the allocation of transfers is not random[16]. The authors observe that in urban areas the take-up of the program is around 50% and argue that this is probably because households are not aware of the existence of the program, or because of uncertainty about their eligibility status or because the program is less attractive in urban settings. They use a combination of difference-in-difference matching and instrumental variables and estimate the average effect of the treatment on the treated (ATT) and the average intention to treat (AIT), assuming stable unit treatment value (SUTVA), conditional independence (CIA) and common support. The findings of this study are that, on the one hand, *Oportunidades* has caused a large increase in food consumption among beneficiaries. Treated households consume a large share of the transfer, and most of it is spent on food. It is also argued that these households – the poorest, which are precisely the ones more likely to enroll in the program in urban areas – are less likely to save a share of the transfer to invest, and most likely, in contrast, to spend it to improve their nutrition. On the other hand, this study finds that the low participation rate

[16] In the case of urban areas, *Oportunidades* sets up an office in those areas with the highest density of poor households. Then, it estimates a propensity score at the block level to estimate the probability of each block to receive the program (Angelucci & Attanasio, 2009).

in urban areas may be caused by a low expected benefit and that participation in the program is strongly correlated to poverty. Other explanations such as low information and uncertainty on eligibility status are not excluded.

The program has also important spill-over effects among non-beneficiary children at the community level as well. In this respect, Handa, Huerta, Perez and Straffon (2000) develop five indicators to measure changes in (1) relative poverty rates, (2) inequality, (3) school continuation rates, (4) nutrition surveillance rates and (5) prices. The authors construct difference-in-differences estimators and apply regression techniques to isolate community-level program effects. They find that poverty increases less in communities receiving *Oportunidades* than in control group communities. Results also show a larger reduction in inequality and higher school continuation rates in the program's communities. Moreover, the program does not have an impact on inflation and results show spill-over effects on nutrition surveillance rates in non-beneficiary children.

2.4. Education

There are two paradigms and a trade-off in education: improved-education quality *versus* improved-education access. *Oportunidades* adopts in this area an improved-education access approach, that is, the education dimension of the program is focused on providing support to households in order to raise enrollment and attendance rates from elementary to high-school while reducing child labor by directly transferring cash to pre-selected households (Coady & Parker, 2004). In consequence, enrollment rates and regular attendance have been analyzed since they are core objectives of the program. On the one hand, it has been shown that *Oportunidades* has increased enrollment in secondary school by 6% and 9% for boys and girls, respectively (Adato & Hoddinott, 2007). In contrast, in the case of elementary school the program has not had a significant impact on enrollment rates. It is argued that at this level enrollment rates were already high even before the program's implementation. On the other hand, however, it has not had a significant incidence on attendance rates, achievement on standardized test, and re-enrollment of those children who had dropped out (Adato & Hoddinott, 2007).

In addition, Skoufias and Parker (2001) show that *Oportunidades* has reduced child labor while increasing school attendance. In this respect, both girls and boys tend to reduce their participation on market and domestic work and are more likely to attend school and spend more time on school activities instead. This positive impact has been mostly observed among children at the secondary school level, with special attention on girls who have reduced their time spent on domestic work, representing a successful empirical case of the program achieving two main intended targets.

The cost-effectiveness of applying a demand-side *versus* a supply-side education intervention, that is, the financial viability of an improved-education access strategy, as it is the case of *Oportunidades*, or an improved-education quality approach, has also been analyzed. In this respect, Coady and Parker (2004) argue that a demand-side policy seems to be the most cost-effective approach for achieving a certain number of years of education. In other words, an expansion in the provision of education by building more schools in remote areas, for example, would be more costly. However, this approach raises concerns in at least two aspects. On the one hand, it has been pointed out that distance plays a very important role on children's enrollment with more negative consequences on girls than boys (Coady & Parker, 2004). It implies that all efforts made through the program to encourage higher enrollment and attendance rates might be wasted in those remote and isolated communities since distance may represent a barrier for children to go to school. On the other hand, the program's focus on improved-education access, from an income perspective, crowds out the quality of education. It may have important consequences on the returns of human capital formation (Coady & Parker, 2004).

Debowicz and Golan (2013) build an applied econometric-based microsimulation model combined with a macro CGE model – a top-down/bottom-up approach – to identify the expected direct and indirect effects of conditional cash transfers on children's allocation of time, and the expected effects on poverty and income distribution. With this combined model, the authors capture two transmission channels: a) occupational effect; and, b) wages effect. The first channel allows assessment of how changes in the program's coverage, in its design and in child wages, may lead to children's reallocation of time between work and school. The second channel assesses how changes in the child labor supply may lead to a

new average general equilibrium real wage in the child labor market which affects the total disposable household income. They find that *Oportunidades* improves household income distribution and poverty indicators. Moreover, they show that an extension of the program's coverage to all moderately poor households could further improve current results. The expansion of *Oportunidades* could even further reduce child labor. The general equilibrium analysis suggests that such an extension would lead to a 2.7 percent decrease in poverty. The authors also argue that if the Mexican government is able to afford the fiscal cost of extending *Oportunidades* and its related increase in public expenditure, mainly in education, school attendance rates could increase about 1.4 percent whereas the poverty rate would fall by 2.7 percent. Furthermore, the authors also find that an increase in the skills of the program's beneficiaries by enhancing their human capital through *Oportunidades* could increase the future poor households' income decreasing the poverty rate by about 1.4 percent.

Another study carried out by Azevedo and Robles (2010) applies the Bourguignon, Ferreira and Leite (BFL) model (Bourguignon et al., 2003) relaxing the identification assumption and carrying out counter factual simulations to assess potential impacts of policy changes in *Oportunidades* on households. The authors focus on school attendance results generated by changes in the rules of the program and the value of the transfers. They find that among poor households with children between the age of 16 and 18 there is an increase in school enrollment of about 4.5 percent, whereas only around 1 percent remain working and studying. The same pattern is found for children between the age of 12 and 18. There is an increase in school enrollment as a result of cash transfers. When executing simulations to change the amount of cash transferred, the authors find that the elimination or reduction of subsidies for primary school while increasing transfers for older students lead to higher school enrollment keeping the *Oportunidades*' budget neutral. Hence, the program has a significant impact on school attendance for children who are not attending school; however, it has only a marginal impact on those already attending school and working. Finally, this study argues that complementary interventions are required in order to further encourage school attendance because it may be too expensive doing it through conditional cash transfers.

As the program's coverage expanded to urban areas since 2002, new challenges emerged concerning its targeting and the need to decrease the beneficiaries' drop-out rate at high school level[17]. In this respect, Azevedo, Yáñez-Pagans and Bouillon (2010) assess how school attendance responds to changes in *Oportunidades* cash transfers, with focus on secondary and high school beneficiaries, by constructing two types of applied ex-ante simulations, a parametric simulation based on a bi-probit model of school attendance and child labor and a semi-parametric simulation based on matching techniques. The authors find a negative correlation between school attendance and work. As age increases, the probability of attending school decreases while the probability of joining the labor market increases. This pattern is specifically present in boys. Poverty reduces the probability of attending school while increasing the probability of working. In addition, the probability of dropping out of school increases when children complete primary and secondary education. Moreover, the authors also show that, on the one hand, raising the amount of the cash transfer by 50 percent leads to an increase of 6.8 percent in school attendance. On the other hand, a cut in transfers by half leads to lower school attendance of about 5.3 percent. As high school attendance rates are present since the program's implementation, this study suggests that resources should be reallocated from elementary to secondary and high school levels. Doubling the transfers to the latter educational levels may increase school attendance by 7.8 percent.

Most of the studies carried out to analyze the educational component of *Oportunidades* are focused on short-term impacts. To assess the long-term effects of the program on future income distribution and employment outcomes McKee and Todd (2011) propose a nonparametric simulation model to compare earnings and employment distributions, with and without the program, and standard parametric approaches to compare their inferences to those that would be obtained. They focus on years of schooling and increases in height. Their hypothesis states that the program's impact on education and height will increase mean future earnings of beneficiaries. The authors find that current conditional cash transfers will in fact increase beneficiaries' mean income levels; however, they will only have

[17] Azevedo, Yáñez-Pagans and Bouillon (2010) identify three issues concerning the expansion of *Oportunidades* to cover urban areas. First, the allocation of transfers across regions is no longer random. Second, a socioeconomic census to define eligibility of households is no longer feasible either. As a result, the program's offices for household registration were located in regions with high concentration of poor households. Third, the structure and amount of cash transfers are the same as in rural areas.

a small impact on income inequality. They argue that the key factors underlying the moderate effect on inequality relies on the complexity to anticipate which children will become low-income adults as well as nonlinearities in how height and education influence earnings. However, the most significant result shows that an additional year of secondary school has a higher income return than an additional year of elementary school.

So far evaluations of *Oportunidades* have been focused on assessing the short and medium-term impact of the program[18]. This has been the case because of the lack of data to carry out analysis on the program's outcomes over long periods. To fill this gap Behrman, Parker and Todd (2011) investigate two types of long-term impacts of *Oportunidades*. First, they look at the effects of short differential exposure (18-month) on long-term outcomes (after five and a half years). For this case, the method used is difference-in-difference (DID) estimates with the aim of assessing whether initial program's impacts persist or diminish over time. Second, the researchers look at the effects of a long differential exposure (four or five and a half years) on long-term outcomes. In this scenario, they apply difference-in-difference matching (DIDM) estimates in order to find out whether there are increasing or diminishing returns during *Oportunidades* exposure. Moreover, this study also investigates the impact of cash transfers on work, labor market effects and cost-benefit ratios of the program. With respect to the first type of impact, the authors find that greater exposure to the program has increased schooling by 2.4 percent for boys and 2.7 percent for girls. Youth with 18-month exposure to the program have achieved more schooling and this differential has persisted along the five and a half year-period under study. Results suggest that the *Oportunidades*' impact on schooling does not decrease over time. In the second type of impact, results confirm significantly larger effects on schooling with a longer exposure to the program. The older youth show higher rates of working and a change from agricultural to nonagricultural work. With respect to costs and benefits of *Oportunidades*, results show fairly high benefit-to-cost ratios. The main findings of the program suggest that, on the one hand, the initial exposure to the program (18-month) seems to have a robust impact on schooling that is sustained over time. On the other hand, the positive effect on the level of education seems to increase linearly with the duration of the exposure to *Oportunidades*.

[18] About the program's medium-term impact, see (Behrman, J. R.; Parker, S. & Todd, P. E., 2009).

2.5. Investment

Another relevant study analyzes the long-term poverty implications of productive investments made as a result of conditional cash transfers. Gertler, Martínez and Rubio-Codina (2012) examine the hypothesis that poor households use a share of their cash transfers to invest in productive entrepreneurial activities. They argue that cash transfers alleviate liquidity and credit constraints and may encourage risk-adverse households to invest in riskier but higher return activities. If the cash transfer is large enough to tackle liquidity constraints, more investment in productive assets by poor households is expected to take place. This research applies a controlled randomized experiment of *Oportunidades* transfers. The authors find that beneficiary households increased ownership of productive farm assets and their agricultural production and income grew faster and higher than in the controlled group. Consumption for the original treatment group of households was 5.6 percent higher than that of the control group, even four years after control groups were enrolled into the program. An 18-month enrollment in the program resulted in a 9.6 percent increase in agricultural income, as well. Moreover, households' recipients of *Oportunidades* started more nonagricultural microenterprises than non-beneficiary households.

In addition, results show that these investments also lead to higher long-term consumption improving living standards of beneficiaries. From each peso transferred, households consume about 74 cents and invest the remaining part. After five years and a half, beneficiary households increased consumption by $41.9 Mexican pesos per capita per month, and after nine years they did so by $53.9 Mexican pesos. The authors argue that the increased income stream generated from investing in productive assets is sustained over time, leading to higher long-term standards of living measured by consumption levels. As a result, this study concludes that *Oportunidades* households are unlikely to return to pre-program poverty levels once they leave the program.

2.6. Political Economy and Electoral Behavior

Some studies have been carried out to investigate the political economy of conditional cash transfer programs and their effects on electoral behavior and returns, and, ultimately, on democracy. In this respect, De La O (2013) analyzes the effect of *Oportunidades* on electoral behavior, electoral outcomes and voting turnout. This research implements a randomized

experiment in seven states where *Oportunidades* was initially scaled up and its sample selection follows the *Oportunidades*' method. The randomization was carried out at the local level (village) and included those localities with access to school and health services. Localities with less than 50 or more than 2500 inhabitants and those isolated were excluded. Priority is given to communities with a high and very high degree of poverty. Applying Geographic Information System (GIS), the remaining localities were sorted out according to their geographical proximity. The author finds that the enrollment in *Oportunidades* led to a 7 percent increase in voting turnout and a 9 percent increase in the incumbent voting share in the 2000 presidential election. She shows that the program's benefits do not have an impact on support for opposition parties. Instead, *Oportunidades* seems to have an effect to mobilize votes in favor of the incumbent political party, that is, it induces a pro-incumbent mobilizing effect of the program's beneficiaries. Moreover, the author finds also little evidence for explanations based on clientelism. The study offers, instead, an argument based on programmatic politics and credit claiming. It suggests that targeting programs, such as *Oportunidades*, operated in a programmatic fashion are conciliable with healthy democratic habits, encouraging participation in elections, likely in favor of the incumbent party.

2.7. Labor Markets

Because of lack of data only a few studies have been conducted to evaluate the impact of *Oportunidades* on labor market outcomes. To assess the impact of *Oportunidades* in schooling and labor market outcomes, Parker and Teruel (2012) carry out difference-in-difference estimators to compare young adults in selected communities receiving *Oportunidades* in the period 1997-1998 (early beneficiaries) with the results of those receiving it in 2004 or later (late beneficiaries). The main objective is to investigate whether beneficiaries in early adulthood obtain higher earnings as a result of having benefited from *Oportunidades*. The study's hypothesis states that the increase in school attainment will lead to increased lifetime earnings through returns to education. The authors find, on the one hand, increased effects of the program on education over time. The overall impact is in the range of 0.5 grades of additional schooling. Moreover, they find significant effects on the likelihood of attending high school by about 5 percent. On the other hand, concerning labor market outcomes, the authors find that *Oportunidades* increases the share of early beneficiaries who are working compared to those late beneficiaries by about 13 percent. The

program shows, in contrast, only a few significant effects on hours worked as well as health benefits whereas no significant effect is found on labor income per hour worked. *Oportunidades* seems to have only a few effects on work outcomes for beneficiaries between ages 22 and 26. The authors argue that the lack of impact on earnings may be because returns to education are not high enough to induce a significant change in earnings, likely because of low quality of education or lack of employment opportunities in rural areas.

In another recent study, Rodriguez-Oreggia and Freije (2011) assess the *Oportunidades*' impact on labor market outcomes, migration and intergenerational occupational mobility. This research attempts to estimate, on the one hand, the probability of being employed and labor earnings of young beneficiaries once they are employed. On the other hand, it investigates if there is an improvement in occupational status compared to that of their parents. The authors focus their assessment primarily on the impact of short (< 3 years), medium (3 to 6 years) and long-term (> 6 years) exposure to *Oportunidades*' benefits on the likelihood of employment, wage levels and intergenerational labor mobility of beneficiaries. To do so, they apply an econometric methodology in which they control for different treatment duration and with ex-ante program characteristics at the household and local level. Four groups are defined. The control group is composed of those beneficiaries who are eligible for treatment but for some reason have not received the benefit. In addition, three treatment groups are integrated: a) less than three years of treatment; b) between three and six years of treatment; and, c) more than six years of treatment. With respect to data, this study uses the 2007 Rural Household Evaluation Survey (ENCEL). The authors find limited impacts on employment, wages and intergenerational occupational mobility of beneficiaries aged 14-24. No significant effect is found concerning the likelihood of being employed, and only a positive effect on wages among males, exposed for minimum six years to the program, is observed. They argue that *Oportunidades* does not seem to either increase or decrease the probability of recipients obtaining employment. Its main impact works through the educational channel increasing their schooling level. With respect to wages, results show that long-term male beneficiaries earn more than non-beneficiaries, however, no difference or even lower earnings are observed among short- and medium-term beneficiaries compared to non-recipients. As far as occupational mobility is concerned, this research finds statistically significant positive impacts only for women in the short-term

treatment group. Moreover, *Oportunidades* seems to reduce migration for beneficiaries with elementary education in long-term treatment localities. Finally, the authors argue that the impact of *Oportunidades* on income and standards of living not only depends on increased capital accumulation, but also on how this translates into greater labor market opportunities for beneficiaries.

Ibarrarán and Villa (2010) also attempt to assess the *Oportunidades*' effects on the labor market. Their study has two main objectives. The first goal is to model and estimate the duration of beneficiaries in the program, whereas the second one is about the evaluation of the program's impact on labor market outcomes. The authors apply a Generalized Propensity Score (GPS). This method allows for comparison among different levels of exposure to the program. They find that a 5-year exposure to the program maximizes the schooling attainment. In addition, the authors suggest that a 3-year exposure to the program for a 14-year old recipient is required in order to maximize the probability of getting employed.

The 2008 external evaluation of *Oportunidades* also sheds light on the program's effect on occupation. González de la Rocha (2008) builds an occupational pyramid composed of 8 levels in order to analyze the occupational distribution of the program's beneficiaries. The author finds that *Oportunidades* has not had the expected occupational impact because of a lack of employment opportunities and the low economic performance of the regions where the program's recipients are located. Rodríguez-Oreggia and Freije (2008) use the occupational pyramid presented by González de la Rocha (2008) and take the analysis further to assess the intergenerational occupational mobility of beneficiaries. The authors evaluate the program's effects on intergenerational occupational mobility of youth who are between 15 to 24 years old in rural households, including in the analysis the recipients' exposure to the program and their emigrant or non-emigrant status. This research uses the 2007 Rural Household Evaluation Survey (ENCEL) and applies a stochastic (Markov) matrix. This method allows assessing the probability of an *Oportunidades* recipient to be in a particular occupational category, given that his/her father is in another. In addition, to capture the effect of the exposure to *Oportunidades* on the probability to move to another occupational category, a *probit* model is also implemented. Results show a limited impact of

Oportunidades on occupational mobility[19]. However, the program seems to have a significant impact on occupational mobility through further education. In this respect, the study finds that 7.4 percent of the observed occupational mobility may be attributed to the increased educational level as a result of the exposure to the program. Moreover, preliminary evidence is found which suggests that beneficiaries obtain higher salaries than non-beneficiaries driven as well by the exposure to *Oportunidades*.

2.8. Social Policy

Levy (2007) argues that the interaction of the components of the current social policy does not create an incentive structure for an efficient allocation of labor in order to raise productivity, encourage economic growth, (formal) job creation, higher wages and net income leading to poverty reduction. The social policy in Mexico has three pillars: social security, social protection, and *Oportunidades*. In the case of social security, on the one hand, it provides eight benefits: health insurance, retirement pensions, disability insurance, life insurance, occupational (work) risk insurance, day care, sporting and cultural services, and housing loans. This system is financed by worker-employer contributions[20] through the payroll tax and covers all sources of formal employment. Social protection, on the other hand, covers all those workers in the informal sector that cannot benefit from the social security system. It provides benefits such as free medical services (*Seguro Popular*), governmental subsidies for housing loans (Fonhapo, Fovi, Habitat, and *Vivienda Rural*), day care, life insurance, and an individual account for retirement savings (*Afore*). All these benefits are free of charge. And the third pillar, *Oportunidades*, covers targeted households in (extreme) poverty in rural and urban areas looking for complementarities between health, nutrition, and education to encourage their human capital development by allocating direct conditioned cash transfers (Levy, 2007).

The interaction between social security and social protection distorts labor markets because they provide different benefits at different costs for workers (Levy, 2007). Hence, workers evaluate the aggregated wages they can earn and costs/benefits granted by the social

[19] With respect to non-emigrants, the program seems to have an impact on women and indigenous beneficiaries, nonetheless, no effect is found on men. For emigrants, results are similar for the case of women.
[20] It has been shown that at the end of the day this cost falls on workers, that is, firms transfer this cost to workers in their total labor cost function (this includes wages, contributions to social security, and taxes) to maximize returns (Levy, 2007).

security associated with the formal sector *versus* the aggregated wage they can earn and costs/benefits granted by the social protection in the informal sector. Perverse incentives are created, leading to a reallocation of workers from the formal to the informal sector, due to the fact that social security benefits have a cost for workers (contributions, deducted from their gross wages) – that is interpreted as a tax – plus their low quality and inefficient provision in a context where social protection is provided at no cost. In other words, when salaried workers in the formal sector undervalue social security, the total benefits of working within the formal sector are considered to be lower than those in the informal sector, leading workers to move to informality (Levy & Rodriguez, 2005) distorting labor markets. As a result, the generation of this incoherent incentive structure leads to (1) lower mean productivity, (2) lower competitiveness in the formal sector, (3) larger informal sector, (4) regular mobility of low-wage workers from formality to informality (and vice versa), and (5) a failure of the social policy on poverty reduction (Levy, 2007).

Social protection makes it more attractive for workers to join informality since they can have access to certain social benefits free of any charge. This encourages a reallocation of labor among markets, increasing mobility from formal jobs to informal ones. As a consequence of this process, a lower labor supply in the formal sector raises salaries, increases total labor costs (social security costs don't change) leading to a scenario in which firms end cutting jobs, reducing production, profits, investment (in machinery and equipment, and human capital), and, eventually, losing productivity and competitiveness. In contrast, a larger labor supply in the informal sector reduces salaries and productivity. In general terms, this process hurts the overall growth rate of the economy leading to lower levels of productive employment, lower income, and more poverty (Levy, 2006a), (Levy, 2007).

In addition, another issue that contributes to the formation of a larger informal sector is the evasion of social security by both workers and firms. In this respect, as social security represents a cost for firms and employees, both tend to look for ways to evade such costs. This phenomenon takes place when workers assign a lower value to the benefits granted by social security because of their low quality and the fact that such benefits don't meet workers' needs. For firms, evasion, which usually occurs in micro and small firms, represents a way to reduce total labor costs. Thus, the current format to finance the social security

system, worker-employer contributions, gives rise to perverse incentives encouraging both micro and small firms and low-wage workers to evade such system, move to the informal sector, remain within it or opt, in the case of workers, for self-employment (Levy, 2007). This has serious implications in two dimensions, social and fiscal. On the one hand, an increased informal sector signifies that workers are no longer forced to save for their retirement pensions; they lose some benefits such as day care, disability insurance, and occupational hazard insurance making them more vulnerable.

In the fiscal dimension, on the other hand, a larger informal sector increases demand for social protection. This growing demand for social protection has an impact on public finances. As the federal tax revenue only accounts for about 10% as a share of GDP, social protection has to be financed by the only two possible sources: oil rents and lower public investment. In this respect, the Mexican government has lost any sense of urgency to carry out a comprehensive fiscal reform to raise the total tax revenue because it has always counted on oil rents. However, it makes the country dependent on oil revenue and vulnerable to oil-market shocks. Within a context of very limited public finances, social spending on social protection exceeds public investment leading to lower economic growth, lower employment creation, lower income, and more poverty. Levy (2007) has documented that public spending (programmable expenditure) on social protection increased 110%, 21% on social security and barely 0.8% on public investment between 1998 and 2006. The social policy has allocated more resources to social protection than to social security and public investment in recent years.

Social protection, in combination with social security and *Oportunidades*, has had a perverse effect – contrary to its intended goal of raising welfare by providing social benefits to all those employees who are not covered by social security – leading to a larger informal sector with lower wages, lower productivity, and lower economic growth affecting the ultimate goal of raising workers' net personal income to break the intergenerational transmission of structural poverty (Levy, 2007).

Some studies have shown that although poverty has increased nationwide it has done so significantly less in those communities where *Oportunidades* operates. The poverty rate

difference between beneficiary communities and those non-beneficiary ones is about 4 percentage points (Handa, Huerta, Perez, & Straffon, 2001). This highlights the important role of the program to minimize the probability of a household to remain in poverty in the long-run and reduce households' vulnerability to domestic or external shocks.

Levy (2006b) argues that *Oportunidades* has to be complemented by a redefinition of the whole social policy. In this respect, he suggests that a social policy reform should be carried out simultaneously with fiscal and labor market reforms. On the one hand, a social policy reform should be focused on a universal social security system financed by indirect taxes, whereas, on the other hand, a fiscal reform is fundamental to raise the federal revenue in order to finance the universal social security system. As far as a labor market reform is concerned, he argues that it is a critical element to build a coherent incentive structure to encourage both workers and firms to join the formal sector and in so doing, reduce informality leading to a context of higher productivity, formal job creation, sustained economic growth, and poverty reduction (Levy, 2007).

In sum, this literature review shows that *Oportunidades* has had a positive impact on health, nutrition, and education of household beneficiaries, as well as positive spillover effects on non-beneficiaries. With respect to health, conditional cash transfers have reduced the incidence of beneficiaries prone to illness while increasing health coverage, the use of preventive health services, and checkups. By attending mandatory hygiene- and nutrition-related talks, parents are better informed to buy products with higher nutritional content. This has caused child malnutrition and the probability of stunting to decrease. At the same time, in raising the net disposable household income, *Oportunidades* has led beneficiaries to higher food consumption levels. The fact that cash transfers are provided on the condition that poor families send their children to school has reduced child labor while increasing school enrollment and attendance rates.

However, as research shows, *Oportunidades* can be further improved on different levels. The program's focus on improved-education access crowds out the quality of education, which can ultimately affect the returns of human capital formation. There is a need to increase the quality of education and improve employment opportunities in those regions where the

program operates. It is precisely the link between *Oportunidades*' beneficiaries and the labor market that deserves more attention. Studies show that, so far, there are inconclusive results concerning the impact of the program on labor market outcomes such as the probability of beneficiaries to obtain employment. At this time, *Oportunidades* has not made the expected occupational impact because of lack of employment opportunities and the low economic performance of the regions where the program is currently operating. It is important that the regional economies restore or further stimulate their economic growth for job creation and carry out active labor market policies, such as an apprenticeship scheme, to broaden the likelihood of beneficiaries to find employment. Besides, it is advisable to follow the labor trajectory of beneficiaries to find out whether they join the formal sector. On the other hand, there is a need to revise the current targeting system to select households. Nowadays there is an inclusion error that needs to be corrected: one of every five beneficiaries in urban areas and one of every four in rural settings have an income above the wellbeing line (IADB, 2012). This implies that there are households that should not benefit from *Oportunidades* while there are some poor families being excluded.

Given the current poverty levels in Mexico, which are as high as they were even before the implementation of *Oportunidades*, and the uptake of the program that is only about 50% in urban areas, cutting conditional cash transfers can lower school attendance rates. Instead, it is advisable to focus on extending the program's coverage to all moderately poor households because it could further improve current results, as IFPRI research shows (Debowicz and Golan, 2013). In addition, a reallocation of larger resources from elementary to secondary and high-school levels is required because enrollment and attendance rates in elementary school have been high even before the implementation of *Oportunidades*.

Finally, this literature review shows that most of the work done on *Oportunidades* has applied different econometric models and techniques, with the exception of two IFPRI studies carried out by Debowicz and Golan (2013) and Coady and Lee Harris (2001). In the first case, the authors applied an econometric-based micro-simulation model combined with a macro CGE model. In the second case, the authors build a CGE in a *top-down* approach. Their model regionally (North, Central, South West, and South East) disaggregates a national social accounting matrix only by production and factor markets, and households by income

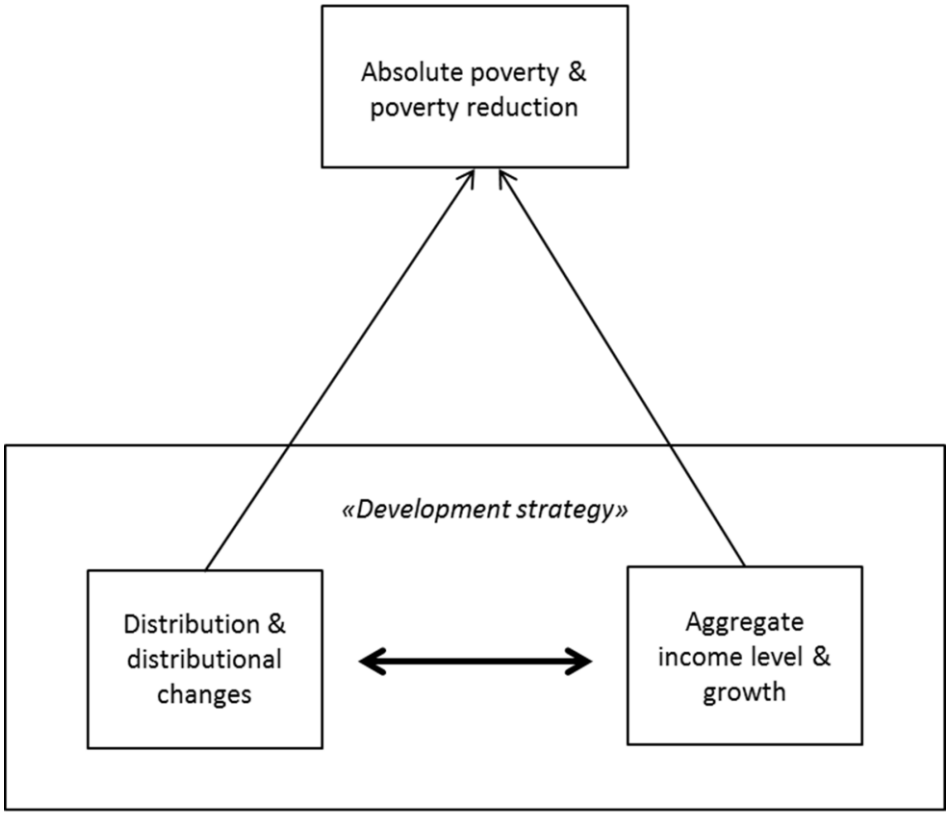
terciles (poor, medium, and rich). In contrast, present dissertation uses an applied CGE in a *bottom-up* (based on microfoundations) approach for the regional setting of Chiapas. It proceeds to evaluate the opportunity cost of financing *Oportunidades*, that is, the forgone strategies for achieving economic growth and poverty reduction at regional level. This methodology allows assessing, among other things, the welfare effect of individual and cumulative economic policies, selected according to the ongoing debate about poverty reduction, pro-poor economic growth, and tax policy in Mexico such as the extension or elimination of conditional cash transfers, investment targeting, and the role of the value-added tax and social security contributions. The next chapter covers the theoretical framework and the conceptual model of this study.

3. Theoretical Framework

This research project is based on the theoretical framework of pro-poor macroeconomics (UNDP, 2008). According to this approach the government shall play a relevant and indispensable role to foster inclusive economic growth and poverty reduction. In this respect, some active public policies such as fiscal, monetary, trade and exchange rate are important because a market-oriented strategy should not be expected to generate pro-poor growth (UNDP, 2008). Specifically, a comprehensive and progressive fiscal policy to encourage economic development and reduce poverty is required. Thus, public investment is a crucial fiscal instrument for pro-poor growth.

Also, this work assumes that the rate of economic growth is a relevant determinant of the rate of absolute poverty reduction (Ravallion, 2004). However, in order to accelerate the process of absolute poverty reduction a strong combination of growth and distribution policies is required (Bourguignon, 2004). In this respect, this study follows the theoretical tradition of the "Poverty-Growth-Inequality Triangle" illustrated by figure 3.1 (Bourguignon, 2004):

FIGURE 3.1 THE POVERTY-GROWTH-INEQUALITY TRIANGLE

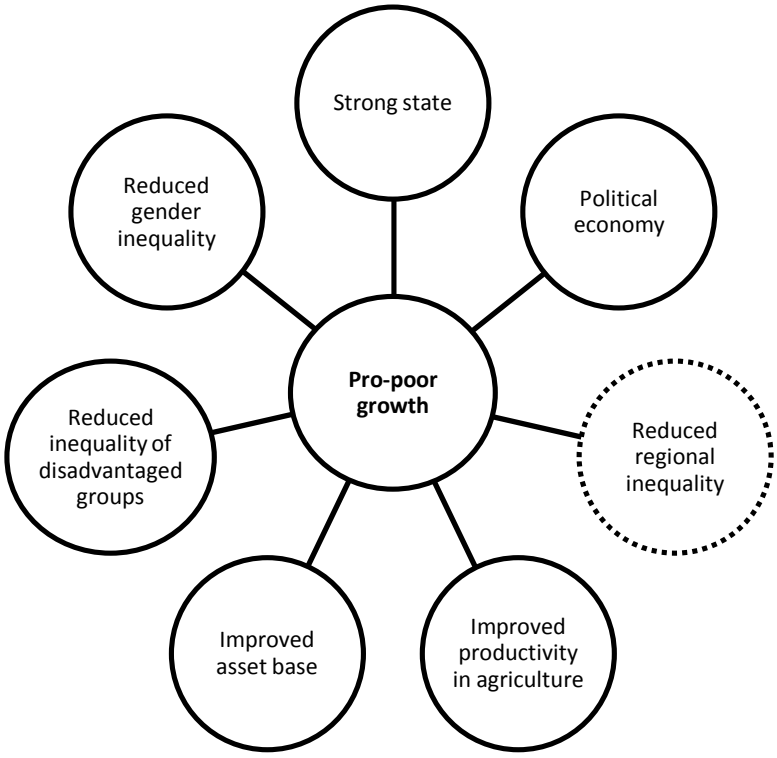


Source: Bourguignon, 2004

This triangle implies that absolute poverty reduction is determined by the interrelation between the growth of the mean income and changes in the distribution of income. Hence, the main challenge of any development strategy relies on the mechanics of growth and distribution. Furthermore, a key issue is to generate high overall economic growth from which poor people can clearly benefit by implementing appropriate policies leading to a pro-poor distributional change (Klasen, 2009). Growth shall be accompanied by a pro-poor distributional adjustment with the aim of reducing or alleviating poverty and inequality.

According to Klasen (2009), pro-poor growth has seven main determinants: a strong state, an improved productivity in agriculture, improved asset base, reduced gender inequality, reduced inequality of disadvantaged groups, reduced regional inequality, and political economy. Figure 3.2 illustrates these seven determinants of pro-poor growth. In the context of this research, reduced regional inequality plays a central role since it may prevent poverty to decline.

FIGURE 3.2 DETERMINANTS OF PRO-POOR GROWTH



Source: Klasen (2009)

On the other hand, inequality is especially important because it mitigates the impact of growth on poverty reduction. In the presence of high inequality and poverty, as is the case of Chiapas, the growth elasticity of poverty is diminished (Ravallion, 2009). Hence, it is also

important to implement public policies aimed at reducing inequality. One way to achieve this goal is by investing in poor areas. Rural infrastructure for local market development, pro-poor provision of public goods and services, targeted subsidies to raise agricultural productivity, progressive taxation, monitoring and accountability of capital allocated in poor areas may lead to attenuated inequality and reduced poverty. Klasen (2009) argues that to achieve reduced regional inequality, it is required to implement a comprehensive strategy based on infrastructure policies, targeted public investment for lagging regions, support for migration and remittances (*i.e.* monetary flows), safety nets, and pro-poor fiscal decentralization.

To systematize the theoretical approach, this research proposes a conceptual model for poverty and income inequality reduction in Mexico, illustrated by figure 3.3. It seeks to enhance a fiscal and investment flow based on three pillars: 1) pro-growth and pro-poor fiscal policy; 2) pro-poor rural growth, structural transformation, and rural change; and, 3) the formal labor market. Pro-growth and pro-poor fiscal policy is focused on tax reform, on the one hand, to raise the tax revenue to finance social policy and public investment, and transfers, and on the other hand, to allocate more resources to poor regions such as Chiapas. On a national level, the additional tax revenue may be used to finance social policy and public investment. Social policy may be focused on extending *Oportunidades*, particularly the educational and food components of the program, and financing a universal social security system. Public investment, in turn, may improve the provision of public goods and services such as infrastructure, health and educational services. A higher tax revenue may also allow the national government to transfer more resources to Chiapas. The regional government of Chiapas may implement a program of targeting investment at the municipal level aimed at (1) building new infrastructure, (2) acquiring machinery and equipment to support primarily the agricultural sector, particularly small farmers who do not have access to credit to finance investment, and (3) improving and extending the provision of public goods and services in those localities with a lack of roads, highways, bridges, water treatment and electricity plants, schools, clinics and hospitals.

Investment from the national and regional governments may foster rural economic growth and structural transformation. Higher aggregate demand (rural and urban) may stimulate the

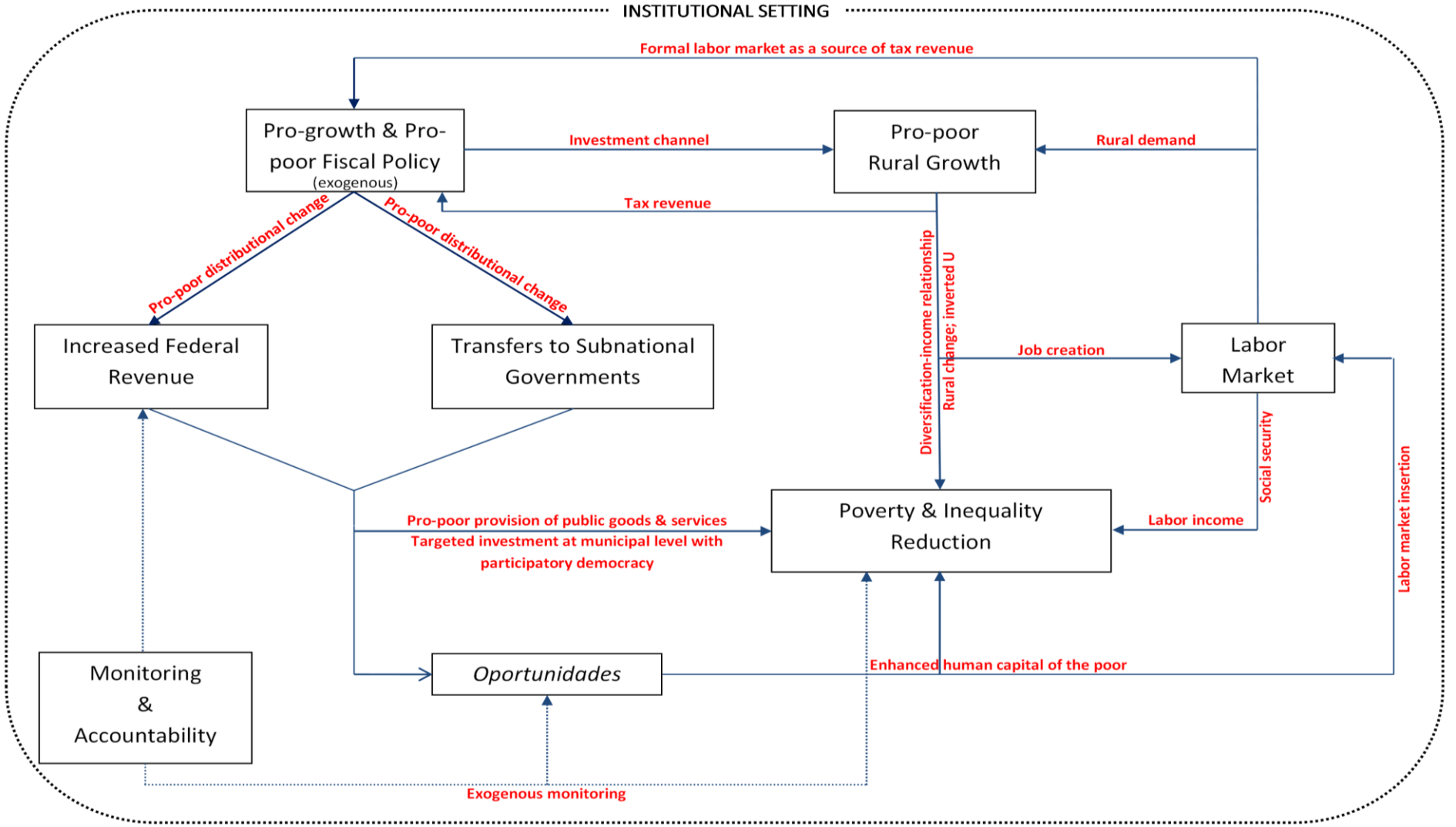
demand for labor, leading to a higher level of employment. If the demand for labor can be met by a labor supply with better skills and higher education, the labor market can contribute to poverty reduction through labor income, which might also further enhance aggregate demand. Moreover, a link between *Oportunidades* and the formal labor market may be created so that poor workers may find a formal job to earn higher wages and have access to social security benefits. By increasing the size of the formal labor market, direct and indirect tax revenue may also grow, strengthening public finance and the capability of the government, to further increase or, at least, sustain investment levels. Ultimately, this fiscal and investment flow may lead to a self-sustaining process of inclusive (rural) economic growth, economic development, structural transformation, and poverty reduction. In what follows below, the theoretical approach of the three pillars of the conceptual model is introduced.

3.1. Pro-growth and Pro-poor Fiscal Policy

A fiscal reform should focus on both, revenue and expenditure. In the first case, revenue, a great number of studies have been done in order to analyze the variety of empirical methods, usually criticized because of a lack of theoretical foundation, because of models, often too abstract, and variables to determine the optimal level of taxation (Tanzi & Zee, 2000). However, there is an inconclusive debate on what is the "optimal" way to determine the so-called "optimal" level of taxation. It is precisely due to the complexity to determine the optimal tax level that it has been suggested that increased attention should be paid to the tax structure and how revenue is used in order to achieve the pre-defined goals of tax policy, in developing countries, rather than to the so-called "optimal" tax level itself. The expenditure side is as important, or perhaps more, as it is the revenue side in fiscal policy (Bird, 2008), (Bird & Zolt, 2007). An alternative way to set the level of taxation is by designing a spending-needs model which shall simultaneously set the revenue needs to be in equilibrium (Tanzi & Zee, 2000). Another possibility is to establish as a tax revenue objective the 22% as a share of GDP as suggested by the UN Millennium Report (2005) for developing and emerging countries to finance economic development (Bird, 2008)[21].

[21] Bird (2008) cites that the UN argues that developing countries require adding 4% to their current average tax revenue of 18% as a share of GDP.

FIGURE 3.3 CONCEPTUAL MODEL: A FISCAL & INVESTMENT FLOW FOR POVERTY REDUCTION



Source: Own elaboration.

Moreover, if abovementioned approach is adopted it would imply that Mexico would have to be able to increase its current revenue by about 13.6 percentage points as a share of GDP. According to the predominant consensus among fiscal experts, to achieve this goal there are three alternative ways: raise taxes, expand bases, and improve administration (Bird, 2008). However, increased emphasis has been placed on lowering tax rates particularly where income tax is concerned. In this respect, this argument is based on the theoretical foundation that any tax on income or any increase on the income tax rate may affect savings and distort the decision making process to allocate capital in productive activities and/or sectors, leading to lower output and welfare (Bird, 2008). Furthermore, raising corporate income taxes, for instance, may discourage the pattern of growth and expansion of companies and impose barriers to small and medium enterprises aiming to join the formal sector. There is a tendency to lowering tax rates –mainly in personal and corporate income taxes – rather than raising them, however, if such strategy is pursued it has to be accompanied by broader tax bases if the overall revenue is to be increased in a sustainable manner.

From a direct-tax perspective, one alternative to raise the tax revenue is through a dual-income tax structure. It attempts to improve the personal income tax by combining a progressive tax on labor income and a lower flat tax rate on capital income (Bird & Zolt, 2011). Hence, this dual structure may act as a platform to introduce a deeper tax reform. One of the main attributes of this policy is that a tax system may gain flexibility to face and react to tax competition within liberalized capital markets and an increasingly integrated world economy without losing progressivity and equity. It means that countries may be able to compete internationally in order to attract foreign direct investment by applying a competitive flat tax rate on capital income[22] while designing an independent set of progressive rates to tax labor income. An alternative to be considered is the possibility of implementing two different regimes to tax capital income. A low flat tax rate on capital gains combined with a higher flat tax rate on income sourced from ongoing businesses (Bird & Zalt, 2011). With this scheme countries may be able to create incentives for small and

[22] It is argued that when reducing capital income tax rates with the aim of setting a flat rate to be accompanied by an independent set of progressive labor income tax rates, it is fundamental to simultaneously broadening the capital income tax base (Bird & Zolt, 2011).

medium enterprises to join the formal sector which may contribute to reducing the informal economy and broadening the tax base.

The empirical evidence on personal income tax reforms shows that the corresponding revenue may be increased by reducing the degree of rate progressivity, that is, cutting the number of rate brackets and reducing exemptions and deductions[23] (Bird, 2008). Tanzi & Zee (2000 & 2001) argue that only a few moderate progressive brackets are required for the personal income tax structure.

There is another important topic within the field of the income tax that deserves attention, the rate structure of the marginal income tax. Recent literature argues about the convenience of applying a marginal tax rate at broader levels in order to capture more income subjected to this tax (Tanzi & Zee, 2000). Furthermore, it is also suggested that the top marginal income rate shall not differ significantly from the corporate income tax rate with the aim of avoiding distortions – not only on markets but also on individuals' willingness to work – and disincentives to engage in entrepreneurial activities, which may hurt economic growth and the process of capital formation (Karabegovic, Veldhuis, Clemens & Godin, 2004).

Another area of opportunity, in developing and emerging countries, the manner in which to tax financial income. It is particularly problematic for these countries to deal with this type of income because of tax administration constraints. Two specific subjects deserve particular attention: interest income and dividends. In the first case, one possibility to capture this income stream into the tax system is by applying a final well-targeted withholding scheme on interest income. Concerning the second case, Tanzi & Zee (2000) discuss that a good option is to exempt dividends or to set a low tax rate, at the same level as that of the interest income, to be applied by a final withholding scheme.

From the indirect-tax perspective, Mexico may raise its tax revenue by adjusting the current value-added tax (VAT) and excise system. On the one hand, VAT multiple rates are costly and

[23] It has been argued that personal income tax deductions can be replaced by tax credits (Tanzi & Zee, 2000). In doing so, equity can still be achieved if the political economy does not allow a reform of the personal income tax structure.

complex to administer, this complexity is even greater when an inefficient administrative system is operating (Tanzi & Zee, 2001), (Bird, 2008), (Bird & Bahl, 2008). This research shall explore two scenarios to determine the best alternative respecting the principle of equity: scenario one, a lower flat VAT rate; and, scenario two, a higher flat tax of 19%. On the other hand, excises should play a more strategic and selective role in Mexico. In other words, an excise system should be narrower and target a few well-chosen goods whose consumption is likely to produce negative externalities. This system should have as a goal to generate revenue at the lowest possible administrative cost (Tanzi & Zee, 2000).

A complementary alternative to raise tax revenue is by broadening tax bases. A tax policy ought to be based on two elemental principles: symmetry and inclusiveness. The former refers to granting the same treatment to losses and gains – something currently absent in the Mexican tax system which is mainly characterized by a lot of exemptions and privileges across different sectors of the economic activity – regardless the income source (Tanzi & Zee, 2000). The latter refers to the ability to incorporate – at some point of the income generating process – all types of income flows into the tax system. The absence of these basic principles creates distortions and inequities. An excess of exemptions, deductions and incentives may tend to narrow the tax base and have a negative impact on the progressivity of the personal income tax structure (Tanzi & Zee, 2000).

The tax administration plays an important role to increase revenue. There are three essential elements for an effective tax administration: 1) the political will for an effective administration of the tax system; 2) a well-defined strategy; and, 3) adequate resources (Bird & Zolt, 2007). The political economy is important to achieve an efficient and effective administration because such an improvement has to be based on a political consensus to carry out a reform that may harm sensitive political interests or privileges of a dominant elite group. Even the best tax reform may fail to achieve its objectives if the political will is absent. Once the political economy is in favor of a tax administration reform to eradicate all type of privileges – beyond names, friendships, and spurious interest – an effective tax administration can be reached by having a well-defined strategy, keeping it simple, adopting a client-oriented approach to deal with taxpayers, prosecuting defaulters, monitoring and controlling corruption, building a list and record of taxpayers, and applying state-of-the-art

technology for managing purposes (Bird & Zolt, 2007). As implementation relies on human capacities it is very important to keep the tax administration staff well-trained with strong moral principles and updated about international practices and on the latest technologies.

As stated at the beginning of this chapter, expenditure is an important component of a pro-poor fiscal policy. Expenditure matters and it matters as much, or probably more, as revenue (Bird & Zolt, 2007). All fiscal attempts to reduce poverty should come from the expenditure side (Bird, 2008). Therefore, a good fiscal policy shall focus on not only revenue but also expenditure in order to make the necessary investments in lagging sectors and regions to increase productivity, boost economic growth and reduce poverty. Hence, this research suggests that it is relevant for Mexico to focus on how revenue is spent[24], that is, on the assessment of pro-poor public spending strategies financed by the tax revenue for poverty reduction.

Monitoring the use of financial resources is another relevant issue. Ahmad (2011) shows the importance and convenience, for developing and emerging countries, of designing and implementing a Treasury Single Account (TSA). Its main objective is to consolidate in a single account all government financial resources in order to guarantee transparency and full information concerning the use of the money. Therefore, a TSA or a financial management information system seems to be an indispensable tool within the Mexican fiscal system. It may, indeed, help reduce corruption practices and set up an accountability system to know the origin and distribution of resources across the three levels of government. Such a tool, allows the gathering of information in order to know, with transparency, what, where, and when the money has been spent, for what purposes, and allows results and productivity to be measured (Ahmad, 2011).

In sum, taxation matters and it does because, although it cannot rescue the poor from poverty, it can make them poorer (Bird & Zolt, 2007). It also matters because it is the pathway to strengthen the financial capability of central governments to finance public investment, encourage growth, reduce poverty, and reach a higher state of economic

[24] Tanzi & Zee (2000 & 2001) have argued that it is most important for developing and emerging counties to focus on how revenue is used and the tax structure, rather than making unfruitful efforts trying to determine an "optimal" level of taxation since it is unlikely such an optimal level, for any country, could ever be derived.

development. In this respect, Rebelo and King (1990) have shown that taxation may affect long-term growth and lead to "growth miracles" if it provides the right incentives[25] for human and physical capital formation. The latter is reinforced in open economies with access to capital markets. Hence, the correlation between taxation and long-term growth highlights the relevance to review the tax structure and rates. Moreover, Easterly and Rebelo (1993) also argue that there seems to be a positive correlation between the level of economic development and the tax structure. They show that the fiscal structure not only depends on income and the structure of the economy but also on the scale of the economy. The scale is important to be considered when designing the tax structure.

Any tax policy should be designed taking into account some basic and general principles which, when applied correctly, may lead to avoid distortions and inequities: 1) symmetry; 2) inclusiveness; 3) neutrality; 4) equity; and 5) simplicity (Tanzi & Zee, 2001). In addition, sustainability should also be considered. One ought to evaluate whether the tax structure and its outcomes will be sustainable. Finally, minimizing the costs of taxation and designing it according to international norms and practices are other important components of a good tax policy (Tanzi & Zee, 2000).

In addition, a complementary element of the fiscal component of the conceptual model refers to fiscal federalism. In this respect this research argues that Mexico needs to revise the current federal system of fiscal revenue-sharing and grants. On the one hand, the system of revenue-sharing consists of the following funds: a general sharing fund[26]; municipal development fund; IEPS-financed fund[27]; tax-inspection fund[28]; filling-gap fund[29]; and the hydrocarbon extraction fund (Ley de Coordinación Fiscal, 2009). On the other hand, there are eight funds to allocate federal grants among subnational governments. These funds cover the following themes: basic education; health services; social infrastructure; territorial and municipal development; adult and technological education; public security in states and the Federal District; strengthening of federal states; and multiple-purpose grants.

[25] If taxation does not provide incentives for the private accumulation of human and physical capital, it may hamper economic growth in closed and open economies (Rebelo & King, 1990).
[26] It is the *Fondo General de Participaciones*.
[27] Such fund is financed by the special tax on production and services (IEPS).
[28] It is known as the *Fondo de Fiscalización*.
[29] A compensation fund (*Fondo de Compensación*) distributed among the 10 Federal States with the lowest GDP per capita.

Concerning the different alternatives to allocate transfers and grants to subnational governments, Ahmad and Searle (2005) introduce a typology of transfer systems which is composed of the following alternatives: gap-filling transfers, whose main goal is to finance gaps between spending needs and revenues; revenue-sharing, which is commonly used to tackle vertical disparities; special-purpose grants, with the aim of financing specific projects (close-ended) or the continuity of them (open-ended) and to tackle horizontal disparities and equalization transfers, which may be over revenue capacity, expenditure needs, or both.

Some observation can be made from these different types of transfer systems. The gap-filling transfer framework does not provide incentives for subnational governments to raise their own revenue and manage their expenditures. The revenue-sharing approach is carried out on the main source of revenue which may lead to greater horizontal disparities. The special-purpose grants have been adjusted in developed countries towards a flexible sector conditionality system which grants discretionality to subnational governments on the spending in the specified sector. Nonetheless, the latter requires the design and implementation of a monitoring system to guarantee transparency and efficiency in the use of resources. Concerning equalization transfers, it is argued that the type based on revenue capacities and expenditure needs may be an interesting alternative to be applied in developing countries, because it may encourage efficiency and accountability, however, its sustainability may depend on the available financial resources (Ahmad & Searle, 2005).

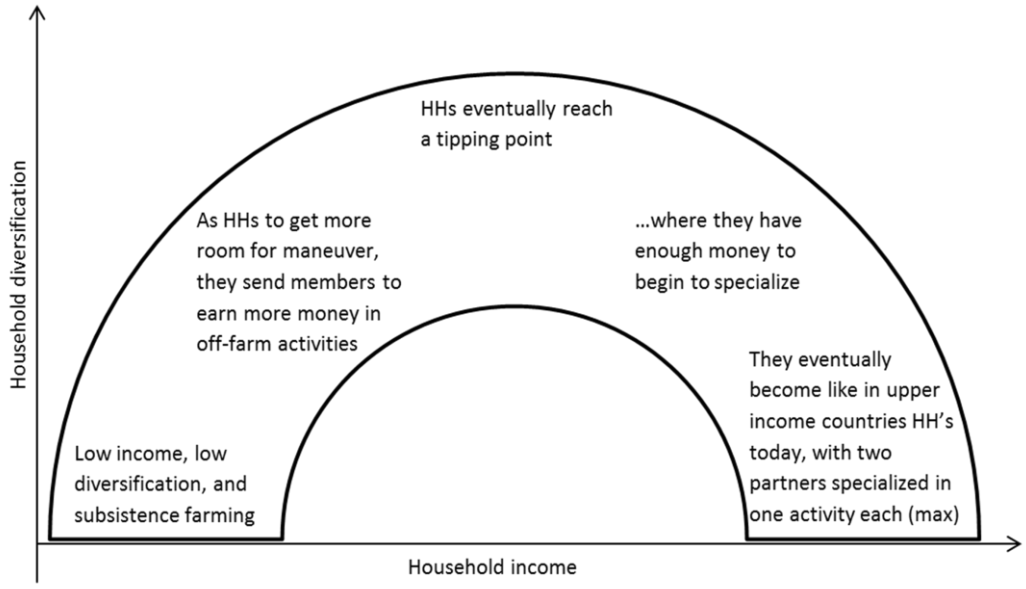
Hence, as far as the allocation of transfers from the general government to subnational governments is concerned, it is advisable to revise the current revenue-sharing system and explore the degree of feasibility to introduce an equalization system based on revenue capacity and expenditure needs with a results-based budgeting approach – withholding funds upon demonstration of results – aimed at raising the productivity of the allocated capital. This approach may work effectively for public investment expenditure in a context where horizontal competition for funds is encouraged (Ahmad, 2011).

3.2. Pro-poor (Rural) Growth and Structural Transformation

Further, this research is also linked to the approach of the revisited structural transformation and rural change introduced by Losch, Fréguin-Gresh and White (2012). According to this

theoretical framework the diversification-income relationship is mainly characterized by an inverted U pattern, illustrated by figure 3.4. The inverted U pattern implies that poor households diversify their economic activities with the aim of broadening their sources of income to earn more money to meet their needs and cope with risks. However, once they reach a certain income threshold they begin to specialize. Moreover, at very low income levels (at the bottom of the pyramid where household income can only be used to meet the very basic needs) the diversification of income sources does not take place and households are mainly occupied with on-farm activities.

FIGURE 3.4 THE INVERTED U PATTERN

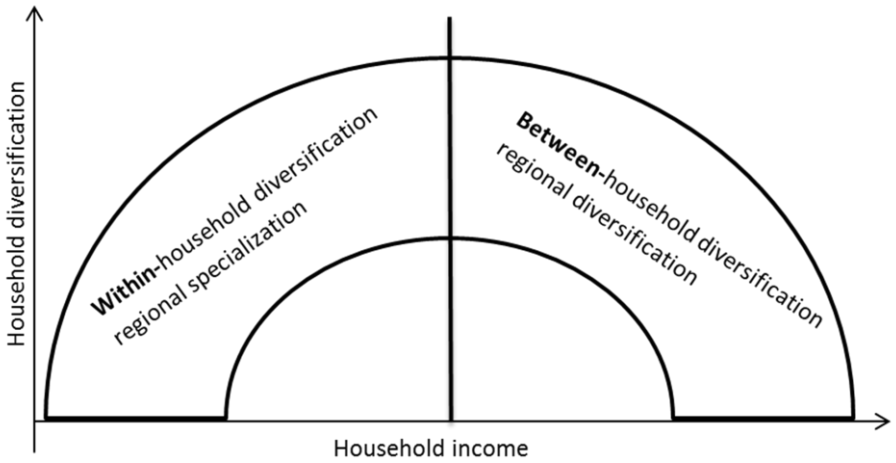


Source: (Losch, Fréguin-Gresh and White, p. 211, 2012)

Nevertheless, as household income begins to slightly increase households remain at risk but they start gaining some capacity to maneuver and build safety nets. As the process of income growth continues households start diversifying their economic activities in order to expand their sources of income and reduce their vulnerability to shocks. At this point the diversification process only occurs at the household level, the so-called *within-household* diversification, whereas the region continues to be specialized in agriculture. This process leads to a stage in which households are able to build an asset and wealth base by specializing in different economic activities, either on-farm or off-farm or both, with the aim of meeting their needs and lowering their risk and vulnerability whereas the region becomes economically diversified, the so-called *between-household* diversification. Figure 3.5

illustrates the diversification process. This diversification-specialization process encourages rural growth, structural transformation and rural change and leads to poverty reduction.

FIGURE 3.5 DIVERSIFICATION WITHIN & BETWEEN HOUSEHOLDS & INVERTED U PATTERN



Source: (Losch, Fréguin-Gresh and White, p. 214, 2012)

3.3. Labor Market

The third component of the conceptual model is about the labor market. In this respect, this study follows the conventional theory of labor demand. It assumes that the labor market is competitive, firms are wage takers and profit maximizers. The labor demand curve has a downward slope in the short-run because of labor's diminishing marginal product. With this approach, the firm will maximize its profits in the short-term (and assuming that factor capital remains constant) at the output level at which marginal revenue equals marginal cost. In other words, the profit-maximizing firm will seek to expand output by one unit if the added revenue from selling that unit is greater than the added cost of producing it (Ehrenberg & Smith, 2012). There are corollaries with regard to the employment of labor and capital:

1) If the revenue generated by employing one more unit of an input (either labor or capital) exceeds the additional costs, then add a unit of that input.
2) If the revenue generated by one more unit of input is less than the additional costs, reduce employment of that input. And,
3) If the revenue generated by one more unit of input is equal to additional costs, then no further changes in that input are advisable (Ehrenberg & Smith, 2012).

Moreover, firms reach the profit-maximizing level of labor when the *Marginal Product of Labor* (*MPL*) multiplied by price (*P*) equals the nominal wage (*W*):

$$MPL \cdot P = W$$

If both sides of the equation are divided by price *P*, the profit-maximizing condition for hiring labor is given by:

$$MPL = \frac{W}{P}$$

Where the right-hand expression is the real wage and has a dimension of physical units. According to Ehrenberg and Smith (2012), such condition implies that:

1) A firm should hire labor up to the point at which the *MPL* equals its real wage, but not beyond that level. And,
2) Its profit-maximizing level of labor is located within the range where its *MPL* is decreasing.

In the long-run, a firm has to adjust its production factors, such as labor and capital, so that the *Marginal Product of Labor* (*MPL*) multiplied by price (*P*) equals the nominal wage (*W*) while the *Marginal Product of Capital* (*MPK*) multiplied by price (*P*) equals the price of capital (*r*). Hence, the following two conditions have to be met:

$$MPL \cdot P = W$$
$$MPK \cdot P = r$$

There are two effects that play a role to analyze labor demand when changes in the price of production factors (e.g., labor and capital) take place: the scale and substitutions effects. For instance, an increase in the wage rate raises the relative cost of labor and induces firms to use less of it and more of other production factors; this is the so-called substitutions effect. The wage increase leads to higher marginal cost of production, and this makes pressure to increase product prices and reduce production, leading to a fall in the level of employment; this is the so-called scale effect. Moreover, if two factors are substitutes in production, increases in the price of the other factor can shift the entire demand curve for a given

category of, say, labor either to the right or to the left. The latter depends on the relative strength of the substitution and scale effects. On the other hand, if two factors are complements in the production process, a lower amount of one implies a lower amount of the other. In this case there is only a scale effect and the two factors are called gross complements (Ehrenberg & Smith, 2012). In the end, the firm's demand for any category of labor is a function of its own wage rate and, through the substitution and scale effects, the wages or prices of all other types of labor, capital, land, and so forth.

Also, there are two kinds of elasticities related to labor demand:

1) The own-wage elasticity of demand. And,
2) The cross-wage elasticity of demand

On the one hand, the own-wage elasticity of demand is defined as the percentage change in labor (L_i) with respect to a one-percentage change in the wage rate (w_i):

$$\varepsilon_{ii} = \frac{\%\Delta\, L_i}{\%\Delta\, w_i}$$

For instance, an increase in the wage rate will cause labor to decline. This elasticity is a negative number. The larger its absolute value, the larger the percentage decrease in labor with respect to any given percentage increase in wages. Three cases can be observed. First, if it is greater than 1, a one-percent increase in wages will lead to a labor decline greater than 1%. In this case, the labor demand is elastic. Second, if it is less than 1, a one-percent increase in wages will lead to a proportionately smaller decline in labor. In this case, the labor demand curve is inelastic. And third, if it is equal to -1, the labor demand curve is unitary elastic, and labor remains unchanged if wages increase.

Furthermore, there are four factors that may have an impact on the own-elasticity of labor demand, known as the Hicks-Marshall laws of derived demand. Ehrenberg and Smith (2012) point out that the first three laws always hold and that all of them affirm that the own-wage

elasticity of demand is high. Hence, according to these laws the own-wage elasticity is high when:

1) The price-elasticity of demand for the product being produced is high.
2) Other production factors can be easily substituted for the factor labor.
3) The supply of other production factors is highly elastic. And,
4) The cost of hiring labor accounts for a large share of the costs of production.

On the other hand, the cross-wage elasticity of demand is defined as the percentage change in the demand for factor *j* induced by a one-percentage change in the price (or wage rate) of factor *k*. If the two factors are two different types of labor, the cross-wage elasticities are given by:

$$\varepsilon_{jk} = \frac{\%\Delta\, L_j}{\%\Delta\, w_k}$$

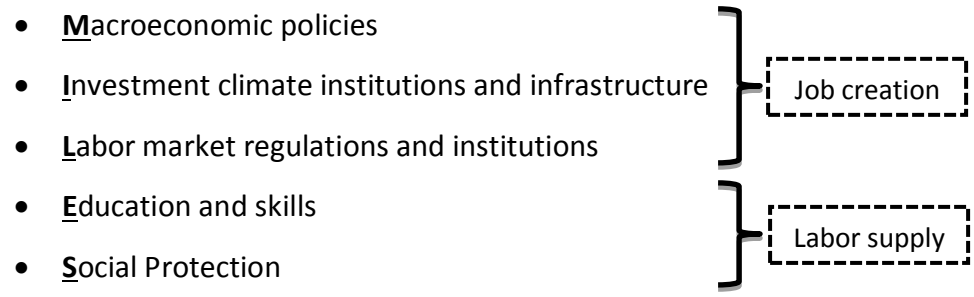
$$\varepsilon_{kj} = \frac{\%\Delta\, L_k}{\%\Delta\, w_j}$$

If an increase in wage rate of one type of labor increases the demand for the other, the cross-wage elasticities are positive and factors are called gross substitutes. If an increase in wage rate of one type of labor reduces the demand for the other, the cross-wage elasticities are negative and factors are called gross complements (Ehrenberg & Smith, 2012). A production factor can be either gross substitute or gross complement depending on the relative magnitude of the scale and substitution effects. For the case of the cross-wage elasticity the Hick-Marshall laws do not hold because the scale and substitution effects work in opposite directions.

With regard to labor supply, in this study it is set to equal labor demand to reach equilibrium in the labor market. It is left for further research to develop a detailed labor supply for the regional setting of Chiapas to be programmed in GAMS for CGE simulations. Furthermore, migration was initially considered to be included into the empirical analysis and modelling, however, in the end it was left out because it does not play a significant role in Chiapas. According to the 2010 Census of Population and Housing carried out by the National

Institute of Geography and Statistics (INEGI), in Chiapas only 0.45% of the population lives in other countries. It is ranked 27th of 32 states on this topic. International migration mainly takes place in other states such as Guanajuato, Zacatecas, Michoacán, Oaxaca and Hidalgo. On the other hand, the National Population Council estimates for Chiapas an intra-state migration rate of only 0.53%[30] (CONAPO, 2010).

In addition to the conventional theory of labor demand, this study follows the MILES framework suggested by the World Bank (World Bank, 2008). It is a multi-sectoral approach to identify key constraints for job creation in a given country, define policy priorities and required reforms. It seeks to create synergies between sectors and involved stakeholders. The MILES framework is focused on the following five areas:



In this context, economic growth enhanced by sound macroeconomic policies, investment in infrastructure, passive and active labor market policies (passive policies such as: unemployment insurance, unemployment assistance, unemployment insurance savings, and a public works' program; and active policies such as: training and job search programs and public works or subsidies), investment in education and training programs (e.g., on-the-job training and apprenticeships), along with social protection programs are essential for job creation and poverty reduction. Hence, this study explores the MILES framework using a structural approach by applying a Computable General Equilibrium model.

In sum, the theoretical framework of this study is focused on pro-poor growth, structural transformation and rural change, inclusive fiscal and labor market policies. In this context, the conceptual model pursues two goals: (1) to enhance a fiscal and investment flow to

[30] More information on the topic is available online at:
http://www.conapo.gob.mx/es/CONAPO/Situacion_Demografica_Publicaciones

restore and boost regional economic growth for poverty reduction through a combination of policies; and (2) to create coherent incentives through the interrelationship of three areas: 1) pro-growth and pro-poor fiscal policy; 2) pro-poor rural growth; and 3) labor market policies. These areas seek synergies and complementarities to create a virtuous circle to achieve poverty reduction in the regional setting of Chiapas. In this framework, monitoring and accountability, e.g. the Federal Superior Auditor[31] (ASF), should play an important role to supervise and guarantee that all financial resources are truly allocated as planned. Moreover, this fiscal and investment flow represents a non-accelerating inflation strategy because public investment shall not be financed by an expansionary monetary policy or increased borrowing, thus, no crowding out takes place. Investment shall be allocated to benefit the poor, through targeted interventions at the regional level for the provision of public goods and services and local market development, with the aim of breaking the intergenerational transmission of poverty.

In the light of this theoretical framework, a *Computable General Equilibrium* (CGE) model is the chosen methodology because it allows evaluating the impact of different pro-poor and pro-growth policy scenarios on production and employment, as well as their welfare effects at the household level for poverty reduction. Given that the core objective of this study is to assess the opportunity cost of financing *Oportunidades* for poverty reduction in the regional setting of Chiapas, this methodology is the best choice because it also allows assessing the effects of changes in social transfers, particularly in the distribution and amount of conditional cash transfers and to what extent these changes might impact households disaggregated by income quintiles. Moreover, with a general equilibrium approach it is also possible to test investment targeting, alternative tax structures, and adjustments in government consumption expenditure at the sectoral level. It is also useful to evaluate changes in the demanded quantity of formal and informal labor, factor income, total household income, and to assess to what extent economic growth contributes to poverty reduction through the growth elasticity of poverty reduction. Finally, to apply a CGE model, a social accounting matrix has to be constructed because it represents the primary input for this kind of methodology. The following chapter describes datasets, data sources, and explains how a social accounting matrix is assembled for the Chiapas' economy.

[31] It refers to the Auditoría Superior de la Federación (ASF).

4. Data

The datasets used for assembling the 2012 Chiapas Social Accounting Matrix are described in this chapter. This study uses secondary data and the main sources are the National Institute of Statistics and Geography (INEGI), the Chiapas State Committee of Statistical and Geographical Information (CEIEG), and the Federal Ministry of Labor and Social Welfare (STYPS). Table 4.1 provides an overview of the datasets used, the corresponding source, file name and the link where they can be downloaded from.

TABLE 4.1 DATASETS

Source	File Name	Link
INEGI	2012 National Employment and Occupation Survey	http://bit.ly/1ejWLbR
CEIEG	2012 Chiapas Employment and Occupation Survey	http://bit.ly/1cWBtkv
INEGI	2013 Chiapas Statistical Yearbook	http://bit.ly/1gCmqfq
INEGI	2012 National Household Income-Expenditure Survey	http://bit.ly/1elmD6V
INEGI	2012 Chiapas Statistical Perspective	http://bit.ly/1hwL7dr
INEGI	2003-2012 Goods and Services Accounts (SCNM)	http://bit.ly/1h77laT
INEGI	2003-2012 Institutional Sector Accounts (SCNM)	http://bit.ly/1kCbH8L
INEGI	2008 Input-Output Table	http://bit.ly/1srus4f
INEGI	2008 Supply and Use Tables	http://bit.ly/1e4FEj8
CEIEG	2012 Chiapas Monthly Statistical Reports of IMSS-insured Workers	http://bit.ly/1srvtcL
STYPS	2012 IMSS-registered Daily Salary by Economic Activity	http://bit.ly/QWuOlq
STYPS	2012 IMSS-insured Workers	http://bit.ly/QWuOlq

Source: Own elaboration.

The central challenge is to assemble an (i,j)-dimensional square social accounting matrix that includes all monetary flows between productive sectors, commodity and factor markets, and economic agents of the Chiapas economy in 2012 with the available datasets. A social accounting matrix is the selected framework to compile all available data because it allows integrating, in a disaggregated and consistent way, all monetary flows of a given economy at a specific period of time. Besides depicting all revenue and expenditure patterns in the economy, this data system constitutes the backbone of *Computable General Equilibrium Models* (CGEs) and it can also be used in empirical multiplier analysis and input-output models. For applications on multiplier analysis see Breisinger, Thomas and Thurlow (2010); for SAM-based models see Pyatt & Round (1985); and about CGE applications for either a closed or open economy see Dervis, de Melo and Robinson (1982). Due to the fact that a CGE is the methodology used in this study, building a single-region SAM represents a primary

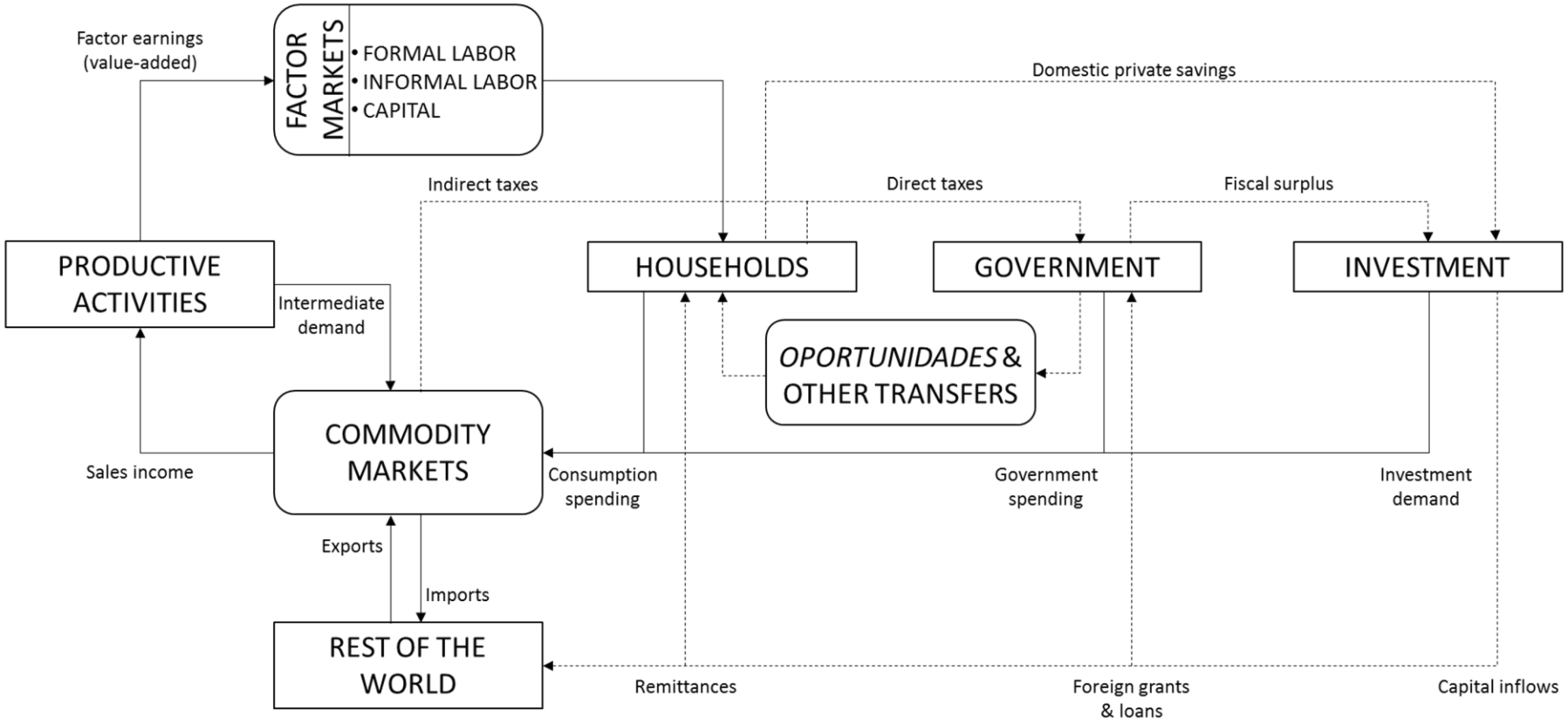
task. All previous CGE-based research projects on Mexico use a national SAM that in some cases is then disaggregated into different regions for some specific accounts, see, for instance, Coady and Lee Harris (2001). In this respect, one of the main features of this research is that it presents a SAM based on a single region, specifically about the Chiapas economy which is the poorest State where *Oportunidades* provides benefits and services in all municipalities.

The following sections discuss in detail the construction of such a matrix and the datasets employed for that matter in each specific account.

4.1. Social Accounting Matrix

A Social Accounting Matrix (SAM) is a balanced square matrix that represents all income and expenditure flows between productive sectors, markets, and economic agents of an economy at a given period of time (Müller, Perez & Hubertus, 2009). It is based on the double entry bookkeeping in accounting, which requires that total revenue equals total expenditure in each single account included in the SAM (Breisinger, Thomas & Thurlow, 2010). Figure 4.1 illustrates the income-expenditure flows within the Chiapas' economy between economic agents, productive activities, factors (formal labor, informal labor, and capital) and commodity markets, households (broken down by income quintiles), government, investment, *Oportunidades* and other non-conditional social programs, and the rest of the world. It can be observed that, for instance, social transfers, such as *Oportunidades*, represent an income flow from the government to households. Direct taxes and household savings, in turn, are examples of expenditure flows from households to the government and the investment account, respectively. Hence, these income-expenditure flows reveal the main characteristics of Chiapas' economy, in a simplified manner, and constitute the transmission mechanism through which the economic policy affects the economy and the wellbeing of the population.

FIGURE 4.1 INCOME AND EXPENDITURE FLOWS OF THE ECONOMY



Source: Own elaboration adapted from Breisinger, Thomas, and Thurlow, p.1, 2010.

Moreover, a SAM has two main objectives. On the one hand, it organizes information about the economic and social structure of a country, region or city in a specific year. In this sense, it presents a static image of the unit of analysis. But, on the other hand, it also provides the statistical basis for the construction of an economic model, usually *Computable General Equilibrium* (CGE) models, with which the researcher may simulate and assess the economic impact and welfare effect of different policy interventions (King, 1985).

A SAM is the selected method to consolidate all available secondary data about the Chiapas economy because it is the most appropriate statistical framework and effective tool for development planning, economic analysis and forecasting (Pyatt & Roud, 1985). In this respect, Round (2003) points out that the main features of a SAM, compared to alternative accounting methods, are: (1) it represents the economy by a set of single-entry accounts; (2) it gives emphasis to households, factors and the institutional component; and, (3) it is complete and comprehensive.

Constructing SAMs can be a time-consuming, tedious, and in many cases challenging task because of incomplete or lack of reliable data. For a successful compilation it is advisable to follow the conventional procedure. In this regard, Keuning and Ruijter (1988) describe the usual 8-step sequence followed for the construction of a SAM. Their analysis covers the whole process from the overall design of the matrix and identification of data sources to data cleaning and reconciliation or balancing.

SAMs are assembled by combining data from different sources, and as a result discrepancies may appear. Such discrepancies may be adjusted through different methods. In this respect, Müller, Perez and Hubertus (2009) provide a detailed analysis of the variety of available techniques for balancing SAMs such as the RAS approach (or bioproportional matrix transformation[32]), Minimizing Quadratic Differences, Entropy approaches, and a hybrid-approach based on RAS and GCE methods as in Müller (2006). In the literature some of the most cited and applied methods are the RAS approach (though it is usually applied for balancing input-output matrices or submatrices of SAMs) and the Cross Entropy approaches (either deterministic or stochastic). For the latter method, see (Robinson, Cattaneo & El-Said,

[32] For an example of the *RAS* technique see Robichaud (2000): http://bit.ly/1au1bcl

1998 & 2000), (Fofana, Lemelin & Cockburn, 2005), (Robinson & El-Said, 2000). However, Round (2003) argues that the Stone-Byron method seems to have some advantages over alternative methods and suggests that the researcher focuses on improving initial estimates leaving reconciliation techniques as a last resort.

Table 4.2 shows the basic structure of the 2012 Chiapas MACRO-SAM. In its disaggregated form it is a 58x58 matrix (see Appendix 2). The structure and size of the SAM is based on the available data and the desire to disaggregate accounts as much as possible without losing consistency and reliability nor accordance with the research objectives. The main features of the SAM are that production activities are broken up in 10 sectors. Commodities are split in 10, that is, one commodity per economic activity. Factors of production are disaggregated into formal and informal labor, and capital. Direct taxes are broken down into activity tax, social security contributions paid by activities, household and corporate income taxes, "tenencia" tax (ownership tax*, i.e.* a tax associated with the possession or use of vehicles), and regional payroll tax. Indirect taxes, in turn, are value-added, sales and export taxes, and import tariffs. Subsidies on production by economic activity. Households are disaggregated by income quintiles. Social transfers are split in non-conditional (*Procampo*, universal pension, PAL-Sin Hambre, temporary employment program, and the regional program *Amanecer*) and conditional cash transfers (*Oportunidades*). *Oportunidades* is also broken down into its five components: food, elderly, education, child, and energy. The introduction of conditional cash transfers in the SAM (and their disaggregation) is particularly relevant for this study because it allows assessing the impact of changes in the distribution and amount of conditional cash transfers on household income, poverty reduction, income inequality, and economic growth at the regional level. Moreover, another important characteristic of the constructed SAM of Chiapas is that it captures the new transfers created and recently enacted under the administration of President Enrique Peña Nieto. In this respect, the new food program *Sin-Hambre* and the universal pension are included with the aim of estimating their impact on household income and poverty reduction.

For assembling the 2012 Chiapas SAM, first, national use and supply matrices are estimated updating the available 2008 versions by applying the *RAS* method. Second, the Chiapas use and supply tables are then derived from the national tables using shares of the national and

regional GDP-Gross value-added at basic prices by economic activity. This theme is further discussed in section 4.2.1.

Hence, the lack of complete and disaggregated data about the Chiapas' economy is dealt with by deriving accounts from the updated national data using shares of reliable information/accounts available both nationwide and at regional level. Section 4.2 provides further details about how each account is assembled, what datasets are used, and what kinds of problems are encountered and how they are solved.

The year 2012 is chosen because the latest available data required for compiling the SAM of Chiapas is precisely from that year. It is also possible to collect reliable data about the GDP-Value-added at basic prices and formal and informal employment based on the North American Industry Classification System (NAICS) by economic sectors at national and regional levels from 2012. Moreover, the selected year meets the conventional rule of thumb that points out that ideally the base-year of a SAM should not be older than five years by the time of its completion (Keuning & Ruijter, 1988).

Finally, all accounts in the 2012 Chiapas SAM are valued in billions of Mexican pesos. The following sections describe how activities, commodities, factors, taxes, subsidies, and institutions are disaggregated in the MICRO-SAM, which is presented in Appendix 2.

TABLE 4.2 STRUCTURE OF CHIAPAS MACRO-SAM, 2012

	Expenditure columns																		
	Activities	Commodities	Transaction Costs	Factors	Direct Taxes	Indirect Taxes	Local Taxes	Subsidies	Households	Enterprises	Government	Amanecer	Oportunidades	Procampo	Universal Pension	PAL-Sin Hambre	Employment Program (PET)	Savings - Investment	Rest of World	Total
Activities		Domestic supply							Home-consumed output											Activity income
Commodities	Intermediate demand		Domestic, export & import trnst cst						Consumption spending		Recurrent spending							Investment demand	Exports	Total demand
Transaction Costs		Domestic, export & import trnst cst																		Total transaction costs
Factors	Value-added																			Total factor income
Direct Taxes	Activity & labor taxes								Income tax	Income tax										Total direct taxes
Indirect Taxes		Net sales taxes & import tariffs																		Total indirect taxes
Local Taxes	Payroll tax								"Tenencia" tax											Total local taxes
Subsidies	Activity subsidies																			Total subsidies
Households				Factors payments to households						Profit distribution	Social transfers	Regional social transfers	Conditional cash transfers	Procampo transfers	Universal pension transfers	PAL-Sin Hambre transfers	PET transfers		Foreign remittances	Total household income
Enterprises				Factors payments to firms															Transfers	Enterprise income
Government				Factors payments to gov't	Income, activity & labor taxes	Net sales taxes & import tariffs	"Tenencia" & payroll taxes	Activity subsidies			Intra-gov't transfers								Foreign grants & loans	Government income
Amanecer											Amanecer transfers									Amanecer income
Oportunidades											Conditional cash transfers									Oportunidades income
Procampo											Procampo transfers									Procampo income
Universal Pension											Universal pension transfers									Universal pension income
PAL-Sin Hambre											PAL transfers									PAL-Sin Hambre income
Employment Program (PET)											PET transfers									Employment program income
Savings - Investment									Private savings	Enterprise savings	Fiscal surplus								Current account balance	Total savings
Rest of World		Imports								Transfers	Other current transfers									Foreign exchange outflow
Total	Gross output	Total supply	Total transaction costs	Total factor spending	Total direct taxes	Total indirect taxes	Total local taxes	Total subsidies	Total households spending	Enterprise expenditure	Government expenditure	Amanecer expenditure	Oportunidades expenditure	Procampo expenditure	Universal pension expenditure	PAL-Sin Hambre expenditure	Employment program (PET) expenditure	Total investment spending	Foreign exchange inflow	

Source: Own elaboration.

4.1.1. Activities, Commodities and Transaction Costs

Economic activities are disaggregated in the 2012 Chiapas MICRO-SAM (see Appendix 2) according to the North American Industry Classification System (NAICS), which is a system for classifying establishments (individual business locations) by type of economic activity used in Canada, the United States and Mexico[33] because of the North American Free Trade Agreement (NAFTA). Table 4.3 shows the consolidated NAICS accounts by economic activity and their classification code to identify them within the system. The first column entitled "AGGREGATION FOR SAM" shows how productive activities are aggregated for the construction of the Chiapas MICRO-SAM. The consolidated NAICS has 19 economic activities which are aggregated into ten for the purpose of this study. Thus, the first five activities remain as in NAICS; trade and transportation and warehousing are consolidated and constitute the sixth activity. The seventh activity is constituted by activities from code 51 to 81. The eighth activity is educational services while health care and social assistance is the ninth. Public administration represents the tenth economic activity.

TABLE 4.3 NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS)

AGGREGATION FOR SAM	CODE	ECONOMIC ACTIVITY
1	11	Agriculture, forestry, fishing and hunting
2	21	Mining
3	22	Utilities (electricity, water, gas distribution)
4	23	Construction
5	31-33	Manufacturing
6	43-46	Trade
	48-49	Transportation and warehousing
7	51	Information
	52	Finance & insurance
	53	Real estate & rental; leasing
	54	Professional, scientific & technical services
	55	Mgmt. of companies & enterprises
	56	Administrative & support; waste mgmt. & remediation ser.
	71	Arts, entertainment & recreation
	72	Accomodation & food services
	81	Other services (except public adm.)
8	61	Educational services
9	62	Health care & social assistance
10	93	Public administration

Source: Own elaboration

[33] The NAICS was created in 1997 as a result of NAFTA with the aim of (1) facilitating the collection, tabulation, presentation, and analysis of data relating to establishments; (2) promoting uniformity and comparability in the presentation and analysis of statistical data describing the North American economy.

The NAICS-based aggregation of economic activities is carried out by constructing an auxiliary matrix which maps NAICS economic activities into the 10-sector structure chosen for the 2012 Chiapas SAM. Table 4.4 shows the mapping matrix applied for aggregating economic activities in the Use and Supply sub-matrices of the 2012 Chiapas SAM.

TABLE 4.4 MAPPING AGGREGATION OF ECONOMIC ACTIVITIES

NAICS CODES	ECONOMIC ACTIVITY	A_AGRC	A_MING	A_UTIL	A_CNST	A_MANU	A_TRDE	A_OSER	A_EDUS	A_HEAS	A_PADM
11	Agriculture, forestry, fishing and hunting	1	0	0	0	0	0	0	0	0	0
21	Mining	0	1	0	0	0	0	0	0	0	0
22	Utilities (electricity, water, gas distribution)	0	0	1	0	0	0	0	0	0	0
23	Construction	0	0	0	1	0	0	0	0	0	0
31-33	Manufacturing	0	0	0	0	1	0	0	0	0	0
43-46	Trade	0	0	0	0	0	1	0	0	0	0
48	Transportation	0	0	0	0	0	1	0	0	0	0
49	Warehousing	0	0	0	0	0	1	0	0	0	0
51	Information	0	0	0	0	0	0	1	0	0	0
52	Finance and insurance	0	0	0	0	0	0	1	0	0	0
53	Real estate and rental and leasing	0	0	0	0	0	0	1	0	0	0
54	Professional, scientific & technical services	0	0	0	0	0	0	1	0	0	0
55	Mgmt. of companies & enterprises	0	0	0	0	0	0	1	0	0	0
56	Administrative & support; waste mgmt. & remediation ser.	0	0	0	0	0	0	1	0	0	0
61	Educational services	0	0	0	0	0	0	0	1	0	0
62	Health care & social assistance	0	0	0	0	0	0	0	0	1	0
71	Arts, entertainment & recreation	0	0	0	0	0	0	1	0	0	0
72	Accomodation & food services	0	0	0	0	0	0	1	0	0	0
81	Other services (except public administration)	0	0	0	0	0	0	1	0	0	0
93	Public administration	0	0	0	0	0	0	0	0	0	1

Source: Own elaboration.

With regard to commodities, they are disaggregated in the same fashion, assuming that each economic activity produces one commodity. Therefore, the SAM has ten commodities. On the other hand, transaction costs are broken down in three accounts: domestic-, export-, and import-based transaction costs which are paid by commodities and earned by the trade, transportation and warehousing account. This classification of transaction costs simply replicates that of the Standard IFPRI CGE model.

4.1.2. Factors of Production

Factors of production are composed of labor and capital. Labor, in turn, is disaggregated into formal and informal. In doing so, this study seeks to evaluate the behavior of informal labor to changes in conditional cash transfers, investment, labor and payroll taxes, and subsidies

on productive activities. On the other hand, factor capital refers to the gross operating surplus and (household) gross mixed income. The latter is the combination of household income from entrepreneurial activities (mainly micro and small household enterprises) and labor. Sections 4.2.2 and 4.2.3 provide further details about how labor was split between formal and informal. This research is more focused on the mechanics of factor labor as opposed to breaking down further to include other factors such as land as it is done in the Standard IFPRI CGE model.

4.1.3. Taxes and Subsidies

Taxes, on the one hand, are classified as direct and indirect. Direct taxes include household and corporate income taxes, social security contributions (labor tax), regional payroll tax, and activity tax. Indirect taxes, in turn, include the value-added tax, sales and export taxes, and import tariffs. On the other hand, the SAM includes an account for subsidies on production by economic activities. The classification of taxes and subsidies reflects the one employed in the 2008 Input-Output matrix. Further details about how each tax and subsidy is estimated are provided in sections 4.2.5, 4.2.6. 4.2.7, 4.2.8, 4.2.12, and 4.2.13.

4.1.4. Institutions

Institutions are broken down into:

- Households
- Enterprises
- Government
- Transfers
- Rest of the World

Household disaggregation can be based on geographical location (urban-rural), assets (wealth, size of land holding), and socioeconomic characteristics. It is advisable to disaggregate in a way to introduce as much within-group homogeneity as it is possible (Round, 2003). In this study, the household account is divided into five categories according to household income. Thus, households are split by income quintiles. It is done this way to use all available data provided by household surveys which contain disaggregated information on income and expenditure by deciles. Such surveys are also useful to analyze

the composition and distribution of income. Shares of income distribution and consumption expenditure are taken from these sources and are used to assemble the SAM. Moreover, Stone (1985) argues that in breaking down the household account different problems can be encountered such as removing private nonprofit institutions. In constructing the 2012 Chiapas SAM it is not possible to separate households from private nonprofit institutions because of the data limitations.

One of the most important characteristics of the 2012 Chiapas SAM is the fact that it splits social transfers into conditional and non-conditional. In the first case, *Oportunidades*, or conditional cash transfers, is broken down into its five components: food, elderly, education, child, and energy. By doing so, the main objective is to analyze and asses the role and impact of each component on household income. On the other hand, non-conditional transfers consist of *Procampo*, temporary employment program, *Amanecer* (a regional transfer program), other social transfers, and the new social programs created and recently enacted under the administration of President Peña Nieto: the food program known as *PAL-Sin-Hambre* and the universal pension.

Enterprises are aggregated into one account while government refers to the regional one. The final institution is the rest of the world through which the trade balance, foreign direct investment (FDI), and transfers to foreign agents and from abroad can be collected. The following section describes how each account is assembled, what datasets are used, and what kinds of problems are encountered and how they are solved.

4.2. The 2012 Chiapas MACRO-SAM

This section introduces the balanced 2012 Chiapas MACRO-SAM in table 4.5. It is important to highlight that the SAM required minor adjustments to be balanced. It is advisable that the researcher seeks to construct a matrix with the least possible discrepancies between income and expenditure flows. In such circumstances, the balancing procedure is carried out in GAMS applying a cross-entropy approach executing the GAMS code developed by Lofgren, Lee Harris, and Robinson (2002) for the IFPRI Standard General Equilibrium Model. Such approach is convenient when the SAM has only minor discrepancies between income and expenditure flows. In this method the authors define the objective function as the cross-entropy distance from the observed SAM coefficients for the whole matrix rather than column sums, and it does not impose constraints on column sums. Two features of this approach can be highlighted:

- Negative values are fixed and excluded from the balancing method; and,
- Rows/columns with negative sums are also excluded and balanced by a simple column adjustment.

Due to lack of detailed and disaggregated regional data about the Chiapas' economy, the construction of the 2012 Chiapas SAM required to assemble a 2012 National Input-Output Matrix by updating the 2008 National Supply- and Use-Tables applying the RAS method and using as control totals the values published in 2012 of intermediate demand, gross value-added, domestic supply, taxes and subsidies, exports, imports, government consumption, fixed investment, stock changes, government and private savings, contained in the 2003-2012 Goods and Services Accounts and the 2003-2012 Institutional Sector Accounts of the System of National Accounts of Mexico (SNAM). Once the National Input-Output Matrix is updated, it is possible to estimate all lacking regional accounts as a share of national data using the most reliable accounts both at national and regional levels. In this respect, employment, gross output or gross value-added disaggregated by economic activity are preferable, if available, to be used as satellite tables to estimate plausible regional accounts. This study uses national and regional GDP- Value-added at basic prices and employment data per economic activity (according to the NAICS classification) as satellite accounts/tables for

deriving those entries for which there is no available or reliable data. These satellite tables are presented in Annex 3.

Each entry of the Chiapas SAM is described in further detail in the following sections.

TABLE 4.5 MACRO-SAM OF CHIAPAS, 2012

(Billion pesos)

	EXPENDITURE COLUMNS																			
	ACTIVITIES	COMMODITIES	TRNSTCOST	FACTORS	DIRTAXES	INDTAXES	REGTAXES	SBSDIES	HOUSEHOLDS	ENTERPRISES	GOVERNMENT	AMANECER	OPORTUNIDADES	PROCAMPO	UNVSALPENSION	PAL-SINHAMBRE	EMPLPROGRAM	SIAC	STCK	ROWD	TOTAL
ACTIVITIES		473							4												477
COMMODITIES	204		44						187		57							57	2	62	612
TRNSTCOST		44																			44
FACTORS	268																				268
DIRTAXES	5								7	4											16
INDTAXES		6																			6
REGTAXES	1								0												1
SBSDIES	0																				0
HOUSEHOLDS				100						90	18	2	6	1	1	3	0.1			7	228
ENTERPRISES				169																	169
GOVERNMENT				0	16	6	1	0			73										95
AMANECER											2										2
OPORTUNIDADES											6										6
PROCAMPO											1										1
UNVSALPENSION											1										1
PAL-SINHAMBRE											3										3
EMPLPROGRAM											0										0
SIAC									30	74	-66									20	59
STCK																		2			2
ROWD		90																			90
TOTAL	477	612	44	268	16	6	1	0	228	169	95	2	6	1	1	3	0	59	2	90	

Source: Own elaboration.

4.2.1. Intermediate Demand

Because of the lack of complete data about the intermediate demand at the regional level, as first step, the 2008 national intermediate demand derived from the Use Matrix of the same year has to be updated applying the RAS method and using the row total from the 2012 intermediate consumption account at purchaser's prices and the column total from the 2012 intermediate demand account, both obtained from the 2003-2012 Goods and Services Accounts of the System of National Accounts of Mexico. Once the 2012 national intermediate demand by economic activity is estimated, the intermediate demand for Chiapas is derived dividing the national intermediate demand by the national GDP-Value added at basic prices and then multiplying by the Chiapas GDP-Value added at basic prices by economic activity. This method assumes that input proportions between different economic sectors are fixed (Leontief coefficients).

This account is estimated this way because of the lack of a regional intermediate demand account. The 2009 Chiapas Economic Census provides a column vector of intermediate demand, however, it is not used in this study because such census is focused only on formal economic units and does not contain data of the base-year of this study. In other words, such economic census does not provide a complete and updated picture of the intermediate demand in Chiapas. Hence, the SAM requires assembling a 10x10 Use Sub-Matrix for Chiapas. Since both the national and Chiapas GDP-Value-added at basic prices accounts are reliable, it is possible to derive a plausible intermediate demand sub-matrix that provides a comprehensive view of the intermediate demand at the regional level. Table 4.6 shows the 2012 national intermediate demand updated by the RAS method used to estimate the account for Chiapas.

TABLE 4.6 2012 NATIONAL INTERMEDIATE DEMAND UPDATED BY THE RAS METHOD

	A_AGRC	A_MING	A_UTIL	A_CNST	A_MANU	A_TRDE	A_OSER	A_EDUS	A_HEAS	A_PADM
C_AGRC	94	0	0	1	593	0	0	0	0	0
C_MING	2	12	9	30	831	0	0	0	0	0
C_UTIL	10	11	3	7	92	56	69	13	11	18
C_CNST	2	6	1	167	4	7	2	5	8	4
C_MANU	171	159	196	674	4477	698	396	17	82	116
C_TRDE	0	1	1	2	32	48	25	2	3	17
C_OSER	10	70	13	122	364	498	733	46	50	133
C_EDUS	0	0	0	0	0	1	1	0	0	0
C_HEAS	0	0	0	0	0	0	0	0	0	0
C_PADM	0	0	0	0	0	0	0	0	0	0

Source: Own elaboration with data from INEGI.

4.2.2. Formal Labor and Wages and Salaries

Factor labor is broken down into formal and informal. This work takes the definitions of formality and informality adopted by Santiago Levy (2008). With respect to formal labor, it is defined as "salaried workers employed by a firm that registers them with IMSS; given the bundled nature of obligations pertaining to salaried labor, they also are covered by employment termination and severance pay regulations and labor taxes" (Levy, 2008, p. 33).

Formal wages and salaries are estimated by using the 2012 national daily salaries by economic activity registered at IMSS published on-line by the Federal Ministry of Labor and Social Welfare (STYPS). It can be found at: http://bit.ly/QWuOlq. The average daily salary in Chiapas registered at IMSS is of $202.81 Mexican pesos. To obtain the daily salaries by economic activities in Chiapas, the national daily salaries are divided by the average national daily salary and then multiplied by the average daily salary in Chiapas. Once the regional daily salaries by economic activity are estimated, they are multiplied by 360 and by the number of workers employed in the formal sector by economic activity. By doing so, fixed coefficients are assumed. Given that the official minimum salary in Chiapas for the year 2012 is of 59.08 as published by the National Minimum Wages Commission (CONASAMI)[34], table 4.7 shows below the estimated daily salaries by economic activity and their equivalence in minimum salaries. This account is net of labor and payroll taxes.

TABLE 4.7 DAILY SALARIES REGISTERED AT IMSS AND MIN. SALARIES

Sector	Daily salaries	Minimum salaries
AGRC	110	1.9
MING	307	5.2
UTIL	466	7.9
CNST	141	2.4
MANU	200	3.4
TRDE	204	3.5
OSER	194	3.3
EDUS	210	3.6
HEAS	210	3.6
PADM	202	3.4
Median	203	3.4

Source: Own elaboration.

[34] This data can be found at: http://bit.ly/1lQbaEf.

With respect to formal employment, it is a satellite account of the SAM. It is constructed with data from the account called "Strategic Indicators of Informality" of the National Survey of Occupation and Employment (ENOE 2012). Such account contains data of both formal and informal employment by economic activity either at national and regional level. Table 4.8 shows the 2012 satellite account of formal employment and its shares by economic activity in Chiapas. It is the one used to estimate plausible formal wages and salaries in the formal sector as explained above. It is important to highlight that the 2009 Chiapas Economic Census contains a column vector of formal wages and salaries, however, such data is ruled out because the reported values are too low, at a level that does not seem reliable, and it is not updated to the base-year of this study. The composition of the formal labor market in Chiapas is further described in section 4.3.

TABLE 4.8 FORMAL LABOR IN CHIAPAS, 2012

Sector	Formal	share
AGRC	36,886	0.09
MING	2,648	0.01
UTIL	2,264	0.01
CNST	16,454	0.04
MANU	26,224	0.06
TRDE	94,102	0.22
OSER	72,452	0.17
EDUS	72,296	0.17
HEAS	40,521	0.10
PADM	61,195	0.14
TOTAL	425,042	

Source: Own elaboration with data from INEGI.

4.2.3. Informal Labor and Wages and Salaries

Informal labor is defined as "self-employed individuals and *comisionistas* working on their own or in a legal nonsalaried capacity with a firm, along with salaried workers who are hired by a firm and paid wages but, in violation of the law, not registered at IMSS" (Levy, 2008, p.33). Hence, informal labor is a satellite account constructed with data from the "Strategic Indicators of Informality" of the National Survey of Occupation and Employment (ENOE 2012). Such account includes data about informal employment by economic activity in Chiapas. This dataset is published by the National Institute of Geography and Statistics (INEGI) and can be found at: http://bit.ly/1lKlkno. Table 4.9 shows below the 2012 satellite account of informal labor and its shares by economic activity in Chiapas.

TABLE 4.9 INFORMAL LABOR IN CHIAPAS, 2012		
Sector	Informal	share
AGRC	759,632	0.52
MING	1,958	0.00
UTIL	1,675	0.00
CNST	95,883	0.07
MANU	86,693	0.06
TRDE	184,756	0.13
OSER	264,066	0.18
EDUS	18,738	0.01
HEAS	10,503	0.01
PADM	26,664	0.02
TOTAL	1,450,568	
Source: Own elaboration with data from INEGI.		

The satellite account of informal labor is used to estimate informal wages and salaries. Informal wages and salaries are calculated using data from the "Strategic Indicators of Informality" of the National Survey of Occupation and Employment (ENOE 2012). These indicators include the average and median hourly income of the occupied population in Chiapas. They show that the median hourly income of the occupied population is $12.5 Mexican pesos and the median workday consists of 8.4 hours. Hence, the median daily income of the self-employed in unskilled activities is $54.3 Mexican pesos or 0.9 minimum salaries while that of the entire occupied population is $104.6 Mexican pesos or 1.8 minimum salaries[35]. Having such information at hand, it is then assumed that informal workers occupied in the agricultural sector earn 1 minimum salary a day while the rest are assumed to earn 1.8 minimum salaries a day, that is, the median daily salary estimated by the survey for the case of Chiapas. These assumptions seem plausible since the ENOE 2012 shows that 31.2% of the occupied population in Chiapas earns up to one minimum salary while about 24% earns between one and two. In other words, more than 55% of the population in Chiapas earns up to two minimum salaries. In addition, about 20% of the occupied population does not earn any money income at all. To obtain the annual remuneration in the informal sector, the estimated daily salaries are multiplied by 360 and by the number of workers employed in the informal sector by economic activity using the satellite account introduced above.

[35] These datasets are elaborated by the National Institute of Geography and Statistics (INEGI) and can be found at: http://bit.ly/1lKlkno.

4.2.4. Factor Capital

The 2012 gross operating surplus in Chiapas is estimated as a residual because of the lack of data on the subject. Therefore, it is obtained by subtracting formal and informal wages and salaries, labor, payroll, and activity taxes, and subsidies on production, from the Chiapas GDP-Value added at basic prices by economic activity. It is important to point out that the 2009 Chiapas Economic Census contains data on gross capital formation, however, such data is ruled out because the reported values are incomplete due to the fact that such census is focused only on formal economic units and data do not cover the base-year of this study.

4.2.5. Labor Tax

Social security contributions (or labor taxes) paid by economic activities are first estimated at the national level because of lack of reliable data at the regional level. The 2003-2012 Goods and Services Accounts provide data on salaried remuneration in a consolidated account. However, such account includes wages and salaries aggregated with social security contributions. Hence, as a first step, contributions and wages and salaries are disaggregated. This can be done because the total value of contributions is given and it is assumed that contributions across sectors have the same shares observed in wages and salaries. Once national contributions are obtained by economic activity, contributions in Chiapas are derived by dividing national contributions by the national GDP-Value-added at basic prices and then multiplying them by the Chiapas GDP-Value-added at basic prices. Finally, regional contributions by economic activity are adjusted to an estimated plausible total level of three billion Mexican pesos, a level that accounts for 11% of total remuneration as observed at the national level. Table 4.10 shows the vector of national labor tax constructed with the 2003-2012 Goods and Services Accounts of the System of National Accounts used to estimate the regional labor tax by economic activity.

TABLE 4.10 NATIONAL LABOR TAX BY ECONOMIC ACTIVITY, 2012
(Billion pesos)

	AGRC	MING	UTIL	CNST	MANU	TRDE	OSER	EDUS	HEAS	PADM	TOTAL
Labor tax	9	9	7	59	53	73	99	61	29	68	467

Source: Own elaboration with data from INEGI.

4.2.6. Activity Tax

Because of the lack of regional data with regard to activity taxes by economic activity, this account is derived from national data on the subject. The national activity tax is obtained from the account called “Otros impuestos sobre la producción netos” included in the 2003-2012 Goods and Services Accounts of the System of National Accounts published by the National Institute of Geography and Statistics (INEGI). With such account at hand, regional activity taxes by economic activity are estimated by dividing national activity taxes by national GDP-Value-added at basic prices and then multiplying them by Chiapas GDP-Value-added at basic prices. Table 4.11 shows the vector of the national activity tax by economic activity used to estimate the respective account for Chiapas.

TABLE 4.11 NATIONAL ACTIVITY TAX BY ECONOMIC ACTIVITY, 2012
(Billion pesos)

	AGRC	MING	UTIL	CNST	MANU	TRDE	OSER	EDUS	HEAS	PADM	TOTAL
Activity tax	1	2	2	6	23	11	31	2	1	7	87

Source: Own elaboration with data from INEGI.

It is important to highlight that prior to estimating activity taxes, these data were officially requested from the national and regional governments through the System of Transparency to access public information, however, no information was provided.

4.2.7. Payroll Tax

The payroll tax is administered at the regional level and, consequently, its rate varies from state to state. It represents an important source of own-revenue for subnational governments. In Chiapas the current payroll tax rate is 2%, according to the 2012 Revenue Law of Chiapas. Unfortunately, there is not any available public record at the regional level about this tax disaggregated by economic activity using the NAICS classification applied by the System of National Accounts. Therefore, this account is estimated by multiplying the payroll tax rate by gross formal wages and salaries by economic activity.

4.2.8. Subsidies on Production

Subsidies on production by economic activity are derived from national data because of the lack of information at the regional level. The 2008 Input-Output Supply and Use tables from

the System of National Accounts include data on subsidies on production by economic activity. Such information is updated to 2012 using the aggregate value reported in the 2003-2012 Goods and Services Accounts. It is known that total subsidies on production in 2012 accounted for $4.73 billion Mexican pesos. The latter value is used as control total to update the data by economic activity assuming fixed coefficients. According to National Accounts, the only economic activity that gets subsidies is *transport*, which in this study is aggregated with trade. Once national subsidies on production are updated, the regional account is estimated by dividing national subsidies by national GDP-Value-added at basic prices and then multiplying them by Chiapas GDP-Value-added at basic prices. Table 4.12 shows the vector with national subsidies used to estimate the regional account.

TABLE 4.12 NATIONAL SUBSIDIES ON PRODUCTION BY ECONOMIC ACTIVITY, 2012
(Billion pesos)

	AGRC	MING	UTIL	CNST	MANU	TRDE	OSER	EDUS	HEAS	PADM	TOTAL
Subsidies on production	0	0	0	0	0	-5	0	0	0	0	-5

Source: Own elaboration with data from INEGI.

As in the case of activity taxes, a request for information was submitted to national and regional governments through the System of Transparency to get these data by economic activity. However, no information was provided.

4.2.9. Gross Output

The 2012 gross output in Chiapas is obtained by adding up intermediate demand; factors of production (formal and informal labor, as well as gross operating surplus); labor, payroll, and activity taxes, and subsidies on production. The 2009 Economic Census contains data on gross product in Chiapas, however, such information is ruled out because it is focused on formal economic units. In other words, it is not an account with complete data on the subject to reflect the real gross output of the region. In addition, it is not updated to 2012, the base-year of this research.

4.2.10. Domestic Supply

Domestic supply by economic activity at the regional level is derived from national data because there is no disaggregated information on this account. Hence, the 2008 National

Supply Matrix is updated assuming fixed proportions and using the 2012 national gross output as a column control account. The updated domestic supply matrix is focused on the primary activities. In other words, it is a diagonal matrix, that is, data on the main diagonal is about primary activities while entries outside such diagonal are all zero. Once the 2012 National Supply Matrix is estimated, Chiapas' domestic supply is derived as a sub-matrix assuming that input proportions between different economic sectors are fixed (Leontief coefficients), and by dividing national domestic supply by national GDP-Value-added at basic prices and then multiplying by Chiapas GDP-Valued-added at basic prices. This procedure is followed for each economic activity. Table 4.13 shows the national domestic supply used to estimate the regional account.

TABLE 4.13 NATIONAL DOMESTIC SUPPLY BY ECONOMIC ACTIVITY, 2012
(Billion pesos)

	C_AGRC	C_MING	C_UTIL	C_CNST	C_MANU	C_TRDE	C_OSER	C_EDUS	C_HEAS	C_PADM
A_AGRC	794	0	0	0	0	0	0	0	0	0
A_MING	0	1579	0	0	0	0	0	0	0	0
A_UTIL	0	0	474	0	0	0	0	0	0	0
A_CNST	0	0	0	2232	0	0	0	0	0	0
A_MANU	0	0	0	0	9093	0	0	0	0	0
A_TRDE	0	0	0	0	0	4616	0	0	0	0
A_OSER	0	0	0	0	0	0	5425	0	0	0
A_EDUS	0	0	0	0	0	0	0	692	0	0
A_HEAS	0	0	0	0	0	0	0	0	484	0
A_PADM	0	0	0	0	0	0	0	0	0	916

Source: Own elaboration with data from INEGI.

The main sources of data are the 2008 National Supply Matrix of the Input-Output Table, and the 2003-2012 Goods and Services Accounts of the System of National Accounts.

4.2.11. Transaction Costs

Transaction costs for Chiapas are derived from national figures assuming fixed input proportions. At the national level transaction costs for 2012 are estimated updating trade and transportation margins (domestic, export and import margins) from the 2008 Input-Output Matrix using control-total accounts published by the System of National Accounts. Hence, at the regional level, domestic, export and import trade and transportations margins are estimated by dividing national margins by national GDP-Value-added at basic prices and

multiplied by Chiapas GDP-Value-added at basic prices. This procedure is applied for each economic activity.

Transaction costs are expenditures for agricultural, mining, utilities, and manufacturing commodities whereas they constitute revenue for the trade and transport account (C_TRDE). The main sources of data are the 2008 Input-Output Matrix and the 2003-2012 Goods and Services Accounts of the System of National Accounts.

4.2.12. Indirect Taxes

Indirect taxes are composed of value-added, sales and export taxes, along with import tariffs. Because of lack of data on these taxes at the regional level, they have to be estimated. The value-added tax (VAT), on the one hand, is derived from national data by multiplying the national VAT revenue by the national GDP-Value-added at basic prices and multiplying by the Chiapas GDP-Value-added at basic prices by economic activity. The estimation of VAT is net of subsidies. On the other hand, the sales tax account at the regional level is derived from a national account called “Otros impuestos a los bienes y servicios” from the 2003-2012 Goods and Services Accounts of the System of National Accounts. Such account is divided by national GDP-Value-added at basic prices and then multiplied by Chiapas GDP-Value-added at basic prices by economic activity.

With respect to import tariffs, they are estimated derived from national data by dividing national import tariffs by national GDP-Value-added at basic prices and then multiplying by Chiapas GDP-Value-added at basic prices. It is done this way because of lack of data at the regional level. In contrast, the current export tax rate is zero; therefore its account shows a value of zero in the SAM. Table 4.14 shows all national indirect taxes used to estimate their regional accounts.

TABLE 4.14 INDIRECT TAXES IN MEXICO, 2012
(Billion pesos)

Sector	VAT	Import tariffs	Other sales taxes	Subsidies
AGRC	9	0	2	36
MING	0	0	0	0
UTIL	12	1	3	61
CNST	13	1	3	46
MANU	325	15	67	268
TRDE	9	0	2	53
OSER	243	11	50	16
EDUS	0	0	0	2
HEAS	0	0	0	3
PADM	0	0	0	0
TOTAL	610	28	126	484

Source: Own elaboration with data from INEGI.

4.2.13. Imports

Regional imports are derived from national figures due to lack of public data on this topic as well. As a first step, the 2012 national imports by economic activity are obtained from the 2003-2012 Goods and Services Accounts. These data are available on-line in the website of the National Institute of Geography and Statistics (INEGI) at: http://bit.ly/1jBQ3Cq. Subsequently, imports in Chiapas are estimated by dividing national imports by national GDP-Value-added at basic prices and then multiplying by Chiapas GDP-Value-added at basic prices. They are then adjusted so that total supply equals total demand in the SAM. This procedure is carried out by economic activity. In this case fixed proportions across sectors are assumed as well. Table 4.15 shows the vector of national imports used to estimate the regional account.

TABLE 4.15 NATIONAL IMPORTS BY ECONOMIC ACTIVITY, 2012
(Billions of pesos)

	AGRC	MING	UTIL	CNST	MANU	TRDE	OSER	EDUS	HEAS	PADM	TOTAL
REST OF THE WORLD	150	35	1	0	4937	29	117	0	0	0	5270

Source: Own elaboration with data from INEGI.

4.2.14. Household Labor Income

As factor labor is divided into formal and informal, households can earn either formal or informal labor income. On the one hand, formal labor income in the SAM is distributed among households using the observed shares in the *remuneration-for-subordinated-work*

account called “cuenta de remuneración por trabajo subordinado” contained in the 2012 Households Income-Expenditure Survey. On the other hand, in the case of informal labor income, it is distributed among households using the observed shares in the *self-employment* account called “cuenta de ingresos por trabajo independiente” contained in the same survey. As can be noticed, the survey used is the one carried out at the national level due to the fact that there is no regional survey of the base-year of this study. Table 4.16 shows the shares used to allocate formal labor among household quintiles.

TABLE 4.16 LABOR INCOME SHARES BY HOUSEHOLD QUINTILE, 2012

TYPE OF LABOR	HOUSEHOLD QUINTILES				
	I	II	III	IV	V
Formal	0.02	0.08	0.13	0.23	0.54
Informal	0.06	0.09	0.13	0.23	0.49

Source: Own elaboration with data from INEGI.

4.2.15. Household Gross Operating Surplus

According to the 2003-2012 Institutional Sector Accounts of the System of National Accounts of Mexico, household gross operating surplus includes mixed income which consists of income from micro and small household enterprises (including farms), plus an element of imputed income from housing, and labor income from entrepreneurial activities (those individuals who are owners and employees at the same time in their own enterprise). This is consistent with social accounting practices as shown by King (1985) and Pyatt and Round (1985). Hence, because of lack of available regional data, the household gross operating surplus in Chiapas is estimated using the share observed in the 2012 dataset of Institutional Sector Accounts. According to such dataset, household gross operating surplus accounts for 14% of the total gross operating surplus. It is therefore assumed that the same share is observed in Chiapas. It is then allocated among households using the shares reported in the account called *income-from-corporations and enterprises* account[36] contained in the 2012 Households Income-Expenditure Survey.

[36] This account is found in the survey under the name of “ingresos provenientes de cooperativas, sociedades y empresas que funcionan como sociedades”.

4.2.16. Enterprise Gross Operating Surplus

With regard to enterprise gross operating surplus in Chiapas there is no available information on the subject, therefore a plausible value has to be estimated. It is calculated using the share reported in the 2003-2012 Institutional Sector Accounts of the System of National Accounts of Mexico. In those accounts it is reported that the enterprise gross operating surplus accounts for 85.9% of the total gross operating surplus in 2012. It is assumed that the same share is observed in Chiapas and it is multiplied by the total amount of gross operating surplus at the regional level. In the SAM the enterprise account is aggregated, so no further adjustment is required.

4.2.17. Government Gross Operating Surplus

In the estimation of this account there is also a challenge due to the lack of information at the regional level. The government gross operating surplus in Chiapas also has to be derived from national data. The 2012 national value of this account is obtained from the General Government Account of the 2003-2013 Institutional Sectors Accounts of the System of National Accounts. According to such datasets the national government gross operating surplus in 2012 accounts for 0.1% of the total gross operating surplus. Having this share at hand, the regional government gross operating surplus is estimated by multiplying this share by the Chiapas total gross operating surplus.

4.2.18. Government Revenue

The government revenue is the sum of its operating surplus, indirect and direct taxes less subsidies, local taxes, and intra-government transfers or grants. On the one hand, indirect taxes include VAT (net of subsidies), other sales and export taxes, and import tariffs. Direct taxes, on the other hand, include activity, labor, and income (household and enterprise) taxes as well as subsidies on production. Local taxes include payroll and '*tenencia*' taxes (which is treated as an income tax). In addition, Intra-government transfers include federal transfers and grants as well as public debt payments, and these are obtained from the 2012 Revenue Law and the 2012 Expenditure Budget of Chiapas, both available on-line at: http://bit.ly/1gU2iFW.

4.2.19. Private Consumption

Private consumption by household quintile is estimated using data from the 2003-2012 Goods and Services Accounts and the 2012 Income-Expenditure Survey, and by applying a cross-entropy method to distribute it by household quintiles. A *prior-share matrix* and a *posteriori-share matrix* are constructed using shares observed in household current expenditures from the cited survey. As a final step, the cross-entropy exercise is carried out to minimize the entropy distance between the *prior* and *posteriori* matrices and get private consumption by household quintiles and by economic activity. The following formula is used (Robinson, Cattaneo and El-Said, 2000):

$$\mathrm{CE} = \min\left[\sum_{\mathrm{i}}\sum_{\mathrm{j}} \mathrm{a}_{\mathrm{i,j}} \ln\left(\frac{\mathrm{a}_{\mathrm{i,j}}}{\bar{\mathrm{a}}_{\mathrm{i,j}}}\right)\right]$$

Subject to:

$$\mathrm{a}_{\mathrm{i,j}}\mathrm{y}_{\mathrm{j}}^{*} = \mathrm{y}_{\mathrm{i}}^{*}$$

$$\sum_{\mathrm{j}} \mathrm{a}_{\mathrm{j,i}} = 1 \text{ and } 0 \leq \mathrm{a}_{\mathrm{j,i}} \leq 1$$

4.2.20. Household Income Tax

Household income tax in Chiapas is derived from national data. At the national level, the household income tax in 2012 is obtained from the tax dataset constructed by the Organization for Economic Co-operation and Development (OECD) available at: http://bit.ly/1qsK0TA. In such dataset, the total value of income tax in Mexico for the year 2012 accounts for $397.7 billion Mexican pesos. At the regional level, household income tax is estimated by dividing the national value of household income tax by national GDP-Value-added at basic prices and then multiplying by Chiapas GDP-Value-added at basic prices. The estimated value is $7.2 billion Mexican pesos. It is then allocated by household quintiles using the shares reported by the Federal Ministry of Finance (SHCP) in the document called "Distribución del pago de impuestos y recepción del gasto público por deciles de hogares y personas. Resultados para el año de 2010"[37], available at: http://bit.ly/QjrM9Z. The tax

[37] By the time of elaboration of this research, the report for the year 2012 was not available yet. Therefore, the latest version is used (2010).

shares are presented by household deciles. In consequence, the first step is to aggregate them by quintiles and then multiplying them by the total estimated value. It is assumed that the 20% poorest households pay a zero rate. It is done this way to avoid a negative value since they are in fact receiving a tax credit. A negative value would cause an error in the CGE.

4.2.21. Household Savings

Household savings are estimated as a residual to balance household income and expenditure. Hence, the total value of savings by household account is obtained by subtracting all household expenditures from total household income.

Another alternative would be to use the savings that can be calculated from the 2012 Household Income-Expenditure survey, however, this procedure is ruled out because household income and expenditure seem to be underreported when compared with data from the System of National Accounts. This is a feature usually observed in household income and expenditure surveys. However, household surveys of this kind are generally helpful to study the distribution of income and expenditure across quintiles or deciles.

4.2.22. Corporate Income Tax

Corporate income tax (CIT) is derived from national data. At the national level, the corporate income tax revenue is obtained from the tax dataset constructed by the Organization for Economic Co-operation and Development (OECD) available at: http://bit.ly/1qsK0TA. According to this dataset, Mexico's corporate income tax revenue in 2012 is $208.4 billion Mexican pesos. Having the value at hand, the regional account is estimated by dividing the national CIT revenue by national GDP-Value-added at basic prices and then multiplying by Chiapas GDP-Value-added at basic prices. The estimated value of CIT in Chiapas for 2012 is $3.8 billion Mexican pesos. As enterprises are aggregated in one single account, the CIT at the regional level does not need to be disaggregated. This method of estimation is chosen because there is not any information available on the subject at the regional level. Nonetheless, this method provides a plausible approximation of the amount of income tax enterprises pay according to the size of the Chiapas' economy.

4.2.23. Profit Distribution to Households

Enterprise profits distributed to households are a sub-matrix in the SAM. This sub-matrix is estimated from national figures. First, a total account of profits allocated to households at the national level is obtained from the 2012 household account net of expenditure (D.4 or "renta de la propiedad") contained in the 2003-2012 Institutional Sector Accounts of the System of National Accounts. Having the 2012 total national amount of profits for households, regional profits are estimated by dividing the national amount of profits by national GDP-Value-added at basic prices and then multiplying by Chiapas GDP-Value-added at basic prices. Having the total amount of profits to be distributed to households in Chiapas (annual profit-sharing), it is then disaggregated by household quintiles using shares from the account called "renta de la propiedad" [38] contained in the 2012 Household Income-Expenditure Survey.

4.2.24. Enterprise Savings

None of the statistical sources available provide data at the regional level concerning enterprise savings. In consequence, the selected alternative for estimating this account is to treat it as a residual, which also helps to balance the enterprise account. Therefore, enterprise savings are estimated by subtracting all enterprise expenditures from enterprise revenue.

4.2.25. Government Consumption

The government consumption account is constructed with data from the 2012 Expenditure Budget of Chiapas available at: http://bit.ly/1gU2iFW. In this file the government expenditure is disaggregated by component and economic activity. Hence, the main task for this account is to assemble a vector column with data of government consumption expenditure by economic activity based on the NAICS classification used throughout this research.

[38] Within the account entitled "renta de la propiedad" shares are taken from the sub-account called "ingresos provenientes de cooperativas, sociedades y empresas que funcionan como sociedades."

4.2.26. Social Transfers, *Oportunidades* and Remittances

Social transfers are broken down into non-conditional and conditional cash transfers from the government to households. On the one hand, non-conditional transfers consist of Procampo, temporary employment program (PET), "Amanecer" (which is a regional program), and the new and recently enacted programs: Pal-Sin Hambre and the universal pension (former "70 y más"). Data for Promcapo, PET, PAL-Sin Hambre, and the universal pension is obtained from the 2012 Expenditure Budget of the Federation[39] (PEF 2012). For the specific cases of PAL-Sin Hambre and the universal pension, an estimation for Chiapas is carried out based on the components and the new budget allocated for both programs. In PAL-Sin Hambre there are approximately 408,877 beneficiaries in Chiapas who receive four components of the program: a) "Alimentario sin hambre", it transfers $310 Mexican pesos a month; b) "Alimentario complementario sin hambre", it transfers $130 Mexican pesos a month; c) "Apoyo SEDESOL sin hambre", it transfers $88 Mexican pesos a month; and, d) "Apoyo infantil", it transfers $115 Mexican pesos per child (in this study it is estimated for two children per beneficiary household). In the universal pension there are 202,540 beneficiaries in Chiapas who receive $580 Mexican pesos a month.[40] In the SAM the allocation of non-conditional transfers by household quintile is carried out using the shares reported by the Federal Ministry of Finance (SHCP) called "Distribución del pago de impuestos y recepción del gasto público por deciles de hogares y personas. Resultados para el año de 2010", which includes an analysis of the distribution of these programs by household deciles. As the new programs, PAL-Sin Hambre and the universal pension, are using the infrastructure of "PAL" and "70 y más", their predecessors, this research uses the respective shares also reported by SCHP in the cited document. These social programs are broken down in the SAM because they are considered the most relevant, other transfers to households are aggregated in the government expenditure account and are allocated among households quintiles using the shares from the cited survey.

With respect to "Amanecer", a regional program for poverty reduction implemented since the administration of the Governor Juan Sabines Guerrero in the period 2006-2012, data are collected from the 2012 Expenditure Budget of Chiapas. The distribution of the "Amanecer"

[39] "Presupuesto de Egresos de la Federación 2012."
[40] Such amount will be increased to $1,092 Mexican pesos a month in fifteen years.

program among households is carried out using the observed shares of the sub-account entitled "Benefits from Government Programs" contained in the 2012 Household Income-Expenditure Survey. Data on the "Amanecer" program is available on-line at: http://bit.ly/1gU2iFW.

Conditional cash transfers, better known as *Oportunidades*, are broken down into five components: a) food; b) elderly; c) education; d) child; and, e) energy. Data are obtained from the 2013 Chiapas Statistical Yearbook published by the National Institute of Geography and Statistics (INEGI), which contains detailed information about the 2012 *Oportunidades* budget allocated to Chiapas households and number of beneficiaries. Its distribution among households is carried out using the observed shares in the sub-account called "transfers from government programs"[41] from the 2012 Household Income-Expenditure Survey. The technical description of such sub-account points out that it includes monetary transfers from the government; that is why shares are taken from it. Moreover, for the case of Chiapas this work assumes a type error I (exclusion) of 28.5% and a type error II (inclusion) of 25%, estimated using the methodology introduced by Cornia and Stewart (1993). In other words, 28.5% of poor households that should receive conditional cash transfers are being excluded from the program whereas approximately 25% of households currently receiving *Oportunidades* are not poor and should not be covered by *Oportunidades* benefits and services.

Remittances, in turn, are estimated with data from the Central Bank of Mexico and the 2012 Household Income-Expenditure Survey. The latter source includes data on transfers from other countries.[42] As there is discrepancy among the two sources, the data are adjusted applying the methodology proposed by Altimir (1987). The adjustment factor is calculated with the following formula:

$$FA = \left(\frac{\lambda}{E}\right) + 1$$

$$\lambda = CN - E$$

[41] It is found in the survey under the name of "beneficios provenientes de programas gubernamentales."
[42] In the survey it is referred to as "ingreso proveniente de otros países."

Where *E* is the value from the survey and *CN* is the value from the Central Bank (or National Accounts if it is the case). Once the adjustment factor is obtained it is then multiplied by the total value of remittances reported by the survey. Remittances are allocated among households using the observed shares in the sub-account called "Income from other countries" contained in the 2012 Household Income-Expenditure Survey. Altimir's methodology makes it possible to overcome any underestimation of- or mismatch between household surveys and National Accounts.

4.2.27. Government Savings and Current Account

Due to data limitations with regard to government savings at the regional level, government savings are estimated as a residual, that is, by subtracting government expenditure from its revenue. This method makes it possible to balance the government account. On the other hand, the current account is also calculated in a similar fashion, that is, as a residual, by subtracting imports from the sum of exports and transfers from the rest of the world to households (remittances).

4.2.28. Fixed Investment and Stock Changes

It is advisable to split the Savings-Investment account into gross fixed capital formation (that is, fixed investment) and stock changes (Müller, Pérez & Hubertus, 2009). Both accounts are derived from national data. National data of gross fixed capital formation and stock changes in 2012 are obtained from the 2003-2012 Goods and Services Accounts from the System of National Accounts. These data can be found in two accounts called "formación bruta de capital fijo" and "variación de existencias", in spreadsheet 22. Having these data at hand, both accounts can be estimated at the regional level by dividing national gross fixed capital formation by national GDP-Value-added at basic prices and then multiplying by Chiapas GDP-Value-added at basic prices by economic activity. The two accounts are then slightly adjusted so that total demand meets total supply. Table 4.17 shows the two vectors with national data used to estimate gross fixed capital formation and stock changes in Chiapas.

TABLE 4.17 NATIONAL GROSS FIXED CAPITAL FORMATION & STOCK CHANGES, 2012 (Billion pesos)		
Sector	Gross fixed capital formation	Stock changes
AGRC	44	139
MING	190	734
UTIL	0	4
CNST	2096	0
MANU	1242	4170
TRDE	0	7
OSER	49	42
EDUS	0	0
HEAS	0	0
PADM	0	0
Source: Own elaboration with data from INEGI.		

These two accounts complete the 2012 SAM of Chiapas. The following section is focused on descriptive statistics about the Chiapas' economy.

4.3. Descriptive Statistics: The Case of Chiapas

Chiapas remains one of the poorest States in Mexico. To propose alternative public policies for enhancing economic growth and reducing poverty, it is fundamental to analyze the main features of the Chiapas' economy. This section reviews the economic activity, labor markets, household income and expenditure, the *Oportunidades* coverage and other social transfers to households, and poverty and income inequality, using data from the 2012 disaggregated SAM introduced in the previous section.

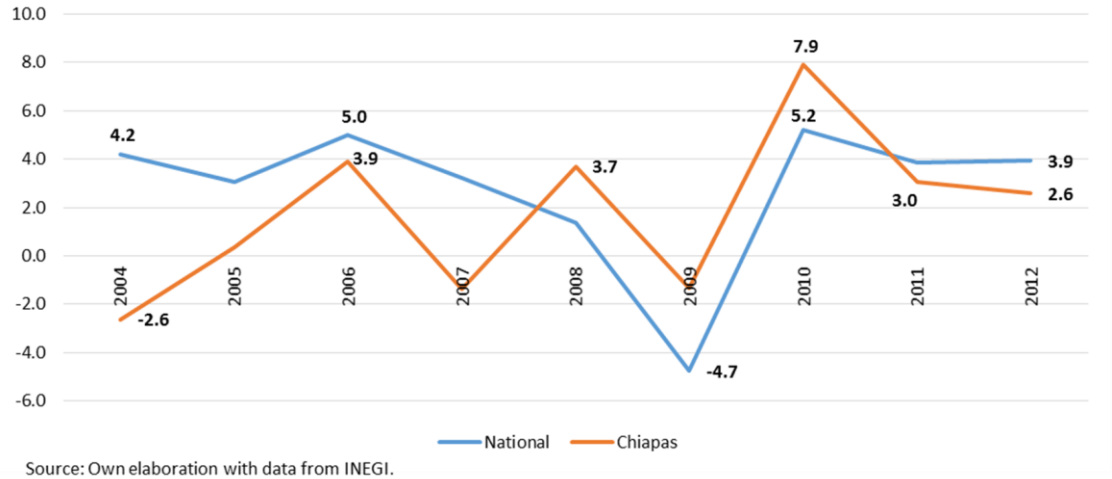
4.3.1. Economic Activity

Chiapas has had an uneven economic growth in the period 2004-2012, similar to the experience of the national economy in the last two decades. Figure 4.2 illustrates the Gross Domestic Product[43] (GDP) growth rate (at constant prices; base 2008) at both national and regional levels. Two trends can be observed. First, Chiapas GDP grew at lower annual rates than national GDP between 2004 and 2007. In that period the regional GDP grew at negative rates in 2004 and 2007, -2.6% and -1.4%, respectively, while the average growth rate was 0.1%. Second, Chiapas GDP grew at higher annual rates than the national economy between 2008 and 2010. In 2009 the regional economy grew -1.3%, as a result of the national

[43] To avoid misunderstandings, GDP at the state-level refers to gross value-added at basic prices.

recession caused by the international financial crisis (the great recession 2008-2009). In contrast, it grew significantly higher than the national economy in 2010 by 8%, nonetheless, it once again grew at a lower rate in 2011 and 2012. In the whole period 2004-2012, the average growth rate of Chiapas GDP was 1.8% while that of the national economy was 2.8%.

FIGURE 4.2 NATIONAL & CHIAPAS GDP GROWTH RATE, 2004-2012



Source: Own elaboration with data from INEGI.

However, given that the average population growth rate in Chiapas has been 2.4%, the real GDP per capita in Chiapas grew on average -0.6% between 2004 and 2012. As stated in previous sections, the base-year of this research is 2012. Table 4.18 shows the base scenario, that is, GDP at market prices from the expenditure-side (GDPMP) and the revenue-side (GDPMP2), as well as macroeconomic accounts such as private consumption (PRVCON), fixed investment (FIXINV), government consumption (GOVCON), exports, imports, net indirect taxes (NETITAX), GDP at factor cost (GDPFC2), regional tax collection (which consists of the payroll and "tenencia" taxes), and absorption (ABSORP). The 2012 GDP of Chiapas is $279 billion Mexican pesos.

TABLE 4.18 CHIAPAS GDP BASE, 2012

	VALUE	PERC-GDP
ABSORP	306.4	109.8
PRVCON	191.0	68.5
FIXINV	56.7	20.3
DSTOCK	1.9	0.7
GOVCON	56.8	20.4
EXPORTS	62.2	22.3
IMPORTS	89.6	32.1
GDPMP	279.0	100.0
GDPMP2	279.0	100.0
NETITAX	7.1	2.5
GDPFC2	271.9	97.5
REGTAX	0.8	0.3

Source: Own elaboration.

Private consumption, fixed investment, stock changes, and government consumption account for $191 and $56.7, $1.9, and $56.8 billion Mexican pesos, which represent 68.5%, 20.3%, 0.7%, and 20.4% of GDP, respectively. Exports and imports have a base-value of $62.2 and $89.6 billion Mexican pesos that generates a deficit in the trade balance of $27.4 billion Mexican pesos, equivalent to 0.1% as a share of GDP. On the other hand, from the revenue perspective, the GDP at factor cost has a value of $271.9 billion Mexican pesos while indirect taxes account for $7.1 billion Mexican pesos or 2.5% of GDP. In addition, the regional tax collection is of $0.8 billion Mexican pesos or 0.3% as a share of GDP. Finally, the absorption, the sum of all domestically-produced goods consumed internally and all imports, has a value of $306.4 billion Mexican pesos.

The economic structure of Chiapas is described in table 4.19. It shows economic sector shares in gross value-added (VAshr), production (PRODshr), formal employment (FEMPshr), informal employment (IEMPLshr), and total exports (EXPshr) and imports (IMPshr). In addition, it includes exports as share in sector output (EXP-OUTshr) and imports as share of domestic demand (IMP-DEMshr). The economic sectors with the largest shares in gross value-added are other-services, trade, and construction with 22.6%, 20.9%, and 10.2%, respectively. The agricultural sector has a share of 8.3%. In contrast, utilities and health-services sectors have the lowest shares with 2.7% each. On the other hand, with respect to production, the economic sectors with the largest share in total production are manufacturing, other-services, and trade with 31.1%, 17.2%, and 16.3%, respectively. The agricultural sector has a share of 6.4%. In contrast, the sectors with the lowest contribution are health-services, utilities, and public administration with 2.1%, 2.3%, and 4.5%, apiece.

Formal employment accounts for 22.7% of total employment. The economic sectors with the largest participation within formal employment are trade, other-services, educational-services, and public administration with 22.2%, 17%, 17%, and 14.4%, respectively. The agricultural sector contributes only with 8.7%. On the other side, the sectors with the lowest share in formal employment are construction, mining, and utilities with 3.8%, 0.7%, and 0.5%, apiece. In contrast, informal employment accounts for 77.3% of total employment. The economic sectors with the largest share within informal employment are agricultural,

other-services, and trade with 52.3%, 18.2%, and 12.7%, respectively, while those with the lowest are health services with 0.8% and again, mining and utilities with 0.1% apiece.

Exports account for 22.3% as a share of GDP. The economic sectors with the largest contribution in total exports are manufacturing, mining, and public administration with 72%, 20.2%, and 5.7%, respectively. The agricultural sector only contributes with 5.7%. On the other hand, imports account for 32.1% as a share of GDP. The sectors with the largest share in total imports are manufacturing, other-services, and agricultural with 52.3%, 17%, and 10.6% apiece, while that with the lowest contribution is utilities with 0.8%. Moreover, with regard to exports as share in sector output, the sectors with the largest contribution are mining and manufacturing with 44% and 26.1%. In the case of imports as share of domestic demand, manufacturing, agricultural, and mining sectors have the largest participation with 29.8%, 25.3%, and 20.1%, respectively.

TABLE 4.19 CHIAPAS ECONOMIC STRUCTURE, 2012 (%)

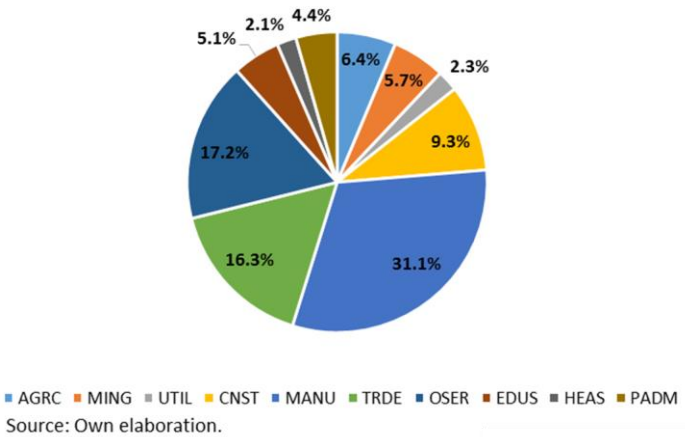
	VAshr	PRDshr	FEMPshr	IEMPshr	EXPshr	EXP-OUTshr	IMPshr	IMP-DEMshr
AGRC	8.3	6.4	8.7	52.3	5.7	6.8	10.6	25.3
MING	8.5	5.7	0.7	0.1	20.2	44.0	4.4	20.1
UTIL	2.7	2.3	0.5	0.1	0.2	0.9	0.8	6.3
CNST	10.2	9.3	3.8	6.6				
MANU	9.7	31.1	6.1	6.0	72.0	26.1	52.3	29.8
TRDE	20.9	16.3	22.2	12.7	0.7	0.6	10.0	10.4
OSER	22.6	17.2	17.0	18.2	1.2	0.9	17.0	15.9
EDUS	8.5	5.2	17.0	1.3			4.8	15.0
HEAS	2.7	2.1	9.7	0.8				
PADM	6.0	4.5	14.4	1.9				
TOTAL-1	100.0	100.0	100.0	100.0	100.0	11.4	100.0	18.1
TAGR	8.3	6.4	8.7	52.3	5.7	6.8	10.6	25.3
TNAGR	91.7	93.6	91.3	47.7	94.3	11.6	89.4	17.5
TOTAL-2	100.0	100.0	100.0	100.0	100.0	11.4	100.0	18.1

Source: Own elaboration.

Table 4.19 also compares the agricultural sector (TAGR) with an aggregated non-agricultural (TNAGR) sector. It shows that non-agricultural sector contributes with the largest share in gross value-added, production, formal employment, total exports and imports, as well as in exports as share in sector output. In contrast, the agricultural sector has the largest share in informal employment and imports as share of domestic demand.

Meanwhile, the gross product of Chiapas in 2012 is $477.1 billion Mexican pesos, accounting for 1.8% as a share of national gross product. Figure 4.3 shows the NAICS-based 10-sector structure of gross product in Chiapas, elaborated with data from the SAM. The economic sectors with the largest contribution in gross product are manufacturing, other-services, and trade with 31.1%, 17.2%, and 16.3%, respectively. The agricultural sector's share is only 6.4% while the lowest contributions come from health-services and utilities sectors.

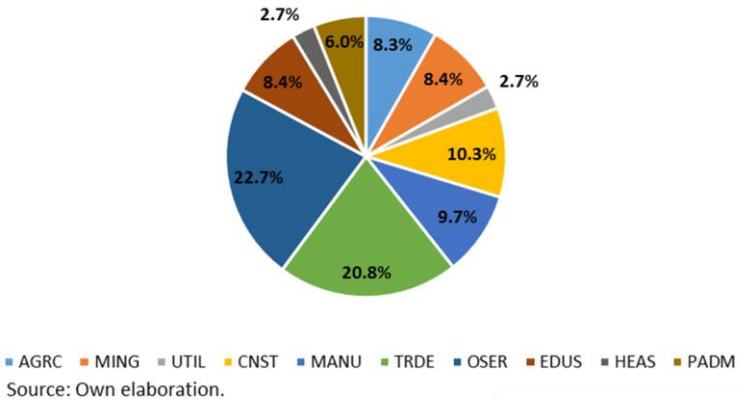
FIGURE 4.3 GROSS PRODUCT IN CHIAPAS, 2012



Source: Own elaboration.

Figure 4.4, in turn, displays the 2012 gross value-added at basic prices in Chiapas, elaborated with data from the SAM. It has a value of $273.4 billion Mexican pesos, which accounts for 1.8% of national gross value-added. The economic activities with the largest contribution are other-services, trade, construction, and manufacturing with 22.7%, 20.8%, 10.3%, and 9.7%, respectively. The agricultural sector's share is only of 8.3%. On the other hand, the lowest proportions are in utilities and health-services sectors with 2.7% each.

FIGURE 4.4 GROSS VALUE-ADDED AT BASIC PRICES IN CHIAPAS, 2012

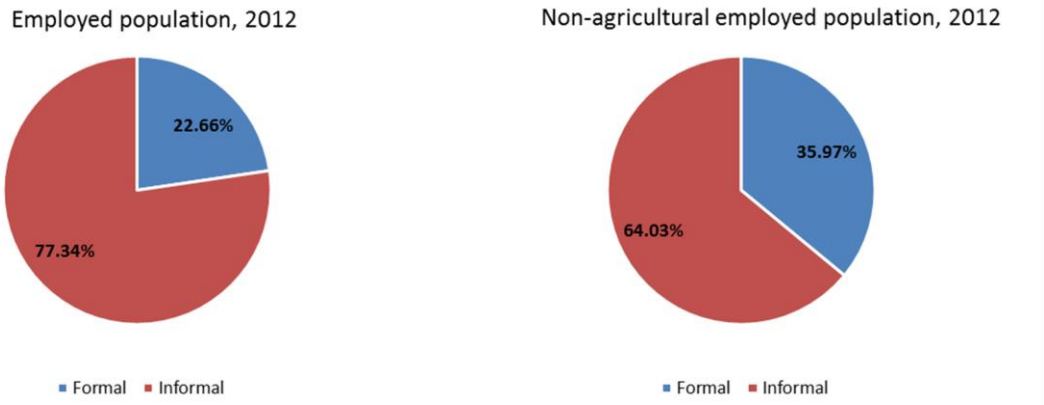


Source: Own elaboration.

4.3.2. The Factors Market

The factors market is integrated by formal and informal labor, and capital. First, with respect to the labor market, the economically active population in Chiapas in 2012 is of 1,921,907 people, of which 97.2% are employed and 2.4% are unemployed. Figure 4.5 illustrates the composition of the employed population. On the one hand, it shows that 77.3% of the total employed population has an informal employment while only 22.6% has a formal job. On

FIGURE 4.5 COMPOSITION OF THE EMPLOYED POPULATION, 2012



Source: Own elaboration.

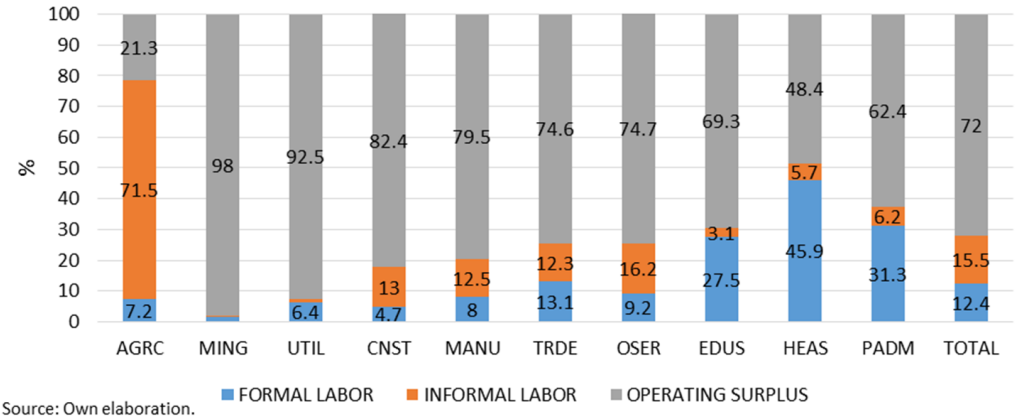
the other hand, it also shows the composition of the non-agricultural-employed population. 64% of the population employed in non-agricultural activities has an informal job while 36% has a formal employment. In other words, even excluding the agricultural sector, informal employment remains predominant in Chiapas. It implies that a significantly large share of the employed population has a job within conditions of informality. In addition, according to the INEGI dataset concerning informality, 18.9% of the population is employed in the informal sector. At this point the reader should bear in mind the distinction made between informal employment and informal sector, as suggested by the International Labor Organization[44].

Moreover, with respect to the contribution of formal and informal labor and operating surplus within each economic activity, figure 4.6 illustrates factor shares within sector. It is important to highlight that formal and informal labor are measured by wages and salaries in this figure. Hence, this graph displays the factor's participation in each one of the 10 economic sectors included in the SAM. The agricultural sector has the largest share of informal labor across sectors, it accounts for 71.5%. In contrast, the largest share of formal

[44] For further details on this subject, see ILO(2013).

labor is located in the other-services sector, where it contributes with 16.2%. The operating surplus, in turn, is the predominant factor in mining, utilities, construction, and manufacturing, other-services, trade, and educational-services sectors, where it contributes with 98%, 92.5%, 82.4%, 79.5%, 74.7%, 74.6%, and 69.3%, respectively. On average, the operating surplus contributes with 72%, followed by informal and formal labor. This structure is mainly explained by the low level of wages and salaries paid by economic activities in Chiapas. A person who has a formal employment earns 3.3 minimum salaries on average while someone with an informal employment earns 1.4. On average, an employed person earns 1.8 minimum salaries. Chiapas has the lowest level of wages and salaries nationwide.

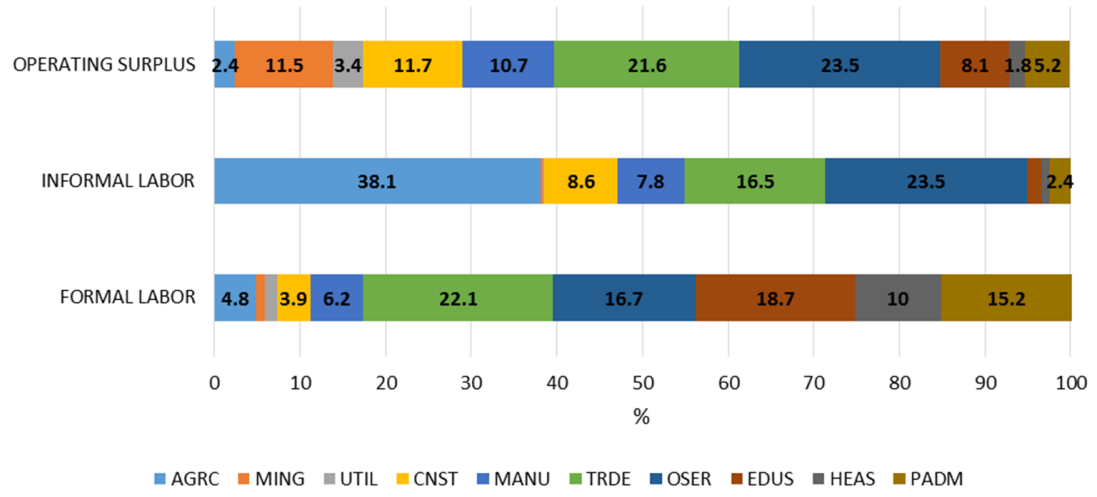
FIGURE 4.6 FACTOR SHARES WITHIN ECONOMIC SECTOR, 2012



Source: Own elaboration.

Factor shares across sectors are depicted in figure 4.7. It shows that the largest share of operating surplus resides in other-services and trade sectors, accounting for 23.5% and 21.6%. In contrast, agricultural and health-services sectors have the lowest shares, 2.4% and 1.8%, respectively. As in the previous graph, formal and informal labor is measured by wages and salaries. Hence, agricultural and other-services sectors have the largest shares of informal labor, accounting for 38.1% and 23.5%, while the lowest proportions are in mining and utilities sectors with 0.2% each one. On the other hand, trade, educational-services, other-services, and public administration enjoy the highest shares of formal labor, accounting for 22.1%, 18.7%, 16.7%, and 15.2%, respectively. In contrast, utilities, mining, and construction sectors bear the lowest shares, 1.1%, 1.4%, and 3.9%.

FIGURE 4.7 FACTOR SHARES ACROSS ECONOMIC SECTORS, 2012



Source: Own elaboration.

4.3.3. Household Income and Expenditure

Household income is mainly composed of factor income (labor income and operating surplus), profits from enterprises, social transfers, and remittances. It is highly concentrated in Chiapas. Figure 4.8 shows the income distribution by household quintiles in 2012, with data from the SAM. The notation used is:

HHD1 = Household quintile 1

HHD2 = Household quintile 2

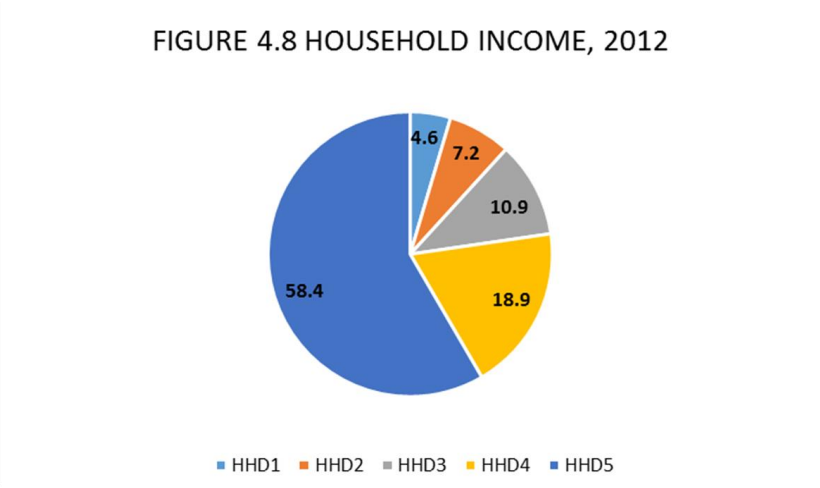
HHD3 = Household quintile 3

HHD4 = Household quintile 4

HHD5 = Household quintile 5

The 20% richest households concentrate 58.4% of total household income. In contrast, the 20% poorest families in Chiapas concentrate only 4.6%. If quintiles I and II are added the result is striking, the 40% richest households together gather 77.3% of total household income while the same percentage of poorest families obtain only 11.8%. This graph makes evident the current huge disparities concerning income distribution in Chiapas.

FIGURE 4.8 HOUSEHOLD INCOME, 2012

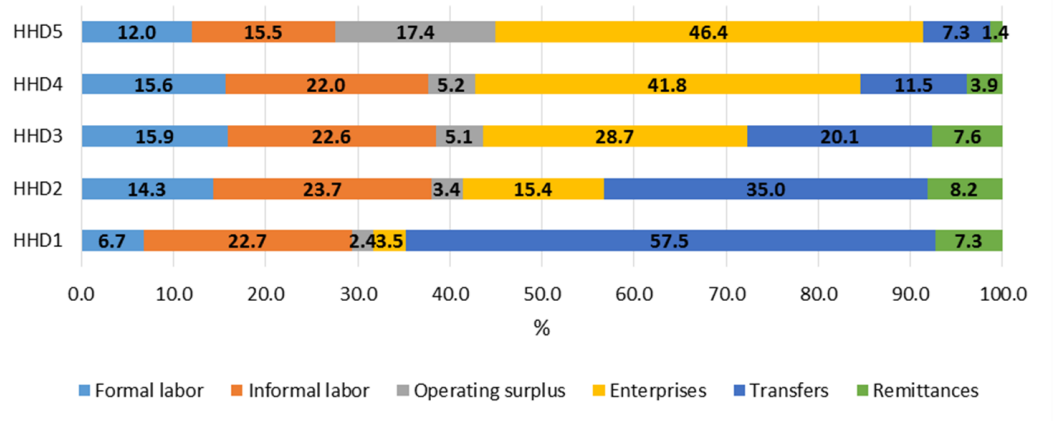


Source: Own elaboration.

Household income disaggregated by source is illustrated in figure 4.9. The main sources of income are formal and informal labor, household operating surplus, enterprises, social transfers, and remittances. A reveling fact is that the main source of income of the 20% poorest households is social transfers, which provide 57.5% of their total income. Social transfers are then followed by informal labor which, as shown above, is mainly characterized by very low wages and salaries. On average, someone with an informal employment earns 1.4 minimum salaries. The 2012 minimum salary in Chiapas is of $59.08 Mexican pesos, that is, USD$4.49 a day[45]. In addition, remittances and formal labor represent the third and fourth sources of income for this group, accounting for 7.3% and 6.7% apiece. As it might be expected, the share of social transfers within the composition of household income declines as income increases. In contrast, the main source of income of the 20% richest families is profits from enterprises (annual profit distribution), which contributes with 46.4% of their total income. It is followed by household operating surplus, informal and formal labor, with 17.4%, 15.5%, and 12%, respectively. For this group remittances represent the least important source of income, accounting only for 1.4%.

[45] Value estimated with an average exchange rate of $13.1596 Mexican pesos per dollar.

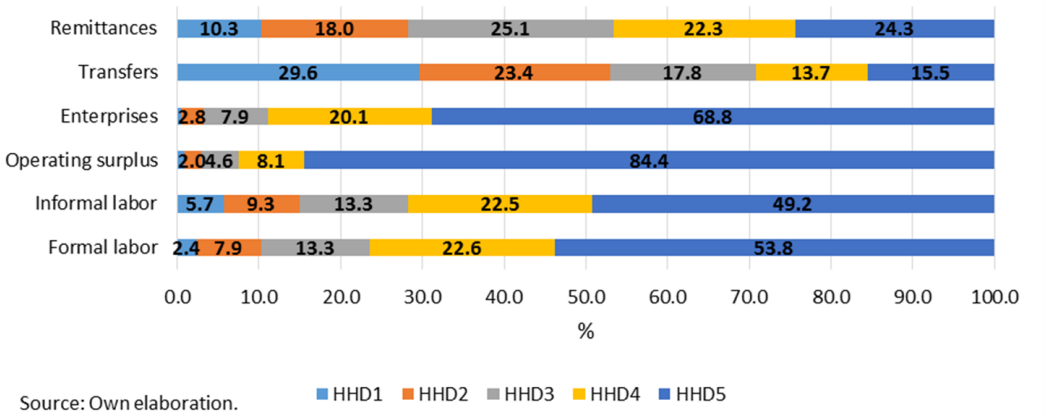
FIGURE 4.9 HOUSEHOLD INCOME BY SOURCE, 2012



Source: Own elaboration.

Furthermore, figure 4.10 shows household shares in income source. With respect to social transfers, the 40% poorest households have the largest share which accounts for 53%. Within informal labor, household quintiles 5 and 4 have the largest shares with 49.2% and 22.5% while in formal labor a similar pattern can be observed because the same quintiles show the largest proportions accounting for 53.8% and 22.6%, respectively. It is important to highlight that the 20% poorest households have the lowest share in formal labor with only 2.4%. In other words, total labor income (formal and informal) is mainly earned by the 20% richest families while social transfers (*Oportunidades* and other non-conditional transfers) are mainly received by the poorest households. Another interesting fact to point out is that, within remittances, middle-income households have the largest share, accounting for 25.1%, followed by quintile 5. In contrast, families in quintile 1 obtain only 10.3% of total remittances. The latter can be explained by the fact that international migration is not a relevant activity in Chiapas. In addition, in gross operating surplus and enterprises (annual profit sharing) the largest share is received in both cases by quintile 5 by 84.4% and 68.8%, respectively.

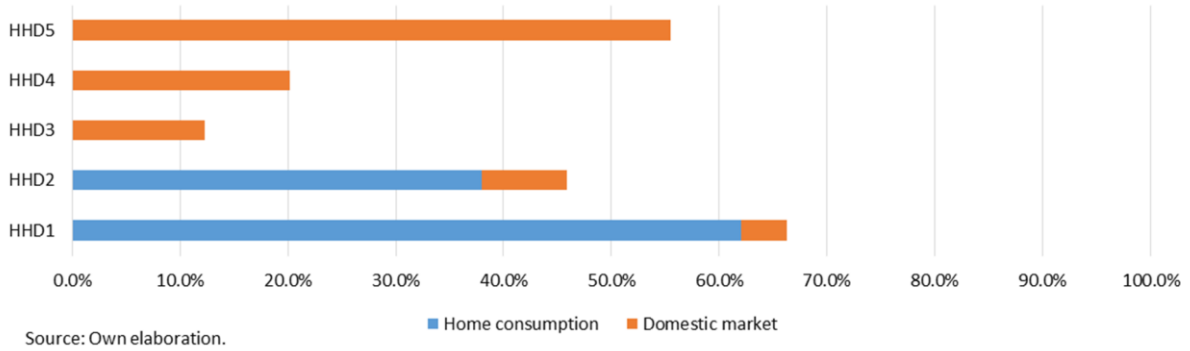
FIGURE 4.10 HOUSEHOLD SHARES IN INCOME SOURCE, 2012



Source: Own elaboration.

With respect to household expenditure, it accounts for $191 billion Mexican pesos, of which 2.2% is home consumption and 97.8% is consumption of market commodities. Figure 4.11 shows that of total home consumption, 62% corresponds to quintile 1 and 38% to quintile 2. In other words, only the 40% poorest households have home consumption (they produce in the agricultural sector for self-consumption). On the other hand, out of total consumption of market commodity, 55.5% corresponds to quintile 5 while 4.2% belongs to the poorest families. 75.6% of total market commodities is consumed by the 40% richest households while 12% by families in quintiles 1 and 2.

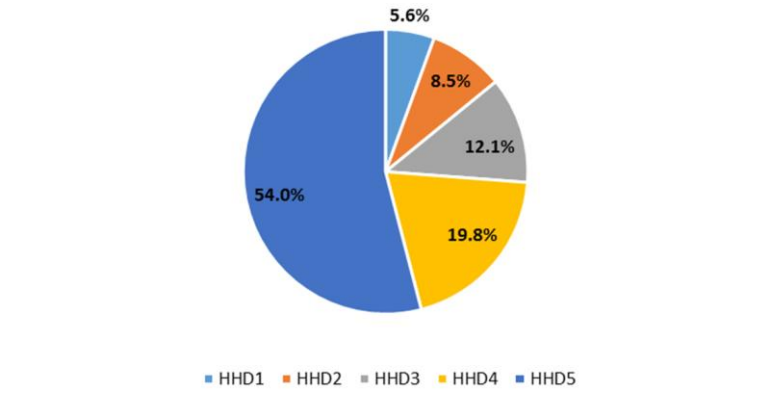
FIGURE 4. 11 HOUSEHOLD CONSUMPTION SHARES IN HOME CONSUMPTION & DOMESTIC MARKET



Source: Own elaboration.

Overall, figure 4.12 depicts total private consumption by households. This pie chart shows that the largest share of household consumption is concentrated in the 20% richest households and accounts for 54% of total consumption. If quintiles 4 and 5 are added up the result is even more striking, these two groups bear 73.8% of total household consumption in Chiapas. In contrast, the 20% poorest have the lowest share with 5.6% while consumption in quintiles 2 and 3 reaches 8.5% and 12.1%, respectively.

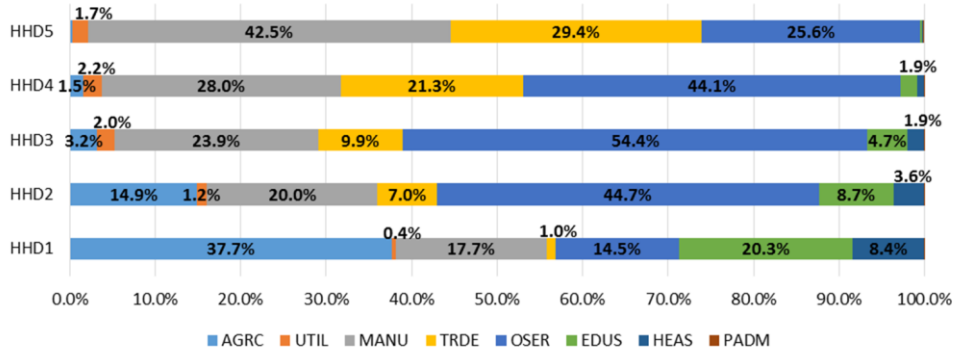
FIGURE 4.12 HOUSEHOLD CONSUMPTION, 2012



Source: Own elaboration.

The composition of household consumption by economic sector is presented in figure 4.13. This chart shows that the poorest households consume about 38% and 20.3% from the agricultural and educational-services sectors. The third main component of their consumption is the manufacturing sector with 17.7%. The 20% richest, in contrast, consume 42.5% from the manufacturing sector, followed by trade and other-services with 29.4% and 25.6%, apiece. This group consumes less than 1% from the agricultural sector. Consumption of commodities from the agricultural, educational-, and health-services sectors declines as income increases while the opposite pattern occurs for manufacturing, trade, and other-services.

FIGURE 4.13 HOUSEHOLD CONSUMPTION BY ECONOMIC SECTOR

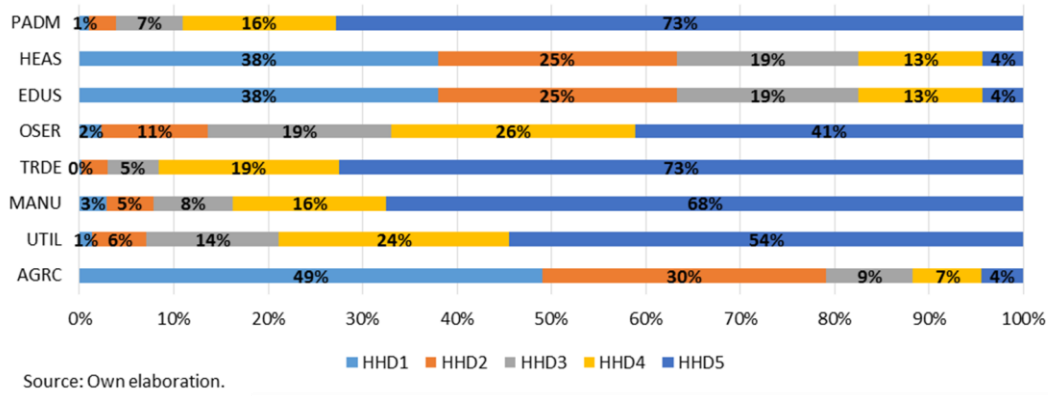


Source: Own elaboration.

Further, household consumption shares within economic sectors is illustrated in figure 4.14. This graph shows that in the agricultural sector the largest share of consumption belongs to households in quintile I, accounting for 49%, followed by quintile 2 with 30%. The poorest also have the largest share within educational- and health-services sectors, in each, they bear 25%. On the other hand, the richest families bear the largest consumption shares in

trade, public administration, manufacturing, utilities and other-services sectors with 73%, 73%, 68%, 54%, and 41%, respectively.

FIGURE 4.14 HOUSEHOLD CONSUMPTION SHARES WITHIN SECTOR



Source: Own elaboration.

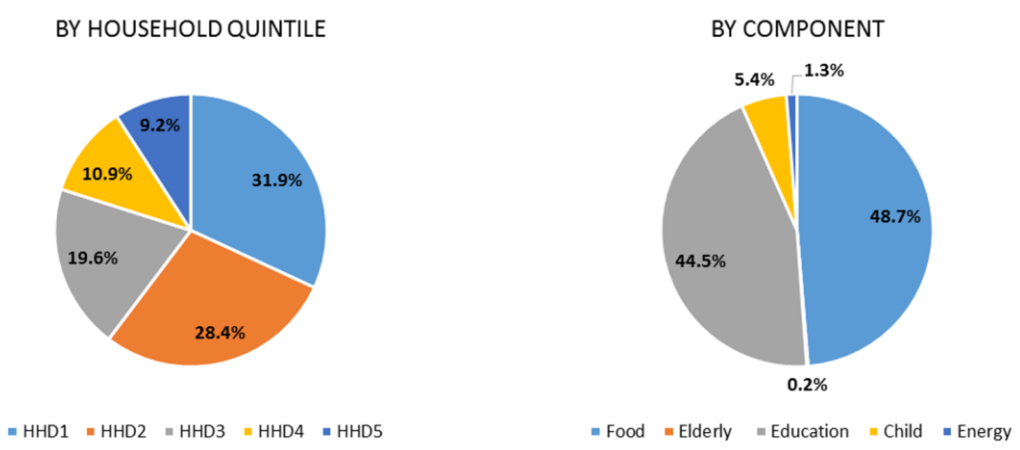
4.3.4. *Oportunidades* and Other Social Transfers

Social transfers are broken down into conditional – *Oportunidades* – and non-conditional. On the one hand, *Oportunidades* represents the largest social program for poverty reduction. It has a budget (2012) of $6 billion[46] Mexican pesos and it covers 627,093 households in 9,684 towns in Chiapas, which is equivalent to 2,860,088 beneficiaries. A typical household is integrated by 4.3 members. *Oportunidades* has five components: food, elderly, education, child, and energy[47]. Figure 4.15 shows the program distribution among households by income quintiles and its component structure. The 20% poorest households receive 32% while quintile 2 obtains 28.4% of total conditional cash transfers. In other words, 60.3% of *Oportunidades* is received by the 40% poorest families. However, as a result of an inclusion error in the allocation of transfers, the richest households obtain 9.2% of transfers even though they should not be covered by a program initially intended to reduce poverty. Moreover, the allocation error is extended to a segment of the poor population that is being excluded from the program. Hence, this research estimates a type error I (exclusion) and a type error II (inclusion) of 28.5% and 25%, respectively. There is a significant misallocation of conditional cash transfers for poverty reduction. Furthermore, as illustrated below, of the five components the main two are food and education, which account for 48.7% and 44.5% of the total budget. The amount of cash to be transferred for the elderly and child

[46] Approximately USD$0.46 billion; taking an average exchange rate of $13.1596 pesos per dollar.
[47] These components are called “alimentación”, “adultos mayores”, “educación”, “infantil vivir mejor”, and “energético”.

components varies depending on the number of children and elderly in the household. The energy component constitutes an additional help to cover monthly home costs related to energy used (electricity, coil, and so forth). As a share of total income, *Oportunidades* contributes on average with 2.52% of total household income. However, it is important to highlight that it accounts for 17.4% of the total income of the 20% poorest households (quintile 1) and 10% of quintile 2 households. As a share of total transfers, *Oportunidades* has the largest contribution. It accounts for 28% and 24% of the total transfers received by household quintiles 1 and 2, respectively. It is the main and largest program for poverty reduction.

FIGURE 4.15 *OPORTUNIDADES* STRUCTURE, 2012

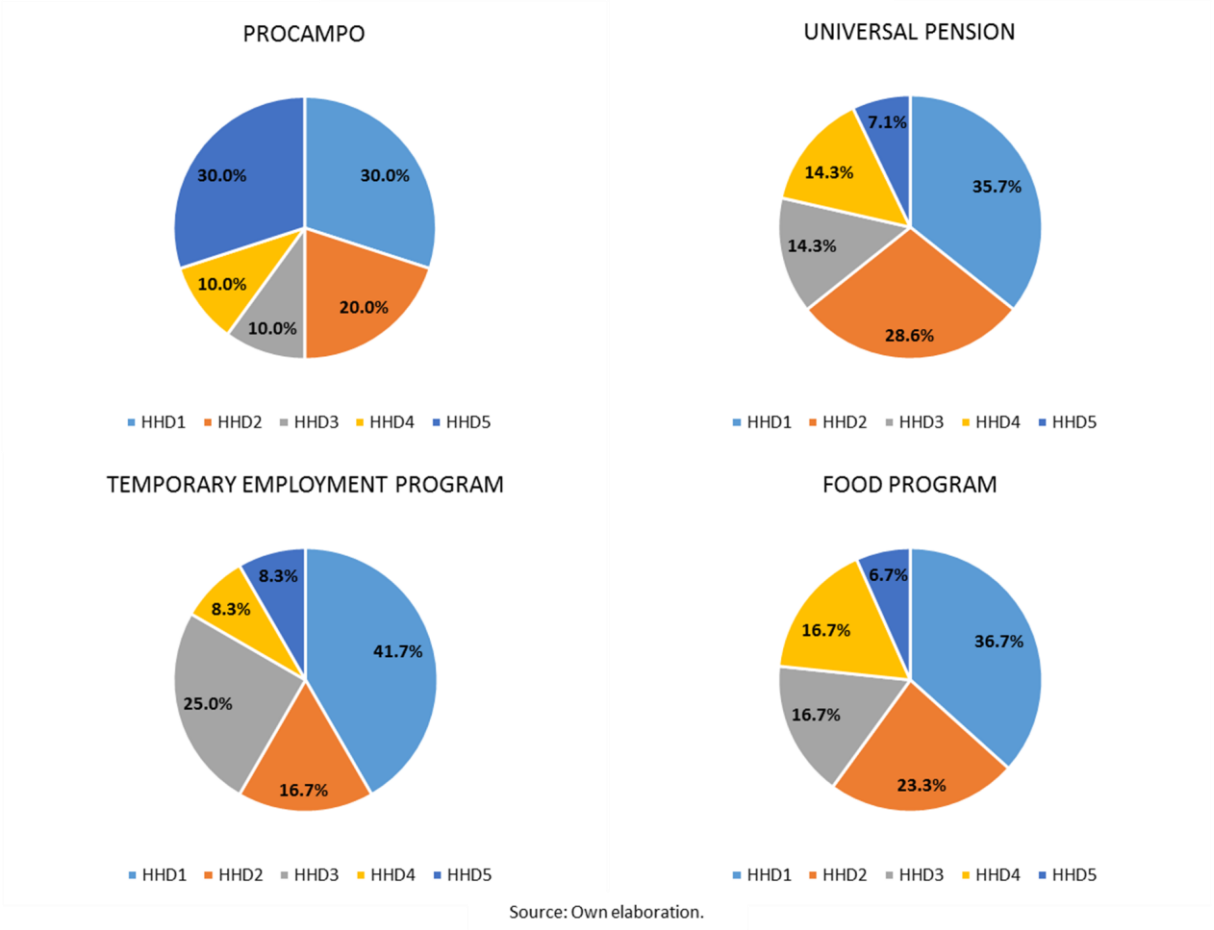


Source: Own elaboration.

On the other hand, non-conditional transfers are broken down into four important programs: Procampo, temporary employment, PAL-Sin Hambre, and universal pension. The last two are new social programs created and recently enacted in the administration of President Enrique Peña Nieto. Figure 4.16 shows the distribution of these programs by household income quintiles. Procampo is the largest social program in the agricultural sector to provide financial support to farmers who were expected to face declining prices after the implementation of the North American Free Trade Agreement (NAFTA) and credit constraints to invest in agricultural production. It contributes on average with 0.44% of total household income. This program is mainly allocated to quintiles 1 and 5, that is, the 20% poorest and richest households, who obtain 30% each of its total budget; they are then followed by families in quintile 2 who get 20% of the transfers. The temporary employment program (known as *PET*), in turn, provides temporary financial support to men and women who face a reduction of their income in times of low job demand and during natural

emergencies to participate in community or household projects. It contributes on average with only 0.1% of total household income. The 20% poorest households receive 41.7% of its total budget while those in quintile 3 get 25%, followed by quintile 2 with 16.7%.

FIGURE 4.16 NON-CONDITIONAL TRANSFERS



Source: Own elaboration.

Moreover, the new food program known as PAL-Sin Hambre uses the infrastructure and structure of the previous program called *PAL*. It is a national strategy of social inclusion and well-being. It seeks to ensure food security and nutrition of 7.1 million Mexicans now living in extreme poverty. This program contributes on average with 1.31% of total household income and it is mainly received by quintile 1 and 2, that is, the 40% poorest households, who obtain 36.7% and 23.3%, respectively. As in the case of *Oportunidades*, since this study is using the preceding food program's (PAL) shares by household income reported by the Ministry of Hacienda[48], PAL-Sin Hambre also has an inclusion error. For this reason the richest households in Chiapas also obtain 6.7% of the transfers from the food program. On

[48] Reported in the document called "Distribución del pago de impuestos y recepción del gasto público por deciles de hogares y personas. Resultados para el año de 2010." Available at: http://bit.ly/1i8vYEA.

the other hand, the new universal pension (before known as "70 y más") provides financial support to adults older than 65 years. It transfers a monthly pension of $580 Mexican pesos (around $USD44) which it plans to progressively increase to $1092 (around USD$83) within fifteen years. It contributes on average with 0.61% of total household income. This universal pension is mainly received by households with the lowest income levels, that is, quintiles 1 and 2, who get 35.7% and 28.6% of the program while quintiles 3, 4, and 5 obtain 14.3%, 14.3%, and 7.1%, respectively.

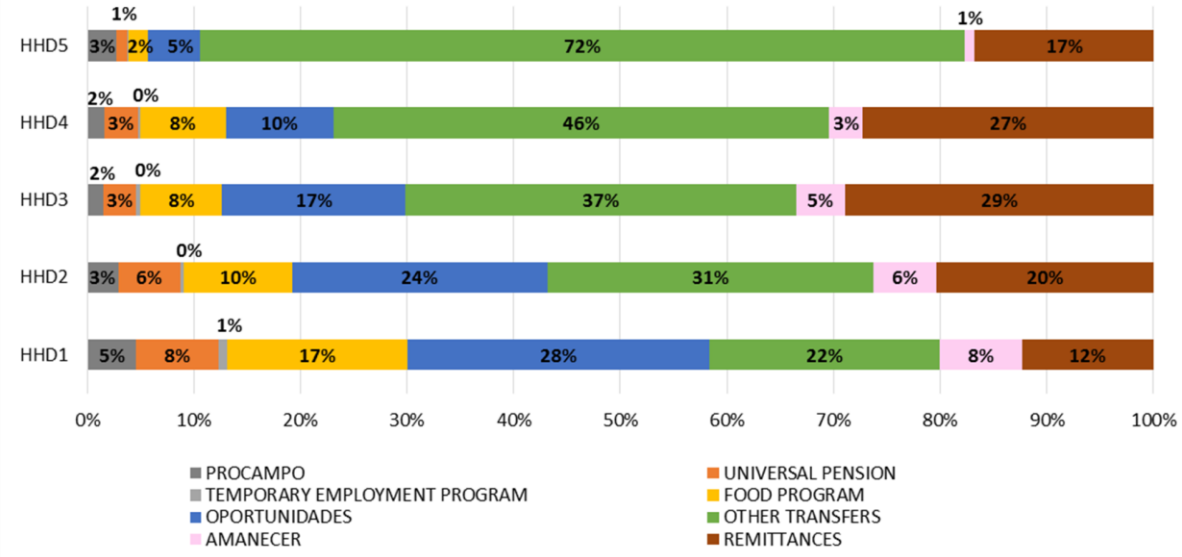
In addition, this study includes the regional program called "Amanecer", other transfers, and remittances. With respect to "Amanecer", it is a regional program for poverty reduction which transfers cash to poor households. It is non-conditional and contributes with 0.66% of total household income. Other transfers, in turn, aggregate 278 federal programs[49]. In the case of Chiapas, other transfers account on average for 7.21% of total household income. Furthermore, it accounts for 13.2% and 12.7% of the total income for household quintiles 1 and 2. On the other hand, remittances contribute on average with 3.32% of total household income. For the 20% poorest households they account for 7.5% of their total income while it represents 8.5% of the total income of household quintile 2. As a share of total transfers, remittances contribute with 4%. For household quintiles 1 and 2, they account for 8% and 6% of total transfers, respectively. Remittances do not play a fundamental role in total household income because Chiapas is not a leading region with regard to emigrants.

All social transfers allocated to households are illustrated by figure 4.17. This chart displays *Oportunidades,* Procampo, PAL-Sin Hambre (food program), universal pension, temporary employment program (*PET*), "Amanecer", other transfers, and remittances by household quintiles in 2012. On the one hand, for the 20% poorest households, that is, quintile 1, *Oportunidades* accounts for 28% as a share of total transfers, it provides the largest contribution among all social transfers. It is then followed by other transfers, and PAL-Sin Hambre, with 22% and 17%, respectively. In contrast, for the 20% richest households (quintile 5), other transfers bear the largest share accounting for 72%, followed by remittances, and conditional cash transfers with 17% and 5%. As might be expected, the role

[49] CONEVAL states that there are 3,127 social programs in Mexico (2012), of which 278 are federal programs and 2,849 are regional (state) ones. Further information on this subject can be found at: http://bit.ly/1iKTRSe.

of *Oportunidades*, PAL-Sin Hambre, and universal pension decreases as household income grows while that of other transfers increases in the context of all social transfers to households in Chiapas.

FIGURE 4.17 TRANSFERS TO HOUSEHOLDS



4.3.5. Poverty and Inequality

Chiapas is the poorest state in Mexico. The National Council for the Evaluation of Social Development Policy (CONEVAL) applies a multidimensional approach to measure poverty in Mexico. Table 4.20 provides an overview of the situation concerning poverty in Chiapas in 2012, from a multidimensional perspective. According to CONEVAL, there are 5.1 million inhabitants in Chiapas of which 3.8 million live in poverty, that is, 74.7% of the total population. Moreover, of the total population in poverty, 42.5% is in moderate poverty while 32.2% lives in extreme poverty. 17.2% is vulnerable to social deprivation and 1.7% is income-vulnerable. Only 324.5 thousand people, equivalent to 6.4% of the population, are non-poor and non-vulnerable. With respect to social deprivation, it is measured by six indicators such as educational backwardness, lack of access to health services, social security, quality and living spaces, access to basic services at home, and access to food. In this respect, 91.9% of the population has at least one social deprivation while 49.8% has at least three. Moreover, social deprivation indicators show that 33.5% of the population is educationally deprived, 24.9% is deprived of access to health services, 83.3% of access to social security, 29.1% of quality and living spaces, 56.8% of access to basic services at home, and 24.7% of access to

food. From an income approach, in turn, 46.7% of the population is below the minimum well-being line and 76.4% is below the well-being line.

Income inequality is another important challenge in Chiapas. According to CONEVAL, the Gini coefficient without transfers is of 0.518 while with transfers it is of 0.445. In general, the Gini coefficient in Chiapas is above the national one which is of 0.48. The level of this indicator highlights the importance of social transfers in Chiapas.

TABLE 4.20 POVERTY IN CHIAPAS, 2012

Incidence, number of people & average deprivation

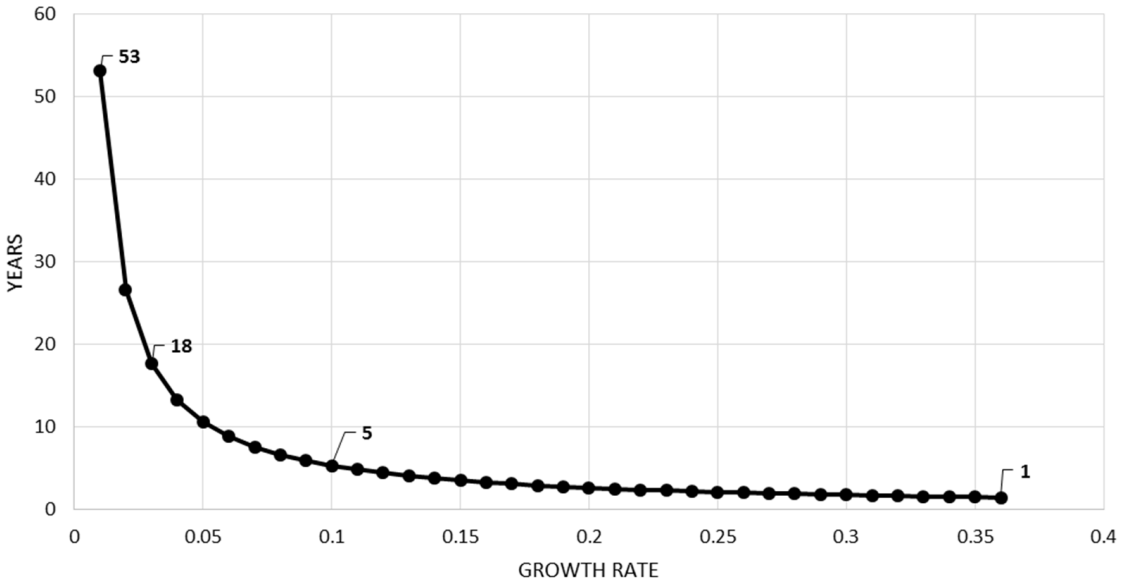
Indicators	Percentage	Thousands of people	Average deprivation
Poverty			
Population in poverty	74.7	3782.3	2.9
Population in moderate poverty	42.5	2153.1	2.2
Population in extreme poverty	32.2	1629.2	3.8
Population vulnerable to social deprivation	17.2	869.7	2.0
Income vulnerable population	1.7	87.6	0.0
Non-poor & non-vulnerable population	6.4	324.5	0.0
Social deprivation			
Population with at least one social deprivation	91.9	4652.1	2.7
Population with at least three social deprivation	49.8	2519.7	3.7
Social deprivation indicators			
Educational backwardness	33.5	1695.5	3.5
Lack of access to health services	24.9	1263.1	3.6
Lack of access to social security	83.3	4217.8	2.9
Lack of quality and living spaces	29.1	1476.1	3.8
Lack of access to basic services at home	56.8	2878.6	3.3
Lack of access to food	24.7	1252.4	3.7
Welfare			
Population with an income below the minimum wellbeing line	46.7	2365.2	3.2
Population with an income below the wellbeing line	76.4	3869.9	2.8

Source: CONEVAL.

Furthermore, figure 4.18 shows the time required to exit poverty (i.e. time to reach the poverty line) for the 20% poorest households (quintile 1) assuming a constant annual growth rate of GDP per capita, *ceteris paribus*. This graph is elaborated using the so-called indicator *time taken to exit poverty*, which is estimated using the poverty line and the base-value of household income of the poorest. The former is estimated at household level with data from CONEVAL and has a monthly value of $6,379.89 Mexican pesos while the latter is taken from the 2012 SAM of Chiapas constructed by this study and has a monthly

value of $3,751.63 Mexican pesos. Hence, assuming that GDP per capita grows at a constant annual rate, *ceteris paribus*, this graph shows that it could take, on average, up to 53 years for households in quintile 1 to escape from poverty with a constant GDP per capita growth rate of 1%. By comparison, it could take 18, 5, and 1 years to exit poverty with rates of 3%, 10%, and 36%, respectively, *ceteris paribus*.

FIGURE 4.18 TIME REQUIRED TO EXIT POVERTY
(Years)



Source: Own elaboration.

5. Methodology

This research applies a Computable General Equilibrium (CGE) model. It is a system of equations that describes an entire economy and all the interactions between productive sectors, commodity and factor markets, and institutions. All of the equations are solved simultaneously to find an economy-wide equilibrium in which demand and supply quantities are equal in every market at a certain level of prices (Burfisher, 2011). One of the features of general equilibrium is that it implements a "bottom-up" approach, that is, it is focused on individual markets and economic agents. This method is chosen because it allows the assessment and analysis of economic policy changes, structural transformations and shocks which can be transmitted through different channels within the economy. It is also a powerful method to evaluate the impact and distributive effects of such changes on and among households. In modeling the economy of Chiapas in a simplified way, a CGE is a useful tool to find out the opportunity cost of financing conditional cash transfers, which is the main objective of this study. This method is also suitable for policy design to encourage pro-poor growth and achieve poverty reduction.

Moreover, a CGE is the chosen methodology because it is a comprehensive approach that allows modelling the economy in a simplified way to study economic policy adjustments and their implications. In this regard, Lucas (1976) argues that general equilibrium is a superior methodology, compared with macroeconometric models, because the latter lack microfoundations to model the effects of policy changes with equations that represent economic agents responding to economic changes, based on rational expectations of the future, which implies that their behavior might be different if economic policy is subject to adjustments. This is the so-called Lucas critique. He also points out that policy advice, based on conclusions derived from macroeconometric models, lacks reliability because their parameters are not structural. In consequence, results from these models can be misleading.

Devarajan and Robinson (2002) point out that it is important to distinguish between *stylized* and *applied* CGE models. On the one hand, stylized models attempt to put numbers to theory and seek to remain as close to the theoretical model as possible. They are not conceived to replicate a real-world scenario. On the other hand, applied models, have a larger and detailed sectoral and institutional structure as they try to provide a wider picture

of the economy. The same authors also argue that a useful CGE should have the following characteristics: 1) policy relevance; 2) transparency; 3) timelessness; 4) validation and estimation; and, 5) diversity of approaches. The CGE used in this dissertation adopts an applied *bottom-up* (that is, based on microfoundations) approach and seeks to provide useful outcomes for policy debate. The central topic that is explored is relevant within the economic and political context of Chiapas, Mexico.

Hence, the applied CGE is an adaptation of the IFPRI Standard CGE Model (Lofgren, H.; Lee Harris, R.; Robinson, S., 2002). It is composed of 48 blocks of equations, 44 blocks of variables, 395 single variables and equations, many of which are nonlinear. It assumes that the economic agents behave rationally, that is, producers and consumers seek to maximize profits and utility, respectively. The maximization process, in each case, is subject to constraints that have to be satisfied to achieve the optimal level. These constraints include factor and commodity markets, savings-investment and government accounts, and the current account of the balance of payments. Further, the following assumptions are made[50]:

1) Perfect factor mobility: there are three factors of production, formal and informal labor, and capital, which may move freely across economic sectors in response to changing wages and rents. Perfect mobility implies that there are no barriers for factors to move between sectors until factor market equilibrium is reached.

2) Imperfect transformability: this refers to the producer's technological flexibility to transform his/her production into exports or domestic sales. The producer's problem is to determine the ratio of exports and domestic sales for a given level of output that maximizes his/her revenue on the basis of a Constant Elasticity of Transformation (CET)[51] function.

3) Imperfect substitutability: this refers to the consumer's choice and substitution between imported and domestically produced varieties of commodities in response to relative price changes at any income level on the basis of a Constant Elasticity of

[50] Lofgren *et. al.* (2002) argues that these assumptions better reflect the real behavior of most economies.
[51] For further details on the Constant Elasticity of Transformation see (Powell & Gruen, 1968).

Substitution (CES) aggregation function (also referred to as the Armington function)[52], (Burfisher, 2011), (Lofgren et. al., 2002).

CGE models require *Macroclosures*. *Macroclosures* show the modeler's decision on which macroeconomic variables will adjust to reach and maintain equilibrium (Burfisher, 2011). In this respect, this study applies the default closures set by Lofgren *et al.* (2002). Hence, the following closures are used:

- **Factors market**:

There are two possible closures for the labor market and two for the capital market. In the labor market, labor can be set to be either mobile and fully employed or mobile and unemployed (sticky wages). On the other hand, in the capital market, capital can be to set to be either mobile and fully employed or activity-specific and fully employed. The selected closures are:

  - Capital is mobile and fully employed
  - Formal and informal Labor is mobile and fully employed

The latter may be appropriate in contexts where there is very low unemployment (Lofgren et. al., 2002). In Chiapas the unemployment rate is 2.4%, the lowest rate in Mexico.

- **Foreign exchange market**:

In this market there are two alternatives: flexible exchange rate or flexible foreign savings. The chosen closure is:

  - Flexible exchange rate

- **Current government balance**:

There are two alternatives. The current government balance can be set to work with flexible government savings and fixed direct taxes or fixed government savings and uniform direct tax rate point change for selected institutions. The selected closures are:

[52] For further details on the CES function and imperfect substitutability see (Armington, 1969).

- Fixed direct taxes
- Flexible government savings

- **Savings-Investment balance**:

This balance can be set as (a): savings are investment driven (the value of savings adjusts); or (b): investment is savings driven (in this case the value of investment adjusts). The selected closure is:

- Investment-driven. Fixed capital formation and the value of savings adjusts

- **Numéraire**:

The *numéraire* represents a point of reference against which changes in all other prices can be assessed (Burfisher, 2011). There are alternatives to set a *numéraire*, it can be the Consumer Price Index (CPI) or Producer Price Index (DPI) for domestically marketed output. The chosen alternative is:

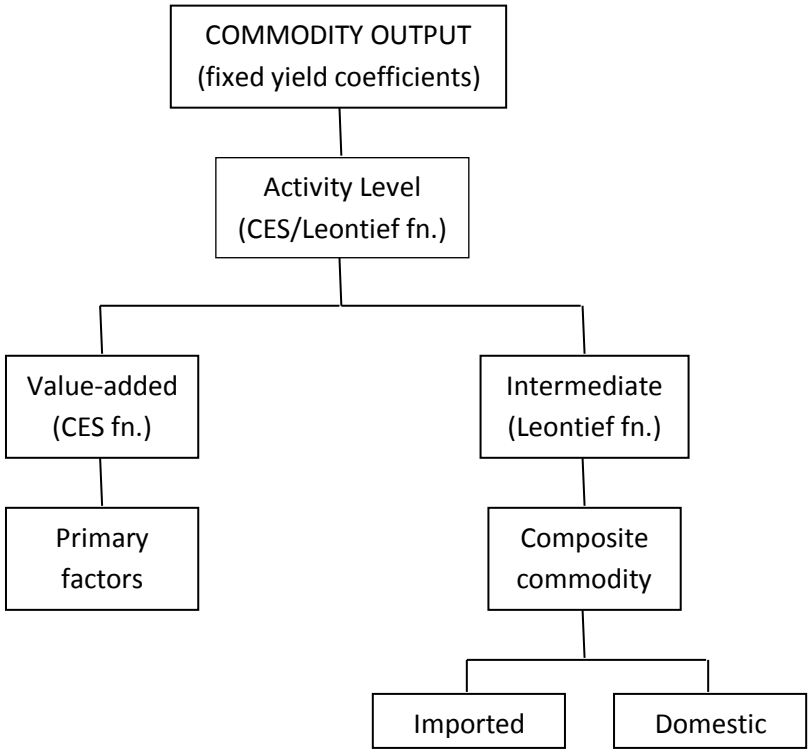
- Consumer Price Index (CPI) is the *numéraire* and it is fixed while DPI is flexible

Lastly, a closure has to be set for export and import prices. In this respect, the selected closure is:

- Import and export prices are fixed

Profit maximization is subject to a production technology which is illustrated in figure 5.1. On top, the production technology may be defined by either a Constant Elasticity of Substitution (CES) function or a Leontief function of value-added and intermediate inputs. In the CGE all activities have a Leontief function. Value-added, in turn, is estimated by a CES function of primary factors (formal and informal labor, and capital) while intermediate demand is specified by a Leontief function of composite commodity. The latter is composed of imported and domestic commodities.

FIGURE 5.1 PRODUCTION TECHNOLOGY



Source: Lofgren, H.; Lee Harris, R.; Robinson, S.; p. 9; 2002.

With respect to elasticities, the CGE assumes, on the one hand, that the Armington elasticity, that is, the elasticity of substitution between imports and domestic output in domestic demand, is set at 0.8. On the other hand, the Constant Elasticity of Transformation (CET), that is, the elasticity of transformation for domestic marketed output between exports and domestic supplies, is set at 1.6. Moreover, production elasticities are represented by the elasticity of substitution between factors of production (at the bottom of the technology nest), the elasticity of substitution between aggregated factors and intermediate demand (at the top of the technology nest), and the output aggregation elasticity for commodity *c*. Each one is set at 0.8, 0.6, and 6, respectively.

There are different functional forms to describe consumer preferences in a CGE model. In this regard, Burfisher (2011) points out that there are four functions widely use in standard CGE models: the Cobb-Douglas, *Stone-Geary*/Linear Expenditure System (LES), Constant Elasticity of Substitution (CES) utility functions, and the Constant Difference of Elasticities (CDE) demand system. In this study households maximize a *Stone-Geary* utility function subject to a consumption expenditure constraint. Hence, household consumption is defined

by a Linear Expenditure System, that is, spending on individual commodities is a linear function of total consumption spending. The LES allows specifying commodity-specific expenditure elasticities and household-specific Frisch parameters. The Frisch parameter for household LES demand measures, in turn, the elasticity of the marginal utility of income with respect to income (Lofgren, H.; Lee Harris, R.; Robinson, S., 2002). If it is set at -1, the LES system collapses to a Cobb-Douglas System. In the CGE it is set at -2. Further, one of the features of the CGE is that it is partially synthetic, that is, most parameters (such as share parameters) can be calibrated with the base year data from the 2012 Chiapas SAM. However, some have to be taken from the literature (as is the case for behavioral elasticities). Household consumption elasticities used in the CGE are shown in table 5.1.

TABLE 5.1 HOUSEHOLD CONSUMPTION ELASTICITIES

SECTOR	HOUSEHOLD QUINTILES				
	HHD1	HHD2	HHD3	HHD4	HHD5
AGRC	1.10	1.10	1.10	0.62	0.62
MING	1.20	1.20	1.20	1.35	1.35
UTIL	1.20	1.20	1.20	1.35	1.35
CNST	1.20	1.20	1.20	1.35	1.35
MANU	1.20	1.20	1.20	1.35	1.35
TRDE	1.20	1.20	1.20	1.35	1.35
OSER	0.76	0.80	0.80	0.76	0.76
EDUS	0.76	0.80	0.80	0.76	0.76
HEAS	0.76	0.80	0.80	0.76	0.76
PADM	0.76	0.80	0.80	0.76	0.76

Source: own elaboration.

The model also includes a set of taxes. Table 5.2 shows the tax accounts that are used in the CGE. This set includes subsidies on production which are treated as activity taxes. The value-added tax is treated as an activity tax. Labor taxes refer to social security contribution paid by economic activities. The value-added tax is net of subsidies while the sales and export taxes and import tariffs are gross. Two regional taxes are also included, a payroll tax ("nomina"), treated as a labor tax paid by economic activities on formal labor, and a "tenencia" tax, treated as an income tax paid by households for having a motor vehicle.

TABLE 5.2 SET OF TAXES IN THE CGE MODEL	
Code in CGE	Type of tax
T_LBTX	Labor tax (social security contribution)
T_CPTX	Activity taxes
T_VATX	Value-added tax
T_IMTX	Import tax
T_SLTX	Sales tax
T_EXTX	Export tax
T_INTX	Income tax
T_CITX	Corporate income tax
T_PYTX	Payroll tax (regional)
T_AMTX	"Tenencia" tax (regional)
T_SBPD	Subsidies on production
Source: own elaboration.	

Factor employment is defined by a satellite account of the SAM introduced into the CGE. Employment supply is specified to equal demand. Therefore, full employment is also assumed. However, it may be adjusted to allow unemployment. The economy-wide wage is specified as a free variable so that demand may equal supply. The model is set up in this way because the observed unemployment rate in Chiapas is low (2.4%). Lofgren, H.; Lee Harris, R.; and Robinson, S. (p. 9, 2002) point out that allowing for unemployment and fixed real wage may be convenient in a context with considerable unemployment.

The First-Order Conditions (FOC) for profits and utility maximization in the CGE model are the following:

- FOC for output aggregation function:

$$PXAC_{a\,c} = PX_c \cdot QX_c \left(\sum_{a \in A'} \delta_{a\,c}^{ac} \cdot QXAC_{a\,c}^{-\rho_c^{ac}} \right)^{-1} \cdot \delta_{a\,c}^{ac} \cdot QXAC_{a\,c}^{-\rho_c^{ac}-1}$$

$[marginal\ cost\ of\ commodity\ c\ from\ activity\ a] = [marginal\ revenue\ product\ of\ commodity\ c\ from\ activity\ a]$

Where,

$PXAC_{a\,c} =$ producer price of commodity c for activity a

$PX_c =$ aggregated producer price for commodity

$QX_c =$ aggregated marketed quantity of domestic output of commodity

$\delta_{a\,c}^{ac} =$ share parameter for domestic commodity aggregation function

$QXAC_{a\,c} =$ quantity of marketed output of commodity c from activity a

$\rho_c^{ac} =$ domestic commodity aggregation function exponent

- FOC for household consumption spending on marketed commodities:

$$PQ_c \cdot QH_{c\,h} = PQ_c \cdot \gamma^m_{c\,h} + \beta^m_{c\,h} \cdot \left(EH_h - \sum_{c' \in C} PQ_{c'} \cdot \gamma^m_{c'h} - \sum_{a \in A} \sum_{c' \in C} PXAC_{a\,c'} \cdot \gamma^h_{a\,c'h} \right)$$

$[household\ consumption\ spending\ in\ market\ commodity\ c]$

$= [total\ household\ consumption\ spending, market\ prices\ of\ c, and\ other\ commodity\ prices\ (market\ and\ home)]$

Where,

PQ_c = composite commodity price

$QH_{c\,h}$ = quantity consumed of commodity c by household h

PQ_c = composite commodity price

$\gamma^m_{c\,h}$ = subsistence consumption of marketed commodity c for household h

$\beta^m_{c\,h}$

= marginal share of consumption spending on home commodity c from activity a for household h

EH_h = consumption spending for household

$\gamma^h_{a\,c'h}$ = subsistence consumption of home commodity c from activity a for household h

- FOC for factor demand:

$$WF_f \cdot WFDIST_{f\,a} = PVA_a \cdot (1 - tva_a) \cdot QVA_a \cdot \left(\sum_{f \in F'} \delta^{va}_{f\,a} \cdot {QF_{f\,a}}^{-\rho^{va}_a} \right)^{-1} \cdot \delta^{va}_{f\,a} \cdot {QF_{f\,a}}^{-\rho^{va}_a - 1}$$

$[marginal\ cost\ of\ factor\ f\ in\ activity\ a] = [marginal\ revenue\ product\ of\ factor\ f\ in\ activity\ a]$

Where,

WF_f = average price of factor f

$WFDIST_{f\,a}$ = wage distortion factor for factor f in activity a

PVA_a = value − added price (factor income per unit of activity)

tva_a = rate of value − added tax for activity a

QVA_a = quantity of (aggregate) value − added

$\delta^{va}_{f\,a}$ = CES value − added function share parameter for factor f in activity a

$QF_{f\,a}$ = demaned quantity of factor f from activity a

ρ^{va}_a = CES value − added function exponent

On the other hand, this research also includes poverty assessment using the model's results. Poverty is measured by the Poverty Gap Index (PGI) and the Squared Poverty Gap Index (SPGI) as follows:

$$PGI = \frac{1}{N}\sum_{i=1}^{q}\frac{(z - y_i)}{z} \qquad SPGI = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^2$$

Where z represents the poverty line and y_i is total household income. The poverty gap is the difference between the income (or expenditure) of the poor and the poverty line. Hence, the PGI is the ratio of the poverty gap to the poverty line. In other words, it measures how far, on average, poor people are from the poverty line and it is considered a measure of the intensity of poverty. The SPGI, in turn, is a weighted PGI, it takes into account inequality among the poor and it is an indicator of the degree of poverty. A useful characteristic of both indicators is that they may be disaggregated by subgroups (Haughton & Khandker, 2009). In this research both indicators are calculated for the 40% poorest households. The poverty line used in the CGE is the average annual wellbeing line in 2012 reported by CONEVAL[53].

Two additional indicators are included in this study: (1) the growth elasticity of poverty reduction (Bourguignon, 2002); and (2) *time taken to exit poverty*. On the one hand, the growth elasticity of poverty reduction represents the percentage change in poverty with respect to a one-percentage change in (per capita) GDP (or mean household income or expenditure):

$$\varepsilon = \frac{\partial P}{\partial Y}\frac{Y}{P}$$

Where, *P* is the *PGI* (or any other *Foster-Greer-Thorbecke* poverty measure), and *Y* is (per capita) GDP.

On the other hand, the so-called indicator *time taken to exit* measures, on average, how many years it could eventually take for poor households to escape from poverty, *i.e.* reach the poverty line, given a base-value of household income and a poverty line, assuming that GDP per capita (or household income or expenditure) grows at a constant annual rate, *ceteris paribus*:

[53] It is set at $1,483.7 Mexican pesos which is the average monthly value. It is then scaled to fit the model. Data on the poverty line is available at: http://bit.ly/1lHUX4Y.

$$t_g^j = \frac{\ln(z) - \ln(y_j)}{g}$$

Where,

$\ln(z)$ = the natural logarithm of the poverty line

$\ln(y_j)$ = the natural logarithm of household income j

g = per capita GDP growth rate

This indicator can also be expressed as the Watt index divided by GDP per capita (another option is to use household income or expenditure) growth rate. It is decomposable by household sub-groups (World Bank, 2005).

All CGE model sets, parameters, variables and equations are presented in Appendix 1.

Finally, it is also important to highlight that most of the CGE-based research applied to the case of Mexico has been carried out at the macro-level with a single- or multi-region approach focused on fiscal reform, trade liberalization and NAFTA, agricultural policies and migration, financial crisis, and the Millennium Development Goals (MDGs), see Kehoe and Serra-Puche (1983), Robinson, Burfisher, Hinojosa-Ojeda and Thierfelder (1993), Kildegaard (1996), Kildegaard (2001), Harris (2001), Sobarzo (2008), Ortega and Székely (2008), and Sobarzo (2011). For an application at village/town-level, see Taylor, Yunez-Naude and Dyer (1999). Coady and Harris (2001) construct a CGE model with a "top-down"-approach using a national SAM which is then divided into five regions (North, Central, South-West, and South-East) to analyze the welfare impact of cash transfers. More recently, Debowicz and Golan (2013) analyze the expected direct and indirect effects of conditional cash transfers on children's allocation of time, and the expected effects on poverty and income distribution by applying an econometric-based microsimulation model combined with a macro CGE model with a top-down/bottom-up approach (further details on this work can be found in the literature review in chapter 2).

The applied CGE model in this study is different from previous works in that it is focused on a state-level analysis to assess the opportunity cost of financing conditional cash transfers for poverty reduction. It is the first CGE model for the regional economy of Chiapas, the poorest

state in Mexico, where *Oportunidades* covers every municipality. With a country-based approach, one can reach general conclusions which might not necessarily translate into realistic policy alternatives for poverty reduction, especially in lagging regions. This is particularly true in large and heterogeneous countries such as Mexico, a country characterized by its significant regional inequality. Therefore, a state-level analysis allows identifying local poverty traps and constraints for poverty reduction. Furthermore, the applied CGE for Chiapas allows evaluating productive activities according to the North American Industry Classification System (NAICS), formal and informal labor, and social transfers, which are split to have a single account for *Oportunidades*. The latter is very helpful to analyze the distribution of cash transfers among households, identify inconsistencies in the targeting method, and to evaluate how changes in conditional cash transfers can impact the wellbeing of beneficiary households.

6. Simulations and Results

In this chapter simulations and results are presented. Simulations are divided into single and cumulative scenarios. Fifteen single and four cumulative scenarios are modeled and results are compared with the base scenario. All of the simulations are aimed at answering the research question of this dissertation and are selected according to the ongoing debate in Mexico concerning economic growth, poverty reduction, tax reform, social security contributions, and conditional cash transfers. The comparative analysis is focused on percentage changes in Gross Domestic Product (GDP) and macroeconomic accounts, factor demand, household income and expenditure, factor income, Poverty Gap Index and Square Poverty Gap Index for the 20% poorest households to also assess pro-poor distributional changes in social transfers, pro-poor growth, informality, and the growth elasticity of poverty reduction.

The following notation is used in tables to present simulation results:

ABSORP	= Absorption		
PRVCON	= Private consumption		
FIXINV	= Fixed investment		
DSTOK	= Stock changes		
GOVCON	= Government consumption		
GDPMP	= Gross Domestic Product at market prices (expenditure approach)		
GDPMP2	= Gross Domestic Product at market prices (revenue approach)		
NETITAX	= Net indirect taxes		
GDPFC2	= Gross Domestic Product at factor cost		
REGTAX	= Regional tax revenue		
DIRTAX	= Direct taxes		
HHD1	= Household quintile 1	HHD2 =	Household quintile 2
HHD3	= Household quintile 3	HHD4 =	Household quintile 4
HHD5	= Household quintile 5		
SIM	= Simulation results		
%Δ	= denotes the percentage change in a variable between the base-value and the new-value after simulation		

6.1. Single Scenarios

Table 6.1 shows the single scenarios to be presented in the following sections. In total fifteen single scenarios are modelled. The themes of these scenarios are focused on *Oportunidades*; other social transfers such as Procampo, Pal-Sin Hambre, temporary employment program, universal pension, and the regional program known as "Amanecer"; fixed investment; government consumption expenditure; remittances, and taxes. Of these, this work specifically tackles value-added, labor and payroll, "tenencia", and corporate and household income taxes.

TABLE 6.1 SINGLE SCENARIOS

Theme	Description
OPORTUNIDADES	Elimination of type I and type II errors 50% increase in *Oportunidades* (with emphasis in education and food) for the 20% poorest & 100% cut for the 20% richest Entire elimination of *Oportunidades* Elimination of *Oportunidades* only for the 40% poorest
OTHER SOCIAL TRANSFERS	Pro-poor redistribution of other social transfers such as Procampo, PAL-Sin Hambre, temporary employment program, universal pension, & "Amanecer"
REMITTANCES	10% increase in remittances
FIXED INVESTMENT	20%, 10%, and 5% increase in fixed investment in the agriculture, construction, and manufacturing
GOVERNMENT CONSUMPTION	100%, 25%, & 20% increase in government consumption expenditure in agriculture, education, and health while cutting it in public administration by 10%
TAXES	Increase in value-added tax from 16% to 19% 100% cut in labor tax 100% cut in payroll tax 100% cut in "tenencia" tax 10% increase in corporate income tax 10% cut in income tax for quintile 2 10% increase in income tax for quintile 5

Source: Own elaboration.

The political debate in Mexico has been focused on the persisting problem of poverty across the country. In this regard, some voices have been raised within the political arena to question the viability and continuity of *Oportunidades*. In this context, this study explores four scenarios. Firstly, to begin with the analysis of *Oportunidades*, the first single simulation seeks to evaluate the effect of the elimination of type I and type II errors by redistributing conditional cash transfers from the richest to the poorest households. This implies that household quintile 5 has to be excluded from the program while household quintile 4

remains but gets a 10% cut in the amount received. In contrast, the 20% poorest households receive the amounts cut to quintiles 4 and 5, which represents a 36.8% increase in transfers. This new arrangement in the allocation of conditional cash transfers does not require any change in the budget of the program, *i.e.* it is budget-neutral as it is only a pro-poor redistribution of cash transfers.

Secondly, a simulation explores the impact of an increase in conditional cash transfers in the educational and food components allocated to household quintile 1 by 50% while eliminating them from the richest. In this respect, an increase in the amount allocated to the poorest is justified by research. As discussed in the literature review, a recent IFPRI study conducted by Debowicz and Golan (2013) shows that extending the program might enhance the positive effects associated with conditional cash transfers. Likewise, an increase in the amount of cash transferred to households might allow them to save a larger share, thus they could allocate more resources to invest in farm assets, for instance, or other entrepreneurial activities. The third single simulation is focused on the welfare effects of the entire elimination of *Oportunidades*, *ceteris paribus*, whereas the fourth simulation evaluates a counterfactual scenario in which *Oportunidades* is eliminated only for the 40% poorest, that is, household quintiles 1 and 2.

With respect to non-conditional transfers, one simulation is devoted to assess the welfare impact of pro-poor distributional changes in Procampo, universal pension, food program (PAL-Sin Hambre), temporary employment program (PET), “Amanecer”, in a budget-neutral fashion. In the case of Procampo, food program, PET, and “Amanecer” a redistribution from quintile 5 to quintile 1 is simulated because the nature and essence of these programs is to attend the poorest households.

To contribute to the debate on alternative strategies for poverty reduction in Mexico, three simulations are concentrated on, evaluating single policies, to find out the opportunity cost of financing *Oportunidades*. In this context, the central objective is to shed light on identifying the forgone investments that might lead to poverty reduction. For that matter, a single simulation on fixed investment and one on government consumption expenditure by economic activities are run taking into account the structure of the Chiapas’ economy. On

the one hand, fixed investment is simulated to grow by 20%, 10%, and 5% in agriculture, construction, and manufacturing, respectively. On the other hand, government consumption expenditure, is modeled to increase by 100%, 25%, and 20% in agriculture, educational and health services while cutting it by 10% in public administration.

The role of the value-added tax to finance social policy in Mexico has been in the debate for quite some time. Levy (2008 & 2012) suggests that increasing the value-added tax rate from 16% to 19% and making it flat, that is, eliminating exemptions and special regimes might provide significant additional tax revenue to be used to finance a universal social security system. Furthermore, he argues that the regressive impact on household consumption expenditure might be compensated with targeted interventions or transfers. Ahmad and Best (2012) evaluate, in turn, alternative tax structures and, specifically for the case of Mexico, the role and effect of the value-added and payroll taxes and corporate income tax (CIT) to finance social policy in the presence of informality. They find that the CIT and value-added tax may play a relevant role to increase tax revenue in an efficient manner. They also find that a uniform value-added tax maintains production efficiency. In the light of these debates, this study carries out a simulation of value-added tax to raise the current rate of 16% to 19% to examine the effect on tax revenue, GDP growth, household consumption expenditure, and poverty reduction. Moreover, changes in social security contributions, regional payroll tax, "tenencia" tax, and corporate and household income taxes are also explored.

Finally, as the American economy is recovering from recession, the International Monetary Fund (IMF) expects it to grow by 2.8% and 3% in 2014 and 2015[54]. As a result, remittances may be expected to increase as well. In this context, there is one single scenario simulating a 10%-increase in remittances. Given the strong ties between the American and Mexican economies, it is worth evaluating the welfare impact of such scenario on household income and poverty reduction at regional level.

To summarize, it is particularly relevant to analyze all these scenarios – which are at the core of the debate in Mexico – in the economic context of Chiapas because it is the poorest

[54] See the World Economic Outlook from April, 2014. It can be found out: http://bit.ly/1i0qOcU.

region and *Oportunidades* covers all of the 118 municipalities. By doing so, this study can (1) shed light on alternative strategies to enhance inclusive economic growth and rural development, and (2) contribute to formulate more effective policy recommendations for poverty reduction at regional level. This work is the first CGE-based study (using a social accounting matrix from 2012) for poverty reduction in Chiapas.

In what follows, single scenarios and simulation results are discussed.

6.1.1. *Oportunidades*

The first single scenario is about conditional cash transfers, well-known as *Oportunidades*. This study has pointed out that there is a misallocation of cash transfers. Households in quintile 4 and 5, that is, the 40% richest receive a share of *Oportunidades*. This misallocation may be attributed to the use of a different procedure for household selection to join the program in urban settings. Since 2002 *Oportunidades* expanded its coverage to include urban areas. However, a random household selection process was no longer implemented, as it was initially done in rural areas, giving rise to new challenges concerning targeting (Angelucci & Attanasio, 2009).

Four single simulations are carried out concerning the distribution of *Oportunidades* by household quintiles. The first scenario seeks to explore the welfare impact of the elimination of type I (exclusion) and type II (inclusion) errors, *ceteris paribus*, while keeping the program's budget constant. The exclusion error is estimated to be of 28.5% while the inclusion one is of 25%. It translates into the entire elimination of conditional cash transfers for quintile 5, a 10% cut for quintile 4, and, in contrast, a 36.84% increase for the poorest households while remaining constant for quintiles 2 and 3. It is important to highlight that this redistribution of transfers is budget neutral. The second simulation explores a 100% increase for quintile 1 and the entire elimination of the program for quintile 5. The third scenario evaluates the impact of the entire elimination of *Oportunidades* on household income, consumption, and poverty. The Fourth simulation analyzes a counterfactual case in which conditional cash transfers to household quintiles 1 and 2 are eliminated while keeping them unchanged for the rest. What if the targeting method of the program fails to allocate conditional cash transfers to the needy and only reaches the well-off?

a) Elimination of type I and type II errors

The first simulation concerning *Oportunidades* is focused on the welfare impact of eliminating type I and type II errors. The former refers to the excluded poor households from the program while the latter is about the included households that should not receive *Oportunidades* because they have an income above the poverty line. Table 6.2 shows the base and adjusted structure of conditional cash transfers after simulating a 36.84% increase for the 20% poorest households, a 10% cut and the entire elimination of *Oportunidades* for quintiles 4 and 5, respectively. This redistribution of transfers is budget neutral and has a pro-poor income effect, as will be shown below.

TABLE. 6.2 ELIMINATION OF TYPE I & TYPE II ERRORS (Billion pesos)

HOUSEHOLDS	*OPORTUNIDADES*		%Δ
	BASE	SIM	
HHD1	1.9	2.6	36.8
HHD2	1.6	1.6	
HHD3	1.1	1.1	
HHD4	0.7	0.6	-10
HHD5	0.6		-100
TOTAL	5.9	5.9	

Source: Own elaboration.

Moreover, the redistribution of *Oportunidades* has a positive impact on total household income of the poor. Table 6.3 shows that the total income of the 20% poorest households grows slightly by 7.2%, followed by that of quintiles 2 and 3 which increases by 0.2% and 0.1%. In contrast, there is a small contraction in total income for household quintiles 4 and 5, mainly caused by the reduction and elimination of conditional cash transfers, respectively. The overall effect is pro-poor since the poor obtain the greater benefit.

TABLE 6.3 HOUSEHOLD INCOME AFTER ELIMINATING TYPE I & TYPE II ERRORS (Billion pesos)

HOUSEHOLDS	TOTAL INCOME		%Δ
	BASE	SIM	
HHD1	10.6	11.3	7.2
HHD2	16.5	16.5	0.2
HHD3	24.9	24.9	0.1
HHD4	43.2	43.2	-0.1
HHD5	133.5	132.9	-0.4

Source: Own elaboration.

Table 6.4 shows the impact on GDP and macroeconomic accounts. GDP grows slightly by 0.2% boosted mainly by government consumption, fixed investment, and stock changes which rise by 0.6%, 0.3%, and 0.2%, respectively. Private consumption basically does not change, increased consumption of the 20% poorest household is neutralized by the fall in the consumption of quintiles 4 and 5. From the revenue approach, GDP at factor costs also grows slightly by 0.2%, it is mainly stimulated by the agricultural, educational- and health-services sectors which expand by 1.5%, 1.2%, and 1.3%, respectively.

TABLE 6.4 GDP AND MACROECONOMIC ACCOUNTS (Billion pesos)

	BASE	SIM	%Δ
ABSORP	306.4	306.8	0.1
PRVCON	190.8	190.7	0.0
FIXINV	56.9	57.1	0.3
DSTOCK	1.9	1.9	0.2
GOVCON	56.9	57.2	0.6
EXPORTS	62.2	62.1	-0.1
IMPORTS	-89.6	-89.5	-0.1
GDPMP	279	279.4	0.2
GDPMP2	279	279.4	0.2
NETITAX	7.1	7.1	0.0
GDPFC2	271.9	272.3	0.2
REGTAX	0.8	0.8	0.2
DIRTAX	14.3	14.3	-0.1

Source: Own elaboration.

This scenario has a positive impact on poverty reduction. Table 6.5 shows the Poverty Headcount, Income Gap Ratio (IGR), Poverty Gap Index (PGI), and the Squared Poverty Gap Index (SPGI) for the 20% poorest households. First, the Poverty Headcount ratio is of .75, that is, 75% of the population is poor. This indicator will remain constant in the rest of the analysis because this study provides a static assessment of poverty reduction. Second, the IGR declines from 0.41 to 0.37, this result will be reflected in the poverty gap. Third, the PGI drops 10.3%, from 0.31 to 0.28. Fourth, the SPGI for household quintile 1 falls about 19.5%, from 0.09 to 0.08. Based on these results, it is possible to point out that poverty falls because of the income effect derived from the pro-poor redistribution of *Oportunidades*.

TABLE 6.5 POVERY GAP INDEX			
INDICATOR	HHD1		
	BASE	SIM	%Δ
POVERTY HEADCOUNT	0.75		
INCOME GAP RATIO	0.41	0.37	
POVERTY GAP	0.31	0.28	-10.3%
SQUARED POVERTY GAP	0.09	0.08	-19.5%
Source: Own elaboration.			

In addition, the growth elasticity of poverty reduction is of -1.43. In other words, for every 1% increase in mean household income of the poorest, poverty drops on average by 1.43%.

b) Redistribution of *Oportunidades*

This scenario evaluates a redistribution of conditional cash transfers with the following structure: a 50% increase in the education and food components of the program for the 20% poorest households while keeping constant the elderly, child, and energy components, combined with the entire elimination of the program for quintile 5. This arrangement ensures a redistribution of income from the richest to the poorest household in a framework of general equilibrium. Table 6.6 shows the base values of *Oportunidades* and the simulation results by household quintiles. Such redistribution of the program translates into a 46% increase in conditional cash transfers received by the 20% poorest beneficiaries with stronger support on education (scholarships) and food, which are the two main components. This allocation of transfers might need a 3% budget increase to be covered by the federal government. It represents an additional amount of $0.2 billion Mexican pesos, an affordable amount given the size of the Mexican economy.

TABLE 6.6 REDISTRIBUTION OF *OPORTUNIDADES*			
HOUSEHOLDS	BASE	SIM	%Δ
HHD1	1.9	2.7	46
HHD2	1.6	1.6	
HHD3	1.1	1.1	
HHD4	0.7	0.7	
HHD5	0.6		-100
TOTAL	5.9	6.1	3%
Source: Own elaboration.			

Household income of the poor grows due to this rearrangement of *Oportunidades*. Table 6.7 shows the base and simulation results of total household income by quintiles. The redistribution of *Oportunidades* simulated in this section leads to higher income for the 20% poorest. In this respect, the total income of household quintile 1 grows by 9%, followed by that of quintiles 2 and 3 by 0.2% and 0.1%, respectively. In the case of quintile 3, income remains unchanged while that of the 20% richest households falls by 0.5%.

TABLE 6.7 HOUSEHOLD INCOME WITH A REDISTRIBUTION OF *OPORTUNIDADES* (Billion pesos)

HOUSEHOLDS	BASE	SIM	%Δ
HHD1	10.6	11.5	9.0
HHD2	16.5	16.5	0.2
HHD3	24.9	24.9	0.1
HHD4	43.2	43.2	0.0
HHD5	133.5	132.9	-0.5

Source: Own elaboration.

At the aggregate level there is a modest impact on GDP. Table 6.8 shows the base scenario and simulation results concerning GDP and macroeconomic accounts. GDP grows slightly by 0.2%, mainly boosted by government consumption, fixed investment, and stock changes which expand by 0.7%, 0.4%, and 0.2%, respectively. From the revenue approach, GDP at factor costs also improves by 0.2%, mainly driven by the agricultural, educational- and health-services sectors which increase by 1.8%, 1.5%, and 1.6%, apiece.

TABLE 6.8 GDP AND MACROECONOMIC ACCOUNTS WITH A REDISTRIBUTION OF *OPORTUNIDADES* (Billion pesos)

	BASE	SIM	%Δ
ABSORP	306.4	306.9	0.2
PRVCON	190.8	190.7	0.0
FIXINV	56.9	57.1	0.4
DSTOCK	1.9	1.9	0.2
GOVCON	56.9	57.3	0.7
EXPORTS	62.2	62.1	-0.1
IMPORTS	-89.6	-89.5	-0.1
GDPMP	279.0	279.5	0.2
GDPMP2	279.0	279.5	0.2
NETITAX	7.1	7.1	-0.1
GDPFC2	271.9	272.4	0.2
REGTAX	0.8	0.8	0.3
DIRTAX	14.3	14.3	0.0

Source: Own elaboration.

Furthermore, this redistribution of *Oportunidades* has a positive impact on poverty reduction through the income channel, as expected. In this regard, table 6.9 shows the base level and simulation results about the Income Gap Ratio (IGR), the Poverty Gap Index (PGI), and the Squared Poverty Gap Index (SPGI). The change in the IGR causes the PGI to fall. Hence, the PGI of the poorest households declines by 13% while the SPGI also falls by 24.1%. Moreover, the growth elasticity of poverty reduction is of -1.43. In other words, for every 1% increase in mean household income of the poorest, poverty drops on average by 1.43%.

TABLE 6.9 POVERTY WITH A REDISTRIBUTION OF *OPORTUNIDADES*

INDICATOR	HHD1		
	BASE	SIM	%Δ
POVERTY HEADCOUNT	0.75		
INCOME GAP RATIO	0.41	0.36	
POVERTY GAP	0.31	0.27	-12.9%
SQUARED POVERTY GAP	0.09	0.07	-24.1%

Source: Own elaboration.

c) Entire elimination of *Oportunidades*

The third simulation related to *Oportunidades* is about the entire elimination of the program, *ceteris paribus*. Table 6.10 shows the impact of such scenario on household income and consumption expenditure. On the one hand, as it might be expected, the elimination of conditional cash transfers has a significant negative impact on the total income of 80% of households. The total income of the 20% poorest households falls by 19.6%, followed by that of quintiles 2, 3, and 4 which declines by 10.6%, 4.2%, and 0.8%, respectively. In contrast, there is only one exception, the income of the 20% richest households, which grows about 1%. The latter can be explained by analyzing the main determinants of total household income. Total household income depends on factor income, transfers from enterprises to households, social transfers, and remittances (transfers from the rest of the world). In the case of quintile 5 its total income grows due to an increase in transfers received from enterprises, which rise by 3.7%. It is also important to highlight that social transfers represent the main component of total household income of the poor. As income grows households are less dependent on social transfers. Moreover, within all social transfers the largest share corresponds to *Oportunidades*. As a result, a cut or elimination of conditional cash transfers translates into a fall of total income of the poor.

TABLE 6.10 HOUSEHOLD INCOME & CONSUMPTION EXPENDITURE WITH THE ELIMINATION OF *OPORTUNIDADES*
(Billion pesos)

HOUSEHOLD	INCOME			EXPENDITURE		
	BASE	SIM	%Δ	BASE	SIM	%Δ
HHD1	10.6	8.5	-19.6	10.6	8.7	-17.9
HHD2	16.5	14.8	-10.6	16.3	14.9	-8.7
HHD3	24.9	23.8	-4.2	23.1	22.6	-2.1
HHD4	43.2	42.9	-0.8	37.7	38.2	1.5
HHD5	133.5	134.5	0.8	103.1	106.6	3.4

Source: Own elaboration.

On the other hand, results also show that the elimination of *Oportunidades* might have a negative impact on household consumption expenditure. As in the case of income, the largest impact takes place in the consumption expenditure of the poorest, which drops noticeably by 18%. There is also a decline in the consumption spending of quintiles 2 and 3 where the elimination of conditional cash transfers cause it to fall by 8.7% and 2.1%, respectively. Moreover, the results show also that the 20% poorest households and those in quintile 2 spend more than their income, which implies that they borrow to consume. In contrast, consumption expenditure increases in quintiles 4 and 5 by 1.5% and 3.4%. As expected, it can also be pointed out that consumption spending as a share of income declines as household income grows.

With respect to the impact on GDP and macroeconomic accounts, table 6.11 displays the simulation results. GDP at market prices fall by 0.5%, mainly hauled by a decline of 1% and 0.4% in fixed investment and stock changes. At the aggregate level, private consumption grows slightly by 0.1% due to increased consumption spending of the 40% richest households. In other words, the higher consumption spending of the rich outweighs the contraction suffered by that of the poor driven by the elimination of *Oportunidades*. GDP at factor costs declines by 0.6% as well. It is mainly hauled by a fall in the agricultural, health- and educational services which drop by 5%, 4.6%, and 4.3%, respectively. The latter is driven by a fall in the variable economy-wide wage for formal and informal labor by 1.3% and 2.7%, apiece. Further, it is important to highlight that the elimination of conditional cash transfers causes a savings-investment imbalance within the framework of the general equilibrium. However, it is pertinent to show the welfare effect of such a policy measure.

TABLE 6.11 GDP & MACROECONOMIC ACCOUNTS WITH THE ELIMINATION OF *OPORTUNIDADES* (Billion pesos)

	BASE	SIM	%Δ
ABSORP	306.4	304.9	-0.5
PRVCON	190.8	191.0	0.1
FIXINV	56.9	56.3	-1.0
DSTOCK	1.9	1.9	-0.4
GOVCON	56.9	55.7	-2.0
EXPORTS	62.2	62.4	0.4
IMPORTS	-89.6	-89.8	0.3
GDPMP	279.0	277.5	-0.5
GDPMP2	279.0	277.5	-0.5
NETITAX	7.1	7.1	-0.3
GDPFC2	271.9	270.4	-0.6
REGTAX	0.8	0.8	-1.0
DIRTAX	14.3	14.3	-0.4

Source: Own elaboration.

As a result of the elimination of *Oportunidades,* poverty rises. Table 6.12 shows the Income Gap Ratio (IGR), the Poverty Gap Index (PGI), and the Squared Poverty Gap Index (SPGI). On the one hand, the IGR increases from 0.41 to 0.53. The latter translates into an increase in the PGI by 28% while the SPGI also deteriorates by 63.8%.

TABLE 6.12 POVERTY WITH THE ELIMINATION OF *OPORTUNIDADES*

INDICATOR	HHD1		
	BASE	SIM	%Δ
POVERTY HEADCOUNT	0.75		
INCOME GAP RATIO	0.41	0.53	
POVERTY GAP	0.31	0.39	28.0%
SQUARED POVERTY GAP	0.09	0.16	63.8%

Source: Own elaboration.

d) Elimination of *Oportunidades* for the 40% poorest

The last single simulation about conditional cash transfers explores a case in which *Oportunidades* is entirely eliminated for the 40% poorest households, *ceteris paribus*. This experiment analyses a counterfactual scenario where there is a targeting failure (a total misallocation of transfers) of the program to reach the needy. The main objective is to evaluate the welfare effect of imperfect targeting on total household income and poverty reduction. Table 6.13 displays both the base and new simulated structure of *Oportunidades*.

An elimination of conditional cash transfers for quintiles 1 and 2 causes the program's budget to fall from $5.9 to $2.4 billion Mexican pesos.

TABLE 6.13 ELIMINATION OF OPORTUNIDADES FOR THE 40% POOREST HOUSEHOLDS (Billion pesos)

HOUSEHOLDS	BASE	SIM	%Δ
HHD1	1.9		-100
HHD2	1.6		-100
HHD3	1.1	1.1	
HHD4	0.7	0.7	
HHD5	0.6	0.6	
TOTAL	5.9	2.4	

Source: Own elaboration.

Since *Oportunidades* is the main source of income of the 20% poorest households, this scenario has a significant negative impact on their total income, consumption expenditure, causing poverty to increase. Table 6.14 shows base levels and simulation results concerning household income and spending. On the one hand, the total income of quintiles 1 and 2 drops considerably by 19.6% and 10.8%, respectively. In contrast, in the rest of households total income grows slightly. On the other hand, as a result of the income contraction, consumption expenditure in the same subset of households also falls notably by 18.5% and 9.5%, apiece. As it can be observed these households spend more than their income, which implies that they borrow to consume. In the case of the rest quintiles, consumption spending expands.

TABLE 6.14 HOUSEHOLD INCOME & CONSUMPTION EXPENDITURE WITH THE ELIMINATION OF *OPORTUNIDADES* FOR THE 40% POOREST (Billion pesos)

HOUSEHOLDS	INCOME			EXPENDITURE		
	BASE	SIM	%Δ	BASE	SIM	%Δ
HHD1	10.6	8.5	-19.6	10.6	8.6	-18.5
HHD2	16.5	14.7	-10.8	16.3	14.8	-9.5
HHD3	24.9	24.9	0.1	23.1	23.5	1.6
HHD4	43.2	43.4	0.4	37.7	38.4	2.1
HHD5	133.5	134.5	0.7	103.1	105.7	2.5

Source: Own elaboration.

This scenario has also an impact on GDP and macroeconomic accounts. Table 6.15 shows that GDP at market prices declines by 0.5%, mainly driven by a contraction in government consumption, fixed investment, and stock changes which deteriorate by 2%, 1.1%, and 0.6%, respectively. The contraction in government consumption takes place because its revenue falls due to the fact that tax revenue declines as well. In this respect, the tax collection from direct and indirect taxes drops by 0.1% while revenue from local taxes (payroll and "tenencia") does so too, by 1%. Fixed investment, in turn, declines because domestic private savings fall, both household and enterprise savings. In fact, the 40% poorest households even have to borrow for consumption. In contrast, private consumption barely grows by 0.1%. The latter is explained by the fact that household consumption expenditure in quintiles 4 and 5 rises. Such increase offsets the lower spending of quintiles 1 and 2. Furthermore, GDP at factor costs also decreases by 0.5%. It is mainly driven by a contraction in the agricultural, health- and educational-service sectors: by 5%, 4.5%, and 4.2%, respectively. The latter reflects that the economy-wide wage variable for formal and informal labor drops by 1.3% and 2.7%, apiece. In the end it is important to point out that, as in the previous simulation, with this scenario there is a savings-investment imbalance within the framework of a general equilibrium. Nonetheless, it is relevant to explore the welfare effect of imperfect targeting of *Oportunidades*.

TABLE 6.15 GDP & MACROECONOMIC ACCOUNTS WITH THE ELIMINATION OF *OPORTUNIDADES* FOR THE 40% POOREST HOUSEHOLDS
(Billion pesos)

	BASE	SIM	%Δ
ABSORP	306.4	304.9	-0.5
PRVCON	190.8	191.0	0.1
FIXINV	56.9	56.3	-1.1
DSTOCK	1.9	1.8	-0.6
GOVCON	56.9	55.7	-2.0
EXPORTS	62.2	62.4	0.4
IMPORTS	-89.6	-89.8	0.3
GDPMP	279.0	277.5	-0.5
GDPMP2	279.0	277.5	-0.5
NETITAX	7.1	7.1	-0.1
GDPFC2	271.9	270.4	-0.5
REGTAX	0.8	0.8	-0.9
DIRTAX	14.3	14.3	-0.1

Source: Own elaboration.

As is shown above, this scenario has a negative impact on total household income of the poor. In this regard, table 6.16 shows the poverty headcount, the Income Gap Ratio (the gap with respect to the poverty line), the Income Gap with respect to median household income, the Poverty Gap Index (PGI), and the Squared PGI (SPGI). On the one hand, the income gap between the total income of the 20% poorest families and the poverty line grows from 0.41 to 0.53 while the gap between the income of the same subset of households and the median income of households in Chiapas widens from 0.57 to 0.66, as well, which represents an increase of 15%. On the other hand, as result of the wider gap with respect to the poverty line, the PGI grows 28% while the SPGI does so as well by 64%. In other words, poverty increases. It is an expected result since the poor depend substantially on conditional cash transfers.

TABLE 6.16 POVERY GAP INDEX WITH THE ELIMINATION OF *OPORTUNIDADES* FOR THE 40% POOREST HOUSEHOLDS

INDICATOR	HHD1		
	BASE	SIM	%Δ
POVERTY HEADCOUNT	0.75		
INCOME GAP RATIO	0.41	0.53	
INCOME GAP W/MEDIAN INCOME	0.57	0.66	14.7%
POVERTY GAP	0.31	0.39	28.0%
SQUARED POVERTY GAP	0.09	0.16	63.9%

Source: Own elaboration.

6.1.2. Other Social Transfers

Besides *Oportunidades*, households also receive other social transfers from Procampo, universal pension, food program (PAL-Sin Hambre), temporary employment program (PET), and "Amanecer" (a program for poverty reduction operated at the regional level). The objective of this section is to model a pro-poor redistribution of these transfers. In the case of Procampo, transfers received by the 20% richest households are redistributed between the 40% poorest families, quintiles 1 and 2. For that matter, 70% is allocated to quintile 1 and 30% to quintile 2. It is done this way to have a progressive distribution of the program. The argument to carry out such rearrangement of Procampo is that the 20% richest households/farmers, due to their income level, can have access to credit in the banking sector or financial markets, therefore, they do not need to receive benefits from social programs aimed at supporting the poorest farmers.

Moreover, the universal pension is simulated to increase by 5% for all households. It is in line with what the government plans to do so that the universal pension can reach a monthly value of $1,092 Mexican pesos in the next fifteen years. With respect to the food program, known as PAL-Sin Hambre, it is also modeled to redistribute transfers from the rich to the poor. Hence, the food program is entirely eliminated for quintiles 4 and 5 whereas their transfers are allocated to quintiles 1 and 2. The amount initially allocated to quintiles 4 and 5 is of $0.70 billion Mexican pesos of which 70% is allocated to quintile 1 and 30% to quintile 2. In this way a progressive distribution of the program is achieved, that is, transfers decrease as household income grows. Furthermore, in the temporary employment program a similar exercise is carried out. In this case the total amount of transfers initially allocated to quintiles 4 and 5 is of $0.02 billion Mexican pesos of which 50% is redistributed to quintile 1 and the rest to quintile 2. Finally, the "Amanecer" program is modeled to eliminate it for the 40% richest households whereas their transfers are redistributed to quintiles 1 and 2 by 70% and 30%, respectively. The argument behind this simulation is that it is a regional program for poverty reduction, consequently, the richest families ought not to obtain benefits from a program whose goal is to help the poor escape from poverty. It is important to highlight that the pro-poor redistribution of all these social transfers are budget-neutral, that is, their budget is constant. The main objective is to assess the potential positive impact on household income of improved targeting of the financial resources for poverty reduction.

Table 6.17 shows the base and new structure of the allocation of social transfers. The proposed pro-poor redistribution of Procampo translates into an 81.4% and 53% increase in the transfers received by household quintiles 1 and 2, respectively, while remaining constant for quintiles 3 and 4. The universal pension rises by 5% for all households, which implies on average a 3% increase in the budget of the program. The rearrangement of PAL Sin-Hambre causes transfers to quintiles 1 and 2 to grow by 44.5% and 30% whereas transfers to quintile 3 remain unchanged. The benefits received by quintile 1 and 2 from the temporary employment program, PET, grow by 20% and 50% and keep constant for quintile 3. Finally, the pro-poor redistribution of "Amanecer" translates into a 42% and 22.5% increase in the transfers for quintiles, 1 and 2, the 40% poorest households.

TABLE 6.17 REDISTRIBUTION OF OTHER SOCIAL TRANSFERS
(Billion pesos)

HOUSEHOLDS	PROCAMPO			UNIVERSAL PENSION			FOOD PROGRAM (PAL-SIN HAMBRE)		
	BASE	SIM	%Δ	BASE	SIM	%Δ	BASE	SIM	%Δ
HHD1	0.30	0.50	81.4	0.48	0.50	5.0	1.10	1.60	44.5
HHD2	0.20	0.30	53.0	0.42	0.40	5.0	0.70	0.90	30.0
HHD3	0.10	0.10		0.19	0.20	5.0	0.50	0.50	
HHD4	0.10	0.10		0.18	0.20	5.0	0.50		-100.0
HHD5	0.30		-100.0	0.09	0.10	5.0	0.20		-100.0
TOTAL	1.00	1.00		1.36	1.40		3.00	3.00	

HOUSEHOLDS	EMPLOYMENT PROGRAM (PET)			"AMANECER"		
	BASE	SIM	%Δ	BASE	SIM	%Δ
HHD1	0.05	0.06	20.0	0.50	0.70	42.0
HHD2	0.02	0.03	50.0	0.40	0.50	22.5
HHD3	0.03	0.03		0.30	0.30	
HHD4	0.01		-100.0	0.20		-100.0
HHD5	0.01		-100.0	0.10		-100.0
TOTAL	0.12	0.12		1.50	1.50	

Source: Own elaboration.

This pro-poor redistribution of social transfers has a positive impact on total household income and consumption expenditure. Table 6.18 shows base values and simulation results on both variables. On the one hand, total income increases by 9.7%, 3%, and 0.2% in quintiles 1 (the 20% poorest households), 2, and 3, respectively, while it decreases by 2% and 0.5% in quintiles 4 and 5. Thus, the largest benefit is received by the very poor, as one would expect to see from a social program aimed at reducing poverty. On the other hand, consumption expenditure grows but less than proportionally compared to the increase in income. It expands by 9.4% for the 20% poorest households, followed by 2.7% for quintile 2. However, as expected because of the contraction in income, it drops by 2% and 1% in quintiles 4 and 5. Another positive implication of the expansion of income is that it enables the poor to save a share of income. As it will be shown below, higher domestic private savings stimulate economic growth and lead to a decrease in poverty.

TABLE 6.18 HOUSEHOLD INCOME & CONSUMPTION EXPENDITURE WITH A REDISTRIBUTION OF OTHER SOCIAL TRANSFERS
(Billion pesos)

HOUSEHOLDS	INCOME			EXPENDITURE		
	BASE	SIM	%Δ	BASE	SIM	%Δ
HHD1	10.6	11.6	9.7	10.6	11.6	9.4
HHD2	16.5	17	2.9	16.3	16.8	2.7
HHD3	24.9	24.9	0.2	23.1	23.1	0.0
HHD4	43.2	42.5	-1.6	37.7	36.9	-1.9
HHD5	133.5	132.9	-0.5	103.1	102.3	-0.8

Source: Own elaboration.

With this scenario there is a modest expansion of GDP. Table 6.19 shows that GDP at market prices grows slightly by 0.2%, mainly driven by higher government consumption and fixed investment as both components of GDP increase by 1% and 0.5%, respectively. From the revenue approach, GDP at factor costs also expands by 0.3%. It is stimulated by the agricultural, health-, and educational-service sectors which grow by 2.3%, 2.1%, and 1.9%, respectively. The growth in those economic sectors, in turn, is induced by rising economy-wide wages for formal and informal labor. Overall, both rise by 1% and 1.3%.

TABLE 6.19 GDP & MACROECONOMIC ACCOUNTS WITH A REDISTRIBUTION OF OTHER SOCIAL TRANSFERS (Billion pesos)

	BASE	SIM	%Δ
ABSORP	306.4	307.1	0.2
PRVCON	190.8	190.6	-0.1
FIXINV	56.9	57.2	0.5
DSTOCK	1.9	1.9	0.3
GOVCON	56.9	57.4	0.9
EXPORTS	62.2	62.1	-0.1
IMPORTS	-89.6	-89.5	-0.1
GDPMP	279.0	279.7	0.2
GDPMP2	279.0	279.7	0.2
NETITAX	7.1	7.1	0.0
GDPFC2	271.9	272.6	0.3
REGTAX	0.8	0.8	0.3
DIRTAX	14.3	14.3	-0.2

Source: Own elaboration.

Moreover, there is also a positive effect of the pro-poor redistribution of social transfers concerning the demanded quantity of formal and informal labor. Table 6.20 shows the base level and percentage changes in the demand of factor labor. The demanded quantity of formal labor increases mainly in the agricultural, heath- and educational-service, and construction sectors by 2%, 1.3%, 1.1%, and 0.4%, respectively. On the other hand, informal labor declines in all sectors, with exception of the agricultural, health- and educational-service sectors where it grows by 1%. Nonetheless, such increment is lower than that of formal labor.

TABLE 6.20 DEMANDED QUANTITY OF FACTOR LABOR (Thousands of people)

SECTOR	FORMAL LABOR		INFORMAL LABOR	
	BASE	%Δ	BASE	%Δ
AGRC	37	2	760	1
MING	3	-1	2	-1
UTIL	2	-2	2	-2
CNST	16	0	96	0
MANU	26	-1	87	-2
TRDE	94	-1	185	-2
OSER	72	-1	264	-1
EDUS	72	1	19	1
HEAS	41	1	11	1
PADM	61	0	27	0

Source: Own elaboration.

As shown above, this scenario has a positive impact on household income and consumption expenditure of the poor. In fact, this redistribution of social transfers is pro-poor as it induces the income of the 20% poorest to grow on average more than that of the rest of the households. In this context, poverty declines. Table 6.21 shows the Income Gap Ratio (IGR) with respect to the poverty line, the Income Gap Ratio with respect to median household income, the Poverty Gap Index (PGI), and the Squared PGI. First, the IGR, with respect to the poverty line, declines by 16%, from 0.41 to 0.36, whereas the income gap, with respect to median household income, falls by 7%. Second, the PGI drops by 14% while the SPGI does so as well, by 26%. In other words, the PGI can also be interpreted as a measure of the minimum amount of resources necessary to bring the poor to the poverty line and, thus, eradicate poverty. Finally, the growth elasticity of poverty reduction is of -1.43. It means that for every 1% increase in mean household income of the poorest, poverty falls on average by 1.43%.

TABLE 6.21 POVERTY WITH A REDISTRIBUTION OF OTHER SOCIAL TRANSFERS

INDICATOR	HHD1		
	BASE	SIM	%Δ
POVERTY HEADCOUNT	0.75		
INCOME GAP RATIO	0.41	0.36	
INCOME GAP W/MEADIAN INCOME	0.57	0.53	-7.0%
POVERTY GAP	0.31	0.27	-13.8%
SQUARED POVERTY GAP	0.09	0.07	-25.7%

Source: Own elaboration.

6.1.3. Remittances

The World Economic Outlook (IMF[55], 2014) projects the US economy to grow by 2.8% in 2014 and 3% in 2015. Because of the economic ties of Mexico with the American economy and the number of Mexican migrants residing there, the economic recovery in the USA might lead to an increase in the amount of remittances sent to Mexico. Consequently, this section seeks to explore the likely impact of increased remittances on household income, consumption expenditure, and poverty reduction. Table 6.22 shows base values of remittances, household income, and consumption expenditure. Remittances are assumed to increase by 10%. Over the course of the last years remittances tended to grow between 8% and 10%, with the exception of 2009 when they fell by 20% because of the economic recession in the USA. That is why the growth rate of 10% is used. Hence, as a result of increased remittances, total household income increases slightly by 1% in quintiles 1, 2, and 3, whereas they also grow but at a lower rate in quintiles 4 and 5: by 0.4 and 0.2%. The latter is translated into higher consumption expenditure in all households but slightly higher in the poorest.

TABLE 6.22 REMITTANCES, HOUSEHOLD INCOME & CONSUMPTION EXPENDITURE WITH INCREASED REMITTANCES
(Billion pesos)

HOUSEHOLDS	REMITTANCES		INCOME			EXPENDITURE		
	BASE	SIM	BASE	SIM	%Δ	BASE	SIM	%Δ
HHD1	0.8	0.9	10.6	10.7	0.7	10.6	10.6	0.7
HHD2	1.4	1.5	16.5	16.6	0.8	16.3	16.5	0.8
HHD3	1.9	2.1	24.9	25.1	0.8	23.1	23.3	0.8
HHD4	1.7	1.8	43.2	43.4	0.4	37.7	37.8	0.5
HHD5	1.8	2.0	133.5	133.8	0.2	103.1	103.3	0.2
TOTAL	7.6	8.3	228.7	229.6		190.76	191.56	

Source: Own elaboration.

In consequence, poverty measured by the Poverty Gap Index (PGI) and the Squared PGI, drops slightly. Table 6.23 shows that the Income Gap Ratio with respect to the poverty line declines by 1%, from 0.412 to 0.408, whereas the Income Gap Ratio with respect to the median household income does so as well by 0.1%. Furthermore, the PGI falls by 1% while the SPGI drops by 2%. As expected, an increase in remittances improves slightly the wellbeing through the income and consumption channels.

[55] The WEO April, 2014 can be found out: http://bit.ly/1i0qOcU.

TABLE 6.23 POVERTY WITH INCREASED REMITTANCES

INDICATOR	HHD1		
	BASE	SIM	%Δ
POVERTY HEADCOUNT	0.75		
INCOME GAP RATIO	0.412	0.408	
INCOME GAP W/MEDIAN INCOME	0.574	0.574	-0.1%
POVERTY GAP	0.308	0.305	-1.0%
SQUARED POVERTY GAP	0.095	0.093	-2.0%

Source: Own elaboration.

6.1.4. Fixed Investment

This experiment is focused on the quantity of fixed investment demand. It is modeled to expand by 20%, 10%, and 5% in the agricultural, construction, and manufacturing sectors, respectively, *ceteris paribus*. Investment demand refers to expenditure on capital goods (e.g. machinery, equipment, and buildings). It mostly reflects the investment expenditure made by firms but a share of total investment also comes from the government through fiscal policy (e.g. infrastructure such as roads, bridges, hospitals, schools, housing, buildings, machinery, equipment, etc.). In this case, the Savings-Investment closure is set as investment-driven, *i.e.* the base-year saving rates of domestic non-government institutions adjust to reach equilibrium[56]. Lofgren *et. al.* (2002) point out that within this CGE framework it is assumed that the government makes the necessary arrangements and implements policies (e.g. monetary policy to lower interest rates and stimulate investment) to generate the required (private) savings to finance fixed investment. Moreover, as the Chiapas economy is still predominantly rural, public investment shall pay a key role for the provision of public goods and services with the aim of improving the minimum required infrastructure to (1) stimulate further private investment and to (2) improve the wellbeing of the population by grating households' access to basic services.

Fixed investment in the agricultural sector, for instance, refers to the acquisition of capital goods such as tractors and machinery for on-farm activity, irrigation systems, and fertilizers, while in the construction sector, fixed investment translates into infrastructure and public works aimed at providing public goods and services at the municipal level in Chiapas. In the

[56] It is also possible to set a neoclassical closure so that investment is savings-driven.

case of manufacturing, fixed investment can take the form of capital goods to shift from light industry to more capital intensive industry. Nowadays the manufacturing sector is mostly integrated by labor-intensive production units.

By increasing it by 20%, 10%, and 5% in the agricultural, construction, and manufacturing sectors, total fixed investment grows on average by 8.3%, from a base-value of $53.5 to $57.9 billion Mexican pesos. Table 6.24 displays the suggested structure. Despite the proposed changes, the level of fixed investment in the agricultural sector remains very low. It accounts for 0.1% as a share of GDP. The fact that fixed investment is very low in the agricultural sector has important implications in the economic growth and development of Chiapas. In contrast, fixed investment is larger in construction and manufacturing. In these sectors it accounts for 15.3% and 4% as a share of GDP.

TABLE 6.24 FIXED INVESTMENT BY ECONOMIC ACTIVITY (Billion pesos)

SECTOR	BASE	SIM	%Δ	As a share of GDP	
				BASE	SIM
AGRC	0.2	0.3	20	0.08%	0.10%
MING	3.0	3.0		1.1%	
CNST	38.9	42.8	10	14.0%	15.3%
MANU	10.5	11.0	5	3.8%	4.0%
OSER	0.8	0.8		0.3%	
TOTAL	53.5	57.9	8.3		

Source: Own elaboration.

Simulation results show that the CGE model is very sensitive to changes in the quantity of fixed investment demand. The adjustment in fixed investment induces significant changes in GDP and macroeconomic accounts. Table 6.25 shows that GDP grows significantly by 10%, mainly driven by fixed investment and government consumption which increase by 53.5% and 3.7%, respectively. From the revenue approach, net indirect taxes also grow notably by 15.6% while direct taxes and the regional tax revenue based on the payroll and “tenencia” taxes do so as well by 5.6% and 3.5%, apiece. Moreover, GDP at factor costs expands by 9.7%. It is mainly boosted by construction, agricultural, public administration, and health-service sectors which rise by 103%, 3.7%, 2.3%, and 1.8%, respectively. In this respect, the

growth in these sectors takes place due to an increase in economy-wide wages for formal and informal labor by 3.4% and 6.6%, respectively.

TABLE 6.25 GDP & MACROECONOMIC ACCOUNTS WITH INCREASED FIXED INVESTMENT
(Billion pesos)

	BASE	SIM	%Δ
ABSORP	306.4	333.9	9.0
PRVCON	190.8	185.7	-2.6
FIXINV	56.9	87.4	53.5
DSTOCK	1.9	1.9	1.3
GOVCON	56.9	58.9	3.7
EXPORTS	62.2	61.5	-1.1
IMPORTS	-89.6	-88.9	-0.7
GDPMP	279.0	306.5	9.9
GDPMP2	279.0	306.5	9.9
NETITAX	7.1	8.2	15.6
GDPFC2	271.9	298.3	9.7
REGTAX	0.8	0.8	3.5
DIRTAX	14.3	15.1	5.6

Source: Own elaboration.

Moreover, the demanded quantity of formal and informal labor by economic activities changes as well. Table 6.26 shows that, on the one hand, demand of formal labor declines in all sectors, with the exception of construction and public administration. In the first case it grows significantly by 74.5% while in the second case it does so slightly by 0.3%. The agricultural and health-service sectors bear the lower contraction while the largest one takes place in utilities and trade. On the other hand, demand of informal labor also decreases in all sectors with the only exception of construction where it grows exceptionally by 70.3%. Public administration, health-service, and agricultural sectors suffer the lower contraction while the largest occurs in utilities, other-service, and manufacturing.

TABLE 6.26 DEMANDED QUANTITY OF FACTOR LABOR UNDER INCREASED FIXED INVESTMENT
(Thousands of people)

SECTOR	FORMAL			INFORMAL		
	BASE	SIM	%Δ	BASE	SIM	%Δ
AGRC	37	36.5	-1.4	760	731.4	-3.8
MING	3	2.9	-3.1	2	1.9	-5.4
UTIL	2	1.8	-8.1	2	1.8	-10.4
CNST	16	27.9	74.5	96	163.5	70.3
MANU	26	25.0	-3.8	87	81.7	-6.1
TRDE	94	88.7	-5.6	185	170.3	-7.9
OSER	72	69.1	-4.0	264	247.2	-6.3
EDUS	72	70.4	-2.2	19	18.1	-4.6
HEAS	41	40.4	-1.4	11	10.6	-3.8
PADM	61	61.2	0.3	27	26.4	-2.1

Source: Own elaboration.

With respect to household income, table 6.27 shows the base-value and simulation results on the impact of increased fixed investment. The 20%, 10%, and 5% increase in fixed investment in agriculture, construction, and manufacturing has a positive impact in all household quintiles. The income of the 20% poorest grows by 2.3% while that of the richest, by 4%. Further, income of quintiles, 2, 3, and 4 also expands by 2.8%, 3.1%, and 3.2%, respectively. Although in overall all incomes grow, those of the richest do so much more than those of the rest. The rise in household income is mainly driven by factor income and transfers from enterprises (in the form of profit distribution). In the first case, factor income grows by 3.4%, 7.8%, and 11.2% in formal and informal labor, and capital, respectively. In the second case, transfers from enterprises to households increase by 0.8% for all quintiles.

TABLE 6.27 HOUSEHOLD INCOME WITH INCREASED FIXED INVESTMENT
(Billion pesos)

HOUSEHOLDS	BASE	SIM	%Δ
HHD1	10.6	10.8	2.3
HHD2	16.5	17.0	2.8
HHD3	24.9	25.6	3.1
HHD4	43.2	44.6	3.2
HHD5	133.5	138.8	4.0

Source: Own elaboration.

Finally, this scenario has also an impact on poverty reduction. Table 6.28 shows the Income Gap Ratio (IGR) with respect to the poverty line, the Poverty Gap Index (PGI) and the

Squared PGI. On the one hand, the IGR falls slightly from 0.41 to 0.40 which will be reflected in the poverty gap. On the other hand, the PGI decreases by 3.3% while the SPGI drops by 6.5%. In addition, the growth elasticity of poverty reduction is also computed. It is of -0.33, which means that for every 1% increase in GDP, poverty falls on average by 0.33%.

TABLE 6.28 POVERTY GAP INDEX WITH INCREASED FIXED INVESTMENT

INDICATOR	HHD1		
	BASE	SIM	%Δ
INCOME GAP RATIO	0.41	0.40	
POVERTY GAP	0.31	0.30	-3.3%
SQUARED POVERTY GAP	0.09	0.09	-6.5%

Source: Own elaboration.

6.1.5. Government Consumption Expenditure

This experiment seeks to evaluate the impact of a 100%, 25%, and 20% increase in government consumption expenditure in agricultural, health-, and educational-service sectors combined with a 10% cut in the sector of public administration. This scenario also seeks to create synergies in social services to enhance their provision with the aim of improving the educational and health levels of households in Chiapas. These percentage changes might seem large, however, the argument is that the current government spending levels in those sectors are very low which has caused an under-provision of public services. For instance, 33.5% of the population faces educational backwardness while 25% does not have access to health services. Moreover, 83.3% does not have access to social security. These numbers reveal the necessity of the government to spend a larger share of its budget in health and education. The experiment in the agricultural sector to double government spending is based on the fact that the largest share of informal labor is employed in agriculture which has, by the way, one of the lowest shares of government spending compared with the rest of the economic activities. In this respect, a larger government consumption expenditure in the agricultural sector seeks to enhance the provision of services such as research, sanitary services, and irrigation systems to support poor farmers to increase their productivity.

Table 6.29 shows the base-value and simulation results about government consumption expenditure by economic activity. This scenario implies a 9.4% increase in the total budget of government consumption spending. These additional resources account for 2% as a share of GDP and might be obtained from the general government in the form of special-purpose grants. Moreover, this table also shows that government consumption spending in agriculture only accounts for 0.6% as a share of GDP. Education, public administration, and health services have the largest budget shares with 10%, 6.7%, and 3.4%, respectively. By cutting spending in public administration by 10%, this research suggests that resources be reallocated to productive activities, *i.e*. agricultural sector, and social services such as education and health.

TABLE 6.29 GOVERNMENT CONSUMPTION EXPENDITURE (Billion pesos)

SECTOR	BASE	GOVC	%Δ	Share of GDP
AGRC	0.8	1.7	100	0.6%
UTIL	0.1	0.1		0.0%
CNST	1.4	1.4		0.5%
MANU	0.6	0.6		0.2%
OSER	1.9	1.9		0.7%
EDUS	23.1	27.7	20	9.9%
HEAS	7.6	9.5	25	3.4%
PADM	20.9	18.8	-10	6.7%
TOTAL	56.4	61.7	9.4%	

Source: Own elaboration.

Higher government consumption expenditure in agriculture, education, and health, combined with a cut in public administration enhances economic growth. Table 6.30 shows base-values and percentage change of GDP at market prices, GDP at factor costs, and selected macroeconomic accounts. GDP at market prices grows by 3.2%, it is mainly driven by government consumption expenditure and fixed investment. Private consumption falls despite the fact that household income increases, as will be shown below. It falls because domestic private savings rise. GDP at factor costs also expands by 3.2%. It is mainly stimulated by three sectors, education, health, and agriculture which grow substantially by 54, 52.6%, and 1.3%. The latter is the result of higher economy-wide wages for formal labor which increases by 10%. Furthermore, direct taxes and the regional tax revenue based on the payroll and “tenencia” taxes grow by 3.4% and 8.4%. The latter is particularly relevant because it can induce the government to invest in infrastructure.

TABLE 6.30 GDP AND MACROECONOMIC ACCOUNTS WITH INCREASED GOVERNMENT CONSUMPTION EXPENDITURE
(Billion pesos)

	GDP AT MARKET PRICES		GDP AT FACTOR COSTS		
	BASE	%Δ	SECTOR	BASE	%Δ
ABSORP	306.4	2.9	AGRC	22.5	1.3
PRVCON	190.8	-3.4	MING	23.0	-0.7
FIXINV	56.9	1.0	UTIL	7.3	-5.7
DSTOCK	1.9	-0.4	CNST	28.0	3.2
EXPORTS	62.2	0.1	MANU	26.3	-2.6
IMPORTS	-89.6	0.0	TRDE	56.7	-3.3
GDPMP	279.0	3.2	OSER	61.5	-3.2
GDPMP2	279.0	3.2	EDUS	23.0	54.0
NETITAX	7.1	-1.7	HEAS	7.3	52.6
GDPFC2	271.9	3.3	PADM	16.3	-20.6
REGTAX	0.8	8.4	TOTAL	271.9	3.3
DIRTAX	14.3	3.4			

Source: Own elaboration.

With respect to the labor demand, table 6.31 shows the base-value, simulation results, and percentage changes of this variable. The demanded quantity of formal labor decreases in all economic sectors with the exception of the so-called social sectors, that is, educational and health services, where it grows significantly by 33.2% and 34%, apiece. The lower contraction takes place in construction and the agricultural sectors, in which it drops by 5% and 6.4%. In contrast, the largest contraction occurs in utilities and trade where formal labor demand declines by 11.7% and 10.2%. On the other hand, the demanded quantity of informal labor climbs significantly in educational and health services by 43.4% and 44.2%, apiece. The largest contraction takes place in public administration and utilities, which drop by 19% and 4% respectively. In the agricultural sector, in turn, it increases barely by 1%.

TABLE 6.31 DEMANDED QUANTITY OF FORMAL AND INFORMAL LABOR WITH INCREASED GOV'T. CONSUMPTION EXPENDITURE
(Thousands of people)

SECTOR	FORMAL LABOR			INFORMAL LABOR		
	BASE	SIM	%Δ	BASE	SIM	%Δ
AGRC	37	35	-6.4	760	766	0.8
MING	3	3	-7.9	2	2	-0.8
UTIL	2	2	-11.7	2	1.9	-4.9
CNST	16	15	-5.0	96	98.2	2.3
MANU	26	24	-9.5	87	84.8	-2.5
TRDE	94	84	-10.2	184.9	178.9	-3.2
OSER	72	65	-10.0	263.8	255.8	-3.1
EDUS	72	96	33.2	19	27.3	43.4
HEAS	41	55	33.9	11	15.9	44.2
PADM	61	46	-24.5	27	21.9	-18.7

Source: Own elaboration.

Household income grows with increased government consumption expenditure. Table 6.32 shows that, for instance, the income of the 20% poorest households grows more than that of the rich. Hence, household income in quintile 1 increases by 1% while that in quintile 5 does so by 0.2%. Moreover, in quintiles 2, 3, and 4, income rises by 1.1%, 0.9%, and 0.4%, respectively. This expansion in household income is mainly enhanced by factor income. Factor income goes up primarily in formal labor and capital by 10.7% and 2.7%, apiece, while that in informal labor barely improves by 0.1%. Although the growth in household income is not great, it is pro-poor as the income of the needy expands more than that of the rest.

TABLE 6.32 HOUSEHOLD INCOME WITH INCREASED GOVERNMENT CONSUMPTION EXPENDITURE (Billion pesos)

HOUSEHOLDS	BASE	SIM	%Δ
HHD1	10.58	10.65	0.7
HHD2	16.51	16.69	1.1
HHD3	24.87	25.09	0.9
HHD4	43.21	43.38	0.4
HHD5	133.51	133.78	0.2

Source: Own elaboration.

As a result of the increased household income, poverty falls slightly. Table 6.33 shows the Income Gap Ratio (IGR), the Poverty Gap Index (PGI), and the Squared PGI. The IGR drops from 0.412 to 0.408, that is, by 1%. The PGI declines from 0.308 to 0.305, equivalent to 1%, while the SPGI falls by 2%. In addition, the growth elasticity of poverty reduction is of -0.30. In other words, for every 1% increase in GDP, poverty falls on average by 0.30%.

TABLE 6.33 POVERTY WITH INCREASED GOVERNMENT CONSUMPTION EXPENDITURE

INDICATOR	HHD1		
	BASE	SIM	%Δ
INCOME GAP RATIO	0.412	0.408	
POVERTY GAP	0.308	0.305	-1.0%
SQUARED POVERTY GAP	0.095	0.093	-1.9%

Source: Own elaboration.

6.1.6. Taxes

In this section six simulations are carried out: a) 18.75%-increase in the value-added tax, which is equivalent to raising the current base rate from 16% to 19%; b) elimination of labor tax, that is, social security contributions; c) elimination of payroll tax (regional labor tax); d) 10%-increase in corporate income tax; e) 10%-cut in household income tax for quintile 2; and, f) 10%-increase in household income tax for quintile 5.

Table 6.34 shows the impact of these tax rate changes on GDP at market prices, GDP at factor costs, and macroeconomic accounts. First, let's start with the value-added tax (VAT). An 18.75% increase in the VAT rate (from 16% to 19%) enhances indirect tax revenue, which increases by 14.6%. However, it causes a slight contraction of stock changes, exports, imports, government consumption, and private consumption by 0.5%, 0.3%, 0.3%, 0.3%, and 0.01%, respectively. GDP at market prices basically does not change while GDP a factor costs declines slightly on average by 0.4%. The latter is mainly driven by a contraction in all sectors with the only exception of the utilities sector, which grows slightly by 1.7%. The contraction in GDP at factor costs is induced by a declining economy-wide wage for formal and informal labor, both drop by 0.4%. Second, the elimination of labor tax leads to a decline of the direct tax revenue, which decreases notably by 23%. Nonetheless, this scenario does not have any significant impact on GDP and macroeconomic accounts. As it will be shown below, it does have an impact on household income. Third, the elimination of the payroll tax has a serious impact on the regional tax revenue, it goes down by 77.6%. At the regional level the main tax revenue comes from payroll and "tenencia" taxes, that is why tax revenue is very sensitive to changes in both taxes. Despite the important decline of the regional tax revenue, GDP and the rest of the macroeconomic accounts suffer only minor percentage changes.

TABLE 6.34 GDP & MACROECONOMIC ACCOUNTS WITH TAX RATE CHANGES
(Percentage change)

	BASE (billion pesos)	TAXES					
		VAT	LABOR	PAYROLL	INCOME		CORPORATE INCOME
					INCREASE	CUT	
ABSORP	306.4	-0.020	0.010	0.002	0.006	0.001	0.001
PRVCON	190.8	-0.012	0.001	0.000	0.000	0.000	0.000
FIXINV	56.9	0.210	0.005	0.001	0.006	0.002	0.003
DSTOCK	1.9	-0.459	-0.021	-0.004	-0.007	0.000	0.001
GOVCON	56.9	-0.262	0.045	0.008	0.027	0.004	0.005
EXPORTS	62.2	-0.317	-0.023	-0.004	-0.012	-0.001	-0.001
IMPORTS	-89.6	-0.309	-0.024	-0.004	-0.011	-0.001	-0.001
GDPMP	279	0.007	0.013	0.002	0.008	0.001	0.001
GDPMP2	279	0.007	0.013	0.002	0.008	0.001	0.001
NETITAX	7.1	14.627	0.054	0.010	0.020	0.002	0.001
GDPFC2	271.9	-0.375	0.012	0.002	0.007	0.001	0.001
REGTAX	0.8	-0.343	0.201	-77.682	0.033	0.001	-0.011
DIRTAX	14.3	-0.291	-22.733	0.078	3.560	-0.109	2.610

Source: Own elaboration.

Fourth, a 10% increase in household income tax for the 20% richest households leads to higher direct tax revenue. It goes up by 3.6%. However, GDP and macroeconomic accounts only undergo minor percentage changes. Fifth, a 10% cut of household income tax for quintile 2 causes a slight decline in the direct tax revenue, which falls by 0.1%. This scenario does not produce significant changes in tax revenue due to the fact that households in quintile 2 contribute only with a modest share in income tax. At this point the reader should recall that the income tax cut is simulated for quintile 2 because the 20% poorest do not pay any income tax at all. In fact, they receive a tax credit, however, its account is set to zero to avoid a negative value and an execution error in the CGE. Sixth, a 10% increase in corporate income tax causes the direct tax revenue to grow by 2.6%. Nonetheless, GDP and the macroeconomic accounts undergo almost null percentage changes.

With respect to the impact of these tax rate changes on labor demand, table 6.35 shows the base level of formal and informal labor demand and simulation results in percentage changes. The increase of VAT rate has a positive impact on the demanded quantity of formal labor in all sectors with the exception of other-services where it declines barely by 0.3%. The largest increase takes place in utilities and barely in agriculture by 1.7% and 0.1, apiece.

TABLE 6.35 DEMANDED QUANTITY OF FORMAL & INFORMAL LABOR FROM ECONOMIC ACTIVITIES WITH TAX RATE CHANGES
(Percentage changes)

SECTORS	FORMAL LABOR						
	BASE (thousands of people)	TAXES					
		VAT	LABOR	PAYROLL	INCOME		CORPORATE INCOME
					INCREASE	CUT	
AGRC	37	0.133	0.040	0.007	0.029	0.007	0.008
MING	3	0.046	-0.051	-0.009	-0.028	-0.003	-0.004
UTIL	2	1.723	0.014	0.003	0.002	-0.007	-0.007
CNST	16	0.022	0.013	0.002	0.008	0.002	0.002
MANU	26	0.083	-0.094	-0.017	-0.051	-0.006	-0.006
TRDE	94	0.011	-0.160	-0.029	-0.077	-0.010	-0.010
OSER	72	-0.301	0.111	0.020	0.040	0.002	-0.001
EDUS	72	0.081	0.064	0.012	0.037	0.005	0.007
HEAS	41	0.080	0.078	0.014	0.044	0.006	0.008
PADM	61	0.008	0.002	0.000	0.001	0.000	0.000
SECTORS	INFORMAL LABOR						
	BASE (thousands of people)	TAXES					
		VAT	LABOR	PAYROLL	INCOME		CORPORATE INCOME
					INCREASE	CUT	
AGRC	760	0.106	0.023	0.004	0.018	0.004	0.005
MING	2	0.02	-0.069	-0.012	-0.038	-0.006	-0.006
UTIL	2	1.696	-0.003	-0.001	-0.009	-0.009	-0.01
CNST	96	-0.005	-0.004	-0.001	-0.003	-0.001	-0.001
MANU	87	0.056	-0.112	-0.02	-0.062	-0.009	-0.009
TRDE	185	-0.016	-0.178	-0.032	-0.088	-0.012	-0.012
OSER	264	-0.328	0.094	0.017	0.029	-0.001	-0.004
EDUS	19	0.055	0.046	0.008	0.026	0.002	0.004
HEAS	11	0.053	0.06	0.011	0.034	0.003	0.005
PADM	27	-0.019	-0.016	-0.003	-0.009	-0.002	-0.002

Source: Own elaboration.

On the other hand, the quantity of informal labor demand grows barely in utilities by 1.7% whereas, in contrast, it falls slightly in other-services by 0.3%. In the rest of the economic sectors, informal labor demand undergoes almost null changes. One might expect to see some impact of the elimination of labor and payroll taxes on formal labor demand, however, in the context of Chiapas and within the framework of general equilibrium in which these taxes are levied on factor income, only minor changes take place. When eliminating labor tax, formal labor demand barely falls by 0.2% in trade while it goes up by 0.1% in other-services. Informal labor demand, in turn, declines slightly by 0.2% and 0.1% in trade and manufacturing whereas no significant change occurs in the rest of the sectors. With elimination of the payroll tax, both formal and informal labor do not undergo any important change. Finally, income tax rate changes, either household or corporate, do not lead to any

relevant adjustment in the demanded quantity of formal and informal labor, changes are below zero percent.

Moreover, the adjustment of tax rates causes some changes in household income. Table 6.36 shows the base level of household income and its percentage change by tax. First, the VAT rate increase leads to a contraction of income in all quintiles, however, it is slightly larger for the rich than for the 20% poorest as their income falls by 0.2% and 0.1%, respectively. This is caused by a decline in factor income, which goes down by 0.4% in formal and informal labor, and capital. The fall in factor income, in turn, is driven by a reduction of the same percentage change in the economy-wide wage for factor labor. At this point the reader shall recall that the general equilibrium macro closure used in this research sets factors as mobile and fully employed. The latter allows for wage adjustment to reach equilibrium in the factors market. Another independent variable contributing to the decline in income is transfers from domestic non-government institutions, in other words, transfers from enterprises to households, which drop by 0.1%.

TABLE 6.36 HOUSEHOLD INCOME WITH TAX RATE CHANGES
(Percentage changes)

HOUSEHOLDS	BASE (billion pesos)	VAT	LABOR	PAYROLL	HOUSEHOLD INCOME		CORPORATE INCOME	TENENCIA
					INCREASE	CUT		
HHD1	10.6	-0.1	0.7	0.1	0.0	0.0	0.0	0.0
HHD2	16.5	-0.2	1.4	0.2	0.0	0.0	0.0	0.0
HHD3	24.9	-0.2	1.4	0.2	0.1	0.0	0.0	0.0
HHD4	43.2	-0.2	1.2	0.2	0.1	0.0	-0.1	0.0
HHD5	133.5	-0.2	0.7	0.1	0.1	0.0	-0.1	0.0

Source: Own elaboration.

In contrast, the elimination of the labor tax leads to an increase in household income. The income of the poor (quintile 1) grows by 0.7% while that of quintiles 2, 3, and 4 rises b 1.4%, 1.4%, and 1.2%, respectively. The income of the rich (quintile 5), in turn, climbs by 0.7%, as well. There are two important remarks to make about these results. First, within the framework of the general equilibrium applied in this research, labor and payroll taxes are levied on factor income. In consequence, any changes in the tax rate of both have an impact on factor income received by households. Second, at the household level the impact of the elimination of any of these two taxes depends on the share of households within labor income. As shown in previous sections, labor income is not the main source of income for

the poor while it is, along with capital income and profits, for the rich. Consequently, the larger benefit is obtained by quintiles 2 and 3. As income grows the role of labor income increases and, as a result, the larger the impact of the elimination of labor taxes. Further, a similar result is obtained concerning the elimination of the payroll tax. It leads to higher household income, which improves barely by 0.1%, 0.2%, 0.2%, 0.2%, and 0.1% in quintiles 1, 2, 3, 4, and 5, respectively.

With regard to the impact of income tax rate changes on household income, simulation results show that a 10% increase in the rate levied on quintile 5 leads to slightly higher income for quintiles 3, 4, and 5, whose total income grows by 0.1%. In contrast, a 10% cut in the rate paid by quintile 2 does not cause income to change. The reader shall recall at this point that the 20% poorest households do not pay any income tax. On the contrary, they receive a tax credit, which translates into a negative tax payment in the SAM. In consequence the income tax payment of quintile 1 has to be set to zero to avoid a negative value in the SAM that causes an execution error in the CGE. Thus, the income tax exercise is carried out for quintile 2. In any case it is important to highlight that income taxes do not play a major role given the structure of the Chiapas' economy, which is mainly characterized by the presence of high levels of informal employment. Informal employment and the informal sector have an impact on tax collection, causing the tax revenue to be very low and insufficient so that the regional government can finance public investment to boost economic growth and enhance economic development in rural areas. Furthermore, simulation results also show that a 10% increase in the corporate income tax rate decreases income in quintiles 4 and 5 by 0.1%, apiece, mainly driven by a fall in transfers from domestic non-government institutions, that is, transfers in the form of profits distributed to households. Finally, the elimination of the "tenencia" tax does not have any significant impact on household income.

On the other hand, total household consumption expenditure of the 40% poorest, that is, quintiles 1 and 2, is of $27 billion Mexican pesos. For the very poor, quintile 1, 25% of total consumption expenditure is home consumption or home production for self-consumption while the remaining is consumption expenditure in the domestic market. For quintile 2, 10% of total consumption expenditure is home consumption and the rest is market consumption.

With the VAT rate increase simulated in this section, home consumption in quintile 1 grows by 0.4% while that of quintile 2 does so barely by 0.2%. In contrast, household consumption expenditure in the domestic market does not undergo any significant change. Results show that it barely falls but it does so below the zero percent range. This result suggests that the poor replace market consumption (which is commodity-based) with home consumption (which is activity-based) in case of an increase in the VAT rate.

One might expect household consumption expenditure to decrease with a higher VAT rate, however, it does not undergo any meaningful change because households borrow. Nonetheless, the level of consumption expenditure shows that the 40% poorest spend their entire income in consumption while the rest of households have some room for saving. At the end, with these results at hand, it is possible to argue that an increase in the VAT rate harms the poor because they have to borrow to keep subsistence levels of consumption. The latter might be offset with targeted transfers financed with the greater tax revenue obtained from the increased VAT. For an effective compensation, however, the government must be more efficient than it is nowadays to allocate such transfers. Perfect targeting might compensate the harm on the poor, but in its absence badly allocated transfers might have counterproductive effects by deepening income inequality.

Finally, the impact of these tax rate changes on poverty reduction is shown in table 6.37. This table shows the base-value of the Poverty Gap Index (PGI) and the squared PGI, along with the percentage change of these indicators by tax. Only the value-added (VAT), labor, and payroll taxes have an impact on poverty reduction. On the one hand, an 18.75% increase in the VAT rate (equivalent to rising the rate from 16% to 19%) causes the PGI to deteriorate slightly by 0.2% while the SPGI goes up by 0.4%. With this scenario, *ceteris paribus*, poverty grows because of the contraction in household income as shown in the previous tables. On the other hand, the elimination of labor and payroll taxes has a positive effect on poverty reduction. First, if the labor tax is cut out the PGI drops by 1% while the SPGI falls by 2%. Second, if the payroll tax is suppressed the PGI decreases modestly by 0.2% while the SPGI goes down barely by 0.4%. The rest of tax rate changes do not have any effect on poverty reduction. Hence, it is the elimination of the federal labor tax, *ceteris paribus*, that brings greater results with respect to reducing the poverty level.

TABLE 6.37 POVERTY WITH TAX RATE CHANGES

INDICATOR	HOUSEHOLD QUINTILE 1							
	BASE	VALUE-ADDED TAX	LABOR TAX	PAYROLL TAX	INCOME TAX			*TENENCIA* TAX
					HOUSEHOLD		CORPORATE	
					INCREASE	CUT		
POVERTY GAP	0.31	0.2%	-1.0%	-0.2%	0.0%	0.0%	0.0%	0.0%
SQUARED POVERTY GAP	0.09	0.4%	-2.0%	-0.4%	0.0%	0.0%	0.0%	0.0%

Source: Own elaboration.

6.2. Cumulative Scenarios

More often than not, governments design economic growth and development strategies putting together a number of policies to be implemented simultaneously. It is rarely seen that a single policy is executed in isolation because decision makers tend to look for complementarities and synergies between sectors, industries, institutions, and economic agents. Hence, in this section four cumulative scenarios (or strategies) are evaluated with the aim of finding the opportunity cost of financing *Oportunidades*. These scenarios are designed taking into account the political debate in Mexico about economic growth, poverty reduction, and tax structures. Likewise, they are based on the discussion led by Levy (2008), (Levy, Antón & Hernández, 2012), and Ahmad and Best (2012) on an alternative social policy for poverty reduction in Mexico and how to finance it in an efficient manner. Further, as is discussed below, some of these scenarios are also proposals suggested by this study according to the author's own economic reasoning and findings from the literature review. Each cumulative scenario is identified with the following notation:

CSIM1 = Cumulative scenario one CSIM2 = Cumulative scenario two

CSIM3 = Cumulative scenario three CSIM4 = Cumulative scenario four

The first cumulative scenario includes Levy's proposals on the value-added tax, social security contributions, and payroll tax. It also considers a pro-poor redistribution of social transfers and *Oportunidades*. This measure is based on the research finding that an extension of *Oportunidades* (either in coverage or the amount of cash transferred) might further enhance its positive impact. As discussed in single scenarios, it is argued that an increase in conditional cash transfers might allow households to save a larger share of their income, which might be used to invest in farming assets or in any other productive activity that could eventually lead them to break the intergenerational transmission of poverty.

Likewise, a redistribution of social transfers is based on the argument that such transfers are supposed to be exclusively allocated to the poor, as their main objective is poverty reduction. There is no reason for the rich to receive a benefit created for that purpose. It is also important to highlight that the proposed redistribution of *Oportunidades* and other social transfers such as Procampo, Pal-Sin Hambre, temporary employment program, and "Amanecer" are budget-neutral as they are only redistributed from the rich to the poor. The latter also underlines the importance of improving the targeting mechanism for transfer allocation.

Given that this study is inserted in the theoretical framework of pro-poor growth, the first cumulative scenario also evaluates an increase in fixed investment. According to the approach on rural change and structural transformation, investment should be targeted on physical rural infrastructure for territorial development (particularly to develop the so-called missing-middle) and the provision of public goods and services. In this context, a 20%, 10%, and 5% increase in fixed investment in the agricultural, construction, and manufacturing sectors, respectively, are evaluated as well. This experiment is mainly focused on two sectors, agricultural and construction. On the one hand, the suggested increase in fixed investment in the agricultural sector is based on the fact that the base-level of investment is the lowest among the economic activities whereas it is the sector with the largest share of informal employment. The base-level of investment in agriculture accounts only for 0.1% as a share of GDP. It is a very low level that requires to be raised to boost economic growth and development. On the other hand, fixed investment in construction is considered very relevant by this study given the economic context of Chiapas. Investment in construction accounts for 14% as a share of GDP. It is indeed the economic activity with the largest share of fixed investment, however, given that Chiapas still is predominantly a rural region, higher levels of investment in construction are required to close the infrastructure gap, in terms of physical infrastructure accompanied by machinery and equipment. In total, fixed investment accounts for 19.2% of GDP in Chiapas, below the national level (23%).

The political debate in Mexico has been mainly focused on tax structures for a fiscal reform because of the low non-oil tax revenue. However, if the main goal is to restore growth and achieve poverty reduction, it is necessary to look at the current investment levels in key

sectors according to the structure of Chiapas's economy. Moreover, it has already been shown in previous sections that there are exclusion and inclusion errors in the allocation of *Oportunidades*. That is why this study explores both, the impact of further investment in relevant sectors for the regional economy such as the agricultural, construction, and manufacturing sectors accompanied by adjustments in the distribution of conditional cash transfers so that the poorest can really get the benefits of the program. Moreover, this experiment also includes a 10% increase in remittances. This measure is included based on the fact that the American economy is slowly recovering from recession. In this respect, the World Economic Outlook (WEO; Apr. 2014) of the International Monetary Fund (IMF) projects the US economy to grow by 2.8% in 2014 and 3% in 2015, which may cause remittances to grow on average by 10%. Hence, the cumulative scenario one is composed of:

CSIM1:

- Redistribution of *Oportunidades*: a 50% increase in the educational and food components for quintile 1 combined with the entire elimination of the program for quintile 5 while remaining constant for the rest of household beneficiaries
- Pro-poor redistribution of other social transfers such as Procampo, Pal-Sin Hambre, temporary employment program, and "Amanecer": a) Procampo is increased by 81.4%, 53%, and 10% for quintiles 1, 2, and 3, respectively, while remaining constant for quintile 4 and eliminating it completely for quintile 5; b) Pal-Sin Hambre is raised by 38.18%, 30%, and 14% for quintiles 1, 2, and 3, respectively, whereas it is eliminated entirely for quintiles 4 and 5; c) Temporary employment program is increased by 20% and 50% for quintiles 1 and 2 while remaining constant for quintile 3. Also, it is eliminated entirely for quintiles 4 and 5; d) "Amanecer" is raised by 42% and 22.5% for quintiles 1 and 2 while remaining constant for quintile 3. Moreover, it is eliminated completely for quintiles 4 and 5; and, e) Universal pension is increased by 5% for all households
- Fixed investment is increased by 20%, 10%, and 5% in the agricultural, construction, and manufacturing sectors while remaining constant in mining and other-services
- Tax rate changes: a) 18.75% increase of the VAT rate; b) elimination of labor and payroll taxes; c) 10% increase of the income tax rate for household quintile 5; d) 10% increase of corporate income tax rate; e) 10% cut of income tax rate for household quintile 2
- Remittances grow by 10%

With regard to the second cumulative scenario, it combines not only a redistribution but also an expansion of *Oportunidades* with increased government consumption expenditure in agricultural, construction, educational-, and health-service sectors while cutting it by 10% in public administration. Moreover, this scenario includes a slight increase of fixed investment in construction and pro-poor tax rate changes. In this respect, the evaluated pro-poor tax structure is focused on direct taxes – corporate and household income tax, payroll and "tenencia" taxes – as they are also included in the political debate on how to raise the non-oil tax revenue to finance social policy. In sum, this scenario seeks to create a fiscal and investment flow to enhance pro-poor growth and redistribute income for poverty reduction. The cumulative scenario two is thus constituted by:

CSIM2:

- Redistribution of *Oportunidades*: a 40%, 30%, and 10% increase in conditional cash transfers for household quintiles 1, 2, and 3, while remaining constant for quintile 4 and cutting it out entirely for quintile 5
- Increase in government consumption: a 100%, 30%, 25%, and 20% increase in the agricultural, construction, health-service, and educational-service sectors, accompanied by a 10% cut in public administration
- A 5% increase in fixed investment in construction
- Tax rate changes: a) elimination of payroll taxes; c) 10% increase of the income tax rate for household quintile 5; d) 10% increase of corporate income tax rate; e) 10% cut of income tax rate for household quintile 2; and, f) 15% and 10% increase in "tenencia" tax for household quintiles 5 and 4, respectively.

The third cumulative scenario is focused, on the one hand, on redistributing social transfers and *Oportunidades*. Other social transfers (such as Procampo, Pal-Sin Hambre, temporary employment program, and "Amanecer") and *Oportunidades* are reallocated within a pro-poor scheme. Changes in transfers are budget-neutral. On the other hand, this strategy is also accompanied by an increase in fixed investment in agriculture, construction, and mining. As the reader may notice, in this scenario investment in mining is incorporated in the analysis. This is done with the aim of evaluating its impact on economic growth given that Chiapas is a region rich in natural resources such as crude oil and gas. In fact, the

transnational corporation Halliburton has a branch in the municipality of *Reforma* where it provides oilfield services and products to upstream oil and gas to Pemex, Mexico's state-owned enterprise in the oil and gas sector. There is a potential to gain greater benefits from the mining sector but this requires a larger investment in technology for exploration and production of crude oil, natural gas and liquids. In this context, this cumulative scenario seeks to restore growth by generating an investment flow through the combination of the following specific measures:

CSIM3:

- Redistribution of *Oportunidades*: a 50% increase in the educational and food components for quintile 1 combined with the entire elimination of the program for quintile 5 while remaining constant for the rest of household beneficiaries
- Pro-poor redistribution of other social transfers such as Procampo, Pal-Sin Hambre, temporary employment program, and "Amanecer": a) Procampo is increased by 81.4%, 53%, and 10% for quintiles 1, 2, and 3, respectively, while remaining constant for quintile 4 and eliminating it completely for quintile 5; b) Pal-Sin Hambre is raised by 38.18%, 30%, and 14% for quintiles 1, 2, and 3, respectively, whereas it is eliminated entirely for quintiles 4 and 5; c) Temporary employment program is increased by 20% and 50% for quintiles 1 and 2 while remaining constant for quintile 3. Also, it is eliminated entirely for quintiles 4 and 5; d) "Amanecer" is raised by 42% and 22.5% for quintiles 1 and 2 while remaining constant for quintile 3. Moreover, it is eliminated completely for quintiles 4 and 5; and, e) Universal pension is increased by 5% for all households
- Fixed investment is increased by 20%, 10%, and 8% in the agricultural, mining, and construction sectors while remaining constant in manufacturing and other-services

Finally, the fourth cumulative scenario evaluates the impact of the entire elimination of *Oportunidades* in the regional setting of Chiapas accompanied by a rise of fixed investment and government consumption, and pro-poor tax rate changes. In view of growing concerns and questions within the political arena about the continuity of *Oportunidades* given that poverty remains as high as it was when the program began operating, it is relevant to evaluate the potential effect of such measures on household income and poverty reduction

in a region where the program covers all of the 118 municipalities. Hence, this cumulative scenario is composed of the following policies:

CSIM4:

- Elimination of *Oportunidades*
- Fixed investment is increased by 20%, 10%, and 8% in the agricultural, construction, and mining sectors while remaining constant in manufacturing and other-services
- Increase in government consumption: a 50%, 25%, 20% increase in the agricultural, construction, and social-service (education and health) sectors, combined with a 10% cut in public administration
- Tax rate changes: a) elimination of the payroll tax; c) 10% increase of the income tax rate for household quintile 5; d) 10% increase of corporate income tax rate; e) 10% cut of income tax rate for household quintile 2; and, f) 15% and 10% increase in "tenencia" tax for household quintiles 5 and 4, respectively.

In what follows, results of each cumulative scenario are presented. As in the case of the single scenarios, the main variables of interest for comparative analysis are GDP and macroeconomic accounts, labor factor demand, total household income and consumption expenditure, factor income, growth elasticity of poverty reduction, Poverty Gap Index and Square Poverty Gap Index to evaluate to what extent poverty reduction is achieved. Results are reported using the same notation as in single scenarios.

6.2.1. Cumulative Scenario One (CSIM1)

Cumulative scenario one includes Santiago Levy's proposal to raise the indirect tax collection by increasing the value-added tax rate from 16% to 19%, and this measure is accompanied by the entire elimination of labor and payroll taxes, a redistribution of transfers and higher fixed investment in agriculture, construction, and manufacturing in a context of rising remittances. Further, no borrowing takes place to finance investment and the redistribution of social transfers and *Oportunidades* are budget-neutral as they only imply a reallocation of transfers from rich to poor households. Table 6.38 shows the base-value and simulation results with respect to GDP at market prices and GDP at factor costs along with conventional macroeconomic accounts such as private consumption, fixed investment, government

consumption, exports, imports, and tax revenue. Nominal GDP grows significantly by 10.6% mainly driven by fixed investment, government consumption, and stock changes, which increase by 55.6%, 5.1%, and 1.2%, respectively. Considering that the inflation rate and the population growth in Chiapas are of 4.7% and 2.4% in the base-year of this study, the real GDP growth rate is 6% whereas the real per capita GDP is 3.5%. In contrast, private consumption falls on average by 2.3% as a result of declining household consumption expenditure of quintiles 4 and 5 because of a lower level of disposable income for consumption. From the revenue approach, nominal GDP at factor costs grows by 9.9%, mainly boosted by an expansion in construction, agriculture, and health-services in which factor income per unit of activity (value-added price) goes up by 88%, 7.3%, and 5%, respectively. Real GDP at factor costs grows by 5.2% while real GDP per capita increases by 2.8%. The indirect tax revenue, in turn, increases from $7 to $9 billion Mexican pesos, equivalent to 33.4%. As a share of GDP at market prices, it rises from 2.5% to 3.1%.

On the other hand, the direct tax revenue falls from $14 to $13 billion Mexican pesos. As expected, the regional tax revenue declines substantially by 76.8% because the payroll tax is cut out. The revenue gap created by the elimination of the payroll tax at the regional level might be compensated with federal transfers from the increased VAT-driven tax revenue. Despite the fact that the regional tax revenue drops, the elimination of the payroll tax has a positive impact on household income, as shown in the corresponding single simulation in the previous section. Finally, absorption, that is, the sum of all domestically-produced goods consumed internally and all imports, grows by 9.8%.

TABLE 6.38 GDP & MACROECONOMIC ACCOUNTS WITH CUMULATIVE SCENARIO ONE
(Billion pesos)

	BASE	SIM	%Δ
ABSORP	306	336	9.8
PRVCON	191	186	-2.3
FIXINV	57	89	55.6
DSTOCK	2	2	1.2
GOVCON	57	60	5.1
EXPORTS	62	60	-2.9
IMPORTS	-90	-88	-1.3
GDPMP	279	308	10.6
GDPMP2	279	308	10.6
NETITAX	7	9	33.4
GDPFC2	272	299	9.9
REGTAX	1	0	-76.8
DIRTAX	14	13	-11.8

Source: Own elaboration.

With respect to changes in labor factor demand, table 6.39 shows that the demanded quantity of formal labor grows in construction, health-service, and agricultural sectors by 75%, 1%, and 1%, respectively, whereas the largest contraction takes place in utilities and trade by 8.5% and 8%, apiece. On the other hand, informal labor declines in all sectors with the exception of construction in which it rises by 70%. The largest decline occurs in utilities and trade by 11.3% and 10.8%. In the light of perfect mobility of labor and within the framework of general equilibrium, the demanded quantity of formal labor responds slightly better than informal labor within this cumulative scenario.

TABLE 6.39 DEMANDED QUANTITY OF LABOR WITH CUMULATIVE SCENARIO ONE
(Thousands of people)

SECTOR	FORMAL LABOR			INFORMAL LABOR		
	BASE	SIM	%Δ	BASE	SIM	%Δ
AGRC	37.0	37.3	0.9	760.3	743.3	-2.2
MING	3.0	2.9	-4.7	2.0	1.8	-7.6
UTIL	2.0	1.8	-8.5	2.0	1.8	-11.3
CNST	16.0	28.1	75.4	96.0	163.2	70.0
MANU	26.0	24.3	-6.5	87.0	78.8	-9.4
TRDE	94.0	86.5	-8.0	184.9	164.9	-10.8
OSER	72.0	68.6	-4.7	263.8	243.7	-7.6
EDUS	72.0	71.9	-0.2	19.0	18.4	-3.3
HEAS	41.0	41.5	1.0	11.0	10.8	-2.1
PADM	61.0	61.2	0.4	27.0	26.3	-2.7

Source: Own elaboration.

Household income receives a positive impact within this cumulative scenario. Table 6.40 shows the base-value and percentage changes of factor and total household income. On the one hand, factor income grows significantly in formal labor by 18%, followed by capital and informal labor in which it rises by 11% and 9%. Total household income, on the other hand, grows in all households, however, it rises much more for the 20% poorest households than for the rest. The total income of quintile 1 increases by 22% while that of quintile 5 does so by 4%. This result implies that, in the light of the CGE assumptions and within this cumulative scenario, pro-poor growth is achieved. Pro-poor growth takes place when the income of the poor grows more than that of the rich[57]. If this pattern continues over time, *ceteris paribus*,

[57] The World Bank provides two definitions of pro-poor growth. A relative definition which states that pro-poor growth takes places when the income of the poor grow more than the income of the non-poor. On the other hand, an absolute definition which points out that pro-poor growth is achieved when poverty is reduced through economic growth and progressive distributional change. Further details are available at: http://bit.ly/QdxGJk.

one might expect, first, labor income to reach a larger share within all sources of household income, and, second, households to be able to escape from poverty.

TABLE 6.40 FACTOR AND TOTAL HOUSEHOLD INCOME WITH CUMULATIVE SCENARIO ONE (Billion pesos)

HOUSEHOLD	TOTAL INCOME		FACTOR INCOME					
			FORMAL LABOR		INFORMAL LABOR		CAPITAL	
	BASE	%Δ	BASE	%Δ	BASE	%Δ	BASE	%Δ
HHD1	10.6	21.7	0.7	17.8	2.4	9.1	0.2	11.1
HHD2	16.5	8.2	2.4	17.8	3.9	9.1	0.6	11.1
HHD3	24.9	6.1	4.0	17.8	5.6	9.1	1.3	11.1
HHD4	43.2	3.3	6.8	17.8	9.5	9.1	2.2	11.1
HHD5	133.5	3.9	16.1	17.8	20.7	9.1	23.2	11.1

Source: Own elaboration.

As a result of the positive income effect, poverty declines. Table 6.41 shows the Income Gap Ratio (IGR), the Poverty Gap Index (PGI), and the squared PGI. First, the IGR falls from 0.41 to 0.28. Second, the PGI declines notably by 31% while the SPGI drops substantially by 52%. In other words, the distance (gap) between the income of the poor and the poverty line gets shortened and income inequality (severity of poverty) decreases. Moreover, the growth elasticity of poverty reduction is of -2.92, that is, for every one-percent increase in GDP, poverty declines on average by 2.92%.

TABLE 6.41 POVERTY WITH CUMULATIVE SCENARIO ONE

INDICATOR	HHD1		
	BASE	SIM	%Δ
INCOME GAP RATIO	0.41	0.28	
POVERTY GAP	0.31	0.21	-30.9%
SQUARED POVERTY GAP	0.09	0.05	-52.3%

Source: Own elaboration.

6.2.2. Cumulative Scenario Two (CSIM2)

This cumulative scenario seeks to stimulate inclusive economic growth and a pro-poor income distributional change by inducing a fiscal and investment flow through a redistribution and expansion of conditional cash transfers combined with higher fixed investment in construction and higher government consumption expenditure in agricultural, construction, and social-service (health and education) sectors along with a 10% cut in public administration, and a pro-poor tax structure focused on direct taxes such as household and

corporate income taxes and the regional "tenencia" tax. Table 6.42 shows the base-value and percentage changes of GDP and macroeconomic accounts. Nominal GDP grows notably by 8.7% mainly boosted by government consumption expenditure and fixed investment, which rise by 30% and 28.5%. Private consumption goes down by 4.7% because of a contraction of household consumption expenditure of, particularly, quintiles 4 and 5 by 4.8% and 6.4% as a result of lower disposable income for consumption (disposable income for consumption is defined as income net of taxes, savings, and transfers to domestic non-government institutions). Real GDP at market prices, in turn, grows by 4% while real GDP per capita increases by 1.6%. From the revenue approach, real GDP at factor costs also rises by 4%. Furthermore, indirect and direct tax revenue goes up by 6.7% and 12.8%, respectively, whereas, in contrast, the regional tax revenue drops substantially by 74.3% because of the elimination of the payroll tax. The revenue gap caused by cutting it out might be offset through federal fiscal transfers or grants financed by the generated tax revenue at the national level. Finally, absorption, that is, the sum of all domestically-produced goods consumed internally and all imports, grows by 7.9%.

TABLE 6.42 GDP & MACROECONOMIC ACCOUNTS WITH CUMULATIVE SCENARIO TWO (Billion pesos)

	BASE	%Δ
ABSORP	306	7.9
PRVCON	191	-4.7
FIXINV	57	28.5
DSTOCK	2	0.5
GOVCON	57	30.0
EXPORTS	62	-0.8
IMPORTS	-90	-0.6
GDPMP	279	8.7
NETITAX	7	6.7
GDPFC2	272	8.7
REGTAX	1	-74.3
DIRTAX	14	12.8

Source: Own elaboration.

Changes in the demanded quantity of factor labor are presented in table 6.43. This table shows the base-level and the percentage changes of formal and informal demand by economic activity. On the one hand, the demanded quantity of formal labor grows in three sectors, health- and educational-services and construction by 34.3%, 33.3%, and 32.8%,

respectively. In contrast, it declines in the rest of the economic activities. The largest fall takes place in utilities and trade by 16.6% and 14.1%. In the agricultural sector it also goes down by 6%, it is the sector with the lowest declines. On the other hand, informal labor demand drops in all economic activities with the exception of social services (health and education) and construction, in which it increases by 42.2%, 41.2%, and 40.6%, respectively. The largest decline of informal labor demand takes place in public administration and utilities.

TABLE 6.43 DEMANDED QUANTITY OF LABOR WITH CUMULATIVE SCENARIO TWO (Thousands of people)

SECTOR	FORMAL LABOR		INFORMAL LABOR	
	BASE	%Δ	BASE	%Δ
AGRC	37	-6.1	760	-0.6
MING	3	-10.0	2	-4.7
UTIL	2	-16.6	2	-11.7
CNST	16	33.3	96	41.2
MANU	26	-12.8	87	-7.7
TRDE	94	-14.1	185	-9.1
OSER	72	-12.0	264	-6.8
EDUS	72	32.8	19	40.6
HEAS	41	34.3	11	42.2
PADM	61	-24.4	27	-19.9

Source: Own elaboration.

Moreover, this scenario has a positive impact on factor income and total household income. Table 6.44 shows the base-value and percentage changes of factor income and total household by household quintiles. On the one hand, factor income from formal labor grows by 15.4% whereas that from informal labor rises by 4.9%. Income from factor capital also increases by 8.7%. Total household income, on the other hand, grows for all households, however, it rises much more for the 20% poorest households than for the rest. In this respect, the total income of quintile 1 increases by 10% while that of quintile 5 does so by 2%. The redistribution and expansion of *Oportunidades* evaluated within this scenario contributes notably to the expansion of total household income. In this regard, conditional cash transfers rise on average by 34% for the 40% poorest, that is, quintiles 1 and 2. In total the program's budget grow by 11.9%, which is equivalent to $0.7 billion Mexican pesos. This additional budget can be covered by the federal government with the generated additional

tax revenue or with the annual profits from oil exports. Hence, the expansion of income shows a pro-poor distributional pattern as the larger gains are obtained by the needy. This scenario generates pro-poor growth in relative and absolute terms. In relative terms because the income of the poor grows more than that of the non-poor and in absolute terms because poverty falls, as it is shown below.

TABLE 6.44 FACTOR AND TOTAL HOUSEHOLD INCOME WITH CUMULATIVE SCENARIO TWO (Billion pesos)

HOUSEHOLD	TOTAL INCOME		FACTOR INCOME					
			FORMAL LABOR		INFORMAL LABOR		CAPITAL	
	BASE	%Δ	BASE	%Δ	BASE	%Δ	BASE	%Δ
HHD1	10.6	9.9	0.7	15.4	2.4	4.9	0.2	8.7
HHD2	16.5	6.2	2.4	15.4	3.9	4.9	0.6	8.7
HHD3	24.9	3.3	4	15.4	5.6	4.9	1.3	8.7
HHD4	43.2	2.3	6.8	15.4	9.5	4.9	2.2	8.7
HHD5	133.5	1.9	16.1	15.4	20.7	4.9	23.2	8.7

Source: Own elaboration.

Poverty reduction, measured by the Poverty Gap Index (PGI) and the squared PGI (SPGI), falls. Table 6.45 shows, first, that the Income Gap Ratio (IGR) goes down from 0.41 to 0.35. Second, the PGI drops by 14% while the SPGI declines by 26%. In other words, the distance (gap) between the income of the poor and the poverty line gets shortened and income inequality (severity of poverty) goes down, as well. Further, the growth elasticity of poverty reduction is of -1.62, that is, for every one-percentage increase in GDP, poverty declines on average by 1.62%.

TABLE 6.45 POVERTY WITH CUMULATIVE SCENARIO TWO

INDICATOR	HHD1		
	BASE	SIM	%Δ
INCOME GAP RATIO	0.41	0.35	
POVERTY GAP	0.31	0.26	-14.1%
SQUARED POVERTY GAP	0.09	0.07	-26.2%

Source: Own elaboration.

6.2.3. Cumulative Scenario Three (CSIM3)

This scenario is focused on evaluating a pro-poor redistributional change of conditional cash transfers and other social transfers such as Procampo, Pal-Sin Hambre, temporary employment program, and "Amanecer", accompanied by higher levels of investment in three sectors, agricultural, construction, and mining. It seeks to foster an investment flow to stimulate inclusive economic growth for poverty reduction. The redistribution of transfers is aimed at eliminating type error 1 and 2, that is, the exclusion and inclusion errors that currently exist as a result of an inefficient and ineffective targeting strategy, particularly in urban settings. The argument is that social transfers created to help the needy escape from poverty should not be received by rich households under any circumstances. Funds for poverty reduction should exclusively reach those in moderate and extreme poverty. As stated in the previous section, this research estimates an exclusion error of 28.5% and an inclusion one of 25%, in line with international estimations such as the one carried out by the Inter-American Development Bank[58]. Hence, with regard to *Oportunidades* the elimination of transfers for quintile 5 and a 50% expansion of the program in its main two components, education and food, for quintile 1, represent an additional budget of $0.2 billion Mexican pesos or 0.1% of Chiapas GDP, which has to be financed by the national government as it is a federal program. On the other hand, the pro-poor distributional change of the other social programs is budget-neutral, that is, it only represents a reallocation of transfers from the rich to the poor without any increase in the amount of resources transferred.

On the other hand, this scenario is also focused on fixed investment in agriculture, construction, and mining. As stated before, fixed investment in agriculture is very low in Chiapas. It is actually the economic activity with the lowest level of fixed investment, it accounts only for 0.4% of total investment and 0.1% as a share of GDP. Moreover, fixed investment in construction and mining are also evaluated. First, further investment in construction is considered by this study a fundamental measure to boost structural transformation and rural development. By investment in construction this research refers to physical infrastructure and machinery and equipment to enhance the provision of public goods and services and to foster the development of the so-called missing middle. The base-

[58] The estimation from IADB can be found at: http://issuu.com/bid-sph/docs/oportunidades.

level of investment in construction accounts for 14% as a share of GDP. Second, investment in mining is relevant in the context of Chiapas as it a region rich in natural resources, particularly rich in crude oil and gas. To enlarge the benefits obtained from natural resources further fixed investment is required in the whole value-chain of the oil production process, that is, exploration, production, refining, and commercialization. The base-level of investment in mining accounts for 1.1% as a share of GDP. Thus, this scenario evaluates a 20%, 10%, and 8% increase in fixed investment in agriculture, construction, and mining, respectively. The latter implies an additional budget of $3.5 billion Mexican pesos or 1.2% of GDP, which can be financed through federal transfers or grants or by reallocating the regional government budget to prioritize investment in these sectors across the region.

Table 6.46 shows the base-value and percentage changes of GDP and macroeconomic accounts. Nominal GDP grows by 7.7%, mainly fostered by fixed investment and government consumption, which rise by 40.6% and 4.3%. Real GDP at market prices, in turn, grows by 3% while real GDP per capita increases by 0.6%. In contrast, private consumption falls slightly by 2% as a result of lower levels of consumption expenditure from household quintiles 4 and 5. The latter reflects that quintiles 4 and 5 have a lower level of disposable income for consumption, that is, lower income net of taxes, savings, and transfers to domestic non-government institutions.

From the revenue approach, nominal GDP at factor costs grows by 7.7%, too, whereas the real one does so by 3%. GDP at factor costs increases mainly boosted by an expansion in construction, agriculture, and social services such as health and education, which grow by 78.4%, 5.6%, 4.8%, and 4%, respectively. In these sectors factor income per unit of activity (value-added price) goes up by 65.8%, 6.4%, 4.4, and 3.8, respectively. Moreover, the indirect and direct tax revenue rises by 11.6% and 4%, apiece. The regional tax revenue also goes up by 3.2%. The latter is particularly relevant because the additional resources can be used to further finance fixed investment in the next period. Finally, absorption, that is, the sum of all domestically-produced goods consumed internally and all imports, grows by 7.1%.

TABLE 6.46 GDP & MACROECONOMIC ACCOUNTS WITH CUMULATIVE SCENARIO THREE (Billion pesos)

	BASE	%Δ
ABSORP	306	7.1
PRVCON	191	-2.0
FIXINV	57	40.6
DSTOCK	2	1.5
GOVCON	57	4.3
EXPORTS	62	-1.1
IMPORTS	-90	-0.7
GDPMP	279	7.7
NETITAX	7	11.6
GDPFC2	272	7.7
REGTAX	1	3.2
DIRTAX	14	4.0

Source: Own elaboration.

The impact of these policy measures on the demanded quantity of formal and informal labor from economic activities is shown in table 6.47. On the one hand, demand for formal labor increases mainly in construction, agriculture, and health-services by 56.8%, 1.4%, and 1%, while it falls in the rest of the economic activities. The largest contraction of demand for formal labor takes place in utilities and trade where it declines by 8.4% and 6.5%. Demand for informal labor, on the other hand, goes down in all economic activities with the only exception of construction, in which it actually grows notably by 52.7%. The largest contraction of demand for informal labor takes place in utilities, trade, and manufacturing, where it drops by 10.8%, 9%, and 7.3%, respectively. Nonetheless that it goes up in construction, given the high levels of informal employment in Chiapas it is encouraging to see a decline of it in most of the economic activities. Higher levels of formal employment are required to improve the general performance of the economy in a sustainable manner and raise the wellbeing of the population as formality provides social security and higher labor income.

TABLE 6.47 DEMANDED QUANTITY OF FACTOR LABOR WITH CUMULATIVE SCENARIO THREE
(Thousands of people)

SECTOR	FORMAL LABOR		INFORMAL LABOR	
	BASE	%Δ	BASE	%Δ
AGRC	37	1.4	760	-1.2
MING	3	-2.2	2	-4.8
UTIL	2	-8.4	2	-10.8
CNST	16	56.8	96	52.7
MANU	26	-4.9	87	-7.3
TRDE	94	-6.5	185	-8.9
OSER	72	-3.8	264	-6.3
EDUS	72	0.2	19	-2.5
HEAS	41	1.0	11	-1.6
PADM	61	0.3	27	-2.3

Source: Own elaboration.

With respect to factor and total household income, table 6.48 shows the base-value and percentage changes of these variables. First, factor income grows for all households. Income from formal labor increases by 3.5% while that from informal labor goes up by 7.4%. Income from factor capital also grows by 8.5%. Second, total household income rises for all households, too. It does notably increase for the 20% poorest households by 19.7% while it also goes up, barely, for quintile 5, by 2%. This result is remarkable because it implies that pro-poor growth, either relative or absolute, is achieved within this cumulative scenario. Pro-poor growth takes place when the income of the poor grows more than that of the non-poor, which is exactly what happens with the policy measures evaluated in this simulation. Moreover, the redistribution and slight expansion of *Oportunidades* translate into a 42% increase in transfers for the 20% poorest households.

TABLE 6.48 FACTOR AND TOTAL HOUSEHOLD INCOME WITH CUMULATIVE SCENARIO THREE
(Billion pesos)

HOUSEHOLD	TOTAL INCOME		FACTOR INCOME					
			FORMAL LABOR		INFORMAL LABOR		CAPITAL	
	BASE	%Δ	BASE	%Δ	BASE	%Δ	BASE	%Δ
HHD1	10.6	19.7	0.7	3.5	2.4	7.4	0.2	8.5
HHD2	16.5	5.2	2.4	3.5	3.9	7.4	0.6	8.5
HHD3	24.9	3.1	4	3.5	5.6	7.4	1.3	8.5
HHD4	43.2	0.8	6.8	3.5	9.5	7.4	2.2	8.5
HHD5	133.5	2.0	16.1	3.5	20.7	7.4	23.2	8.5

Source: Own elaboration.

As a result of the higher total household income, poverty declines. Table 6.49 shows that the Income Gap Ratio goes down from 0.41 to 0.30. The Poverty Gap Index (PGI), in turn, falls by 28% while the squared PGI (SPGI) also drops by 48%. In other words, the distance (gap) between the income of the poor and the poverty line gets shortened whereas income inequality (severity of poverty) falls, too. Furthermore, the growth elasticity of poverty reduction is -3.63, that is, for every one-percentage change in GDP, poverty declines on average by 3.63%.

TABLE 6.49 POVERTY WITH CUMULATIVE SCENARIO THREE

INDICATOR	HHD1		
	BASE	SIM	%Δ
INCOME GAP RATIO	0.41	0.30	
POVERTY GAP	0.31	0.22	-28.1%
SQUARED POVERTY GAP	0.09	0.05	-48.3%

Source: Own elaboration.

6.2.4. Cumulative Scenario Four (CSIM4)

Despite the implementation of *Oportunidades* and other social programs, poverty remains high in Mexico. In fact, it remains at levels observed in 1997 when conditional cash transfers were introduced. Consequently, claims about the continuity of the program have been raised by some political actors. This cumulative scenario evaluates the impact of the entire elimination of *Oportunidades* and its implication for poverty reduction. Furthermore, this scenario includes higher fixed investment and government consumption, along with pro-poor tax rate changes. Fixed investment is modeled to grow by 20%, 10%, and 8% in agriculture, mining, and construction and government consumption as well, by 50%, 25%, and 20% in agriculture, construction, and social services such as education and health, combined with a 10% cut in public administration. This scenario also seeks to evaluate if further investment and government consumption in selected economic activities, generates a countercyclical process to offset the elimination of conditional cash transfers. Finally, pro-poor tax rate changes are focused on household and corporate income taxes, accompanied by the elimination of the payroll tax.

Table 6.50 shows the base-value and percentage changes of GDP and macroeconomic accounts. Nominal GDP grows by 10.6% mainly boosted by fixed investment and government

consumption, which increase by 43.6% and 25%, respectively. Real GDP at market prices, in turn, grows by 6% while real GDP per capita does so by 3.5%. In contrast, private consumption declines by 5% because of a contraction in consumption expenditure of, primarily, the 40% poorest, that is, households in quintiles 1 and 2. From the revenue approach, nominal GDP at factor costs grows by 10.7% while the real one climbs by 6%. In this respect, GDP at factor costs increases mainly boosted by an expansion in construction, educational and health services, which grow by 87%, 50%, and 38.4%, respectively. In these sectors factor income per unit of activity (value-added price) goes up by 72.4%, 38.4%, and 24.4, respectively. Moreover, the indirect and direct tax revenue goes up by 11.6% and 14%, apiece. Nevertheless, the regional tax revenue falls significantly by 74% because of the elimination of the payroll tax. The revenue gap caused by cutting the payroll tax out might be compensated by the federal government through transfers or grants with the generated additional tax revenue. Finally, absorption, that is, the sum of all domestically-produced goods consumed internally and all imports, grows by 9.7%.

TABLE 6.50 GDP & MACROECONOMIC ACCOUNTS WITH CUMULATIVE SCENARIO FOUR (Billion pesos)

	BASE	%Δ
ABSORP	306	9.7
PRVCON	191	-4.9
FIXINV	57	43.6
DSTOCK	2	0.1
GOVCON	57	24.9
EXPORTS	62	-0.3
IMPORTS	-90	-0.2
GDPMP	279	10.6
NETITAX	7	11.6
GDPFC2	272	10.7
REGTAX	1	-74.1
DIRTAX	14	14.0

Source: Own elaboration.

The impact of this package of policies on factor labor demand is presented in table 6.51. This table shows the base-value and percentage changes of the demanded quantity of formal and informal labor by economic activities. On the one hand, the demanded quantity of formal labor grows in construction and social services, education and health, by 55%, 30%, and 22.4%, respectively. The largest contraction takes place in public administration, other-

services, and agriculture by 24.4%, 11.4%, and 10.6%. Demand of informal labor, on the other hand, also increases in construction and educational and health services by 64.4%, 37.8%, and 30%, respectively. Here the largest contraction takes place in public administration, utilities, and agriculture by 19.8%, 8.7%, and 5.1%, apiece.

TABLE 6.51 DEMANDED QUANTITY OF LABOR WITH CUMULATIVE SCENARIO FOUR (Thousand of people)

SECTOR	FORMAL LABOR		INFORMAL LABOR	
	BASE	%Δ	BASE	%Δ
AGRC	37	-10.6	760	-5.1
MING	3	-7.1	2	-1.4
UTIL	2	-14.0	2	-8.7
CNST	16	54.9	96	64.4
MANU	26	-9.4	87	-3.8
TRDE	94	-10.2	185	-4.7
OSER	72	-11.4	264	-5.9
EDUS	72	29.9	19	37.8
HEAS	41	22.4	11	29.9
PADM	61	-24.4	27	-19.8

Source: Own elaboration.

Factor and total household income and consumption expenditure are shown in table 6.52. This table shows the base-value and percentage changes of these variables. First, factor income grows for all households. Income from formal labor increases by 13.4% while that from informal labor does so as well by 4%. Income from factor capital also goes up by 12%. Interestingly, factor income from formal labor grows more than that from capital. In contrast, total household income falls significantly for the 17% poorest households. Total income of quintile 1 declines by 20% while that of the rich, that is, quintile 5, rises by 4.5%. It also drops for quintile 2 and 3 by 7% and 0.6%, respectively. Despite the fact that the elimination of conditional cash transfers is accompanied by higher fixed investment, government consumption, and pro-poor tax rate changes, total income falls for 60% of households. The income loss of the poor caused by cutting out *Oportunidades* is not offset by a higher level of investment and government consumption. Moreover, consumption expenditure declines in all households as well. It drops notably in quintile 1 by 21.2%, followed by quintiles 2 by 11.6% while that of quintile 5 drops by 2.5%. The contraction consumption expenditure is a result of a lower level of disposable income for consumption.

Disposable income for consumption is defined as available income net of taxes, savings, and transfers to domestic non-government institutions (for instance, inter-household transfers).

TABLE 6.52 FACTOR & TOTAL HOUSEHOLD INCOME & CONSUMPTION EXPENDITURE WITH CUMULATIVE SCENARIO FOUR (Billion pesos)

HOUSEHOLD	TOTAL INCOME		FACTOR INCOME						CONSUMPTION EXPENDITURE	
			FORMAL LABOR		INFORMAL LABOR		CAPITAL			
	BASE	%Δ	BASE	%Δ	BASE	%Δ	BASE	%Δ	BASE	%Δ
HHD1	10.6	-17	0.7	13.4	2.4	4	0.2	12	10.6	-21.2
HHD2	16.5	-7	2.4	13.4	3.9	4	0.6	12	16.3	-11.6
HHD3	24.9	-0.6	4	13.4	5.6	4	1.3	12	23.1	-5.9
HHD4	43.2	2.5	6.8	13.4	9.5	4	2.2	12	37.7	-3.3
HHD5	133.5	4.5	16.1	13.4	20.7	4	23.2	12	103.1	-2.5

Source: Own elaboration.

Due to the contraction of total household income of the poor, poverty increases. Table 6.53 shows, first, that the Income Gap Ratio goes up from 0.41 to 0.51. Second, the Poverty Gap Index (PGI) grows from 0.31 to 0.38, equivalent to 24.3%, whereas the squared PGI also rises by 54.5%. In other words, the distance (gap) between the income of the poor and the poverty line gets widened and income inequality, that is, the severity of poverty, gets worse. Hence, within the framework of general equilibrium (and in the light of the assumptions made) and in the context of Chiapas, the elimination of *Oportunidades* can lead to higher poverty.

TABLE 6.53 POVERTY WITH CUMULATIVE SCENARIO FOUR

INDICATOR	HHD1		
	BASE	SIM	%Δ
INCOME GAP RATIO	0.41	0.51	
POVERTY GAP	0.31	0.38	24.3%
SQUARED POVERTY GAP	0.09	0.15	54.5%

Source: Own elaboration.

7. Discussion

In the light of the assumptions stated in chapter four, the opportunity cost of financing *Oportunidades* is given by the forgone investments in the agricultural, construction, manufacturing and mining sectors. The cumulative scenario one (CSIM1) provides better results on economic growth, informality, household income, and poverty reduction than the other three groups of policies. Table 7.1 shows an overview of main results by policy package. In cumulative scenario one, a 20%, 10%, and 5% increase in fixed investment in agriculture, construction, and manufacturing, combined with pro-poor redistributional changes of and a 50% increase in the educational and food components of *Oportunidades* boost notably real GDP by 6%. Moreover, informality falls in all economic activities, with exception of construction, and factor income increases as well. In this respect, formal labor income (w_f) grows much more than capital income (κ) and GDP growth (g), expressed as $w_f > \kappa > g$ in the table. The former rises by 18% while capital income and GDP growth do so by 11% and 6%, respectively. Total household income grows in all quintiles. However, it does so particularly for the poor. Pro-poor growth takes place in relative and absolute terms. In relative terms because the total income of the poorest goes up by 22% while that of quintile 5 increases by 4%, and in absolute terms because poverty falls.

TABLE 7.1 MAIN RESULTS

	CUMULATIVE SCENARIOS			
	CSIM1	CSIM2	CSIM3	CSIM4
GDP	6%	4%	3%	6%
GDP per capita	3.5%	1.6%	0.6%	3.5%
Informality	Declines, except in construction	Declines, except in construction & social services	Declines, except in construction	Declines, except in construction & social services
Factor income	$w_f > \kappa > g$	$w_f > \kappa > g$	$w_f < \kappa > g$	$w_f > \kappa > g$
Pro-poor growth	Yes	Yes	Yes	No
Poverty reduction	Yes	Yes	Yes	No
Growth elasticity of poverty	2.92%	1.62%	3.63%	n.a.

Source: Own elaboration.

Hence, a redistribution of *Oportunidades* and other social transfers such as Procampo, Pal-Sin Hambre, temporary employment program, and "Amanecer" – with the aim of targeting exclusively the poor thus eliminating the existing exclusion and inclusion errors – may also

reduce income inequality and contribute to poverty reduction. Poverty reduction, measured by the Poverty Gap Index, declines by 31%, and the growth elasticity of poverty reduction shows that for every one-percentage change in GDP poverty goes down by 2.92%. Such pro-poor redistribution of transfers may be done either extending the program's coverage or raising the amount of transferred cash. If the latter is carried out it might allow households to save a larger share of income to invest in farming assets or other productive activities, which might lead to break the intergenerational transmission of poverty. Finally, with these policy measures the average time required to exit poverty, that is, the average time for the poorest to reach the poverty line, is 10 years, assuming a sustained pro-poor GDP per capita growth rate of 3.5% in the framework of cumulative scenario one, *ceteris paribus*.

Investment in the construction sector translates into investment in infrastructure, mainly in transport and communication, which promotes diversification, structural transformation and rural change while reducing the vulnerability and risk faced by households. In this respect, Losch, Fréguin-Gresh and White (2012) point out that at very low levels of income (in which households only hardly meet their basic needs) the diversification of income sources does not take place and households are mainly engaged in on-farm activities. However, as household income begins to increase slightly households remain at risk but they gain some capacity to maneuver and build safety nets. As the process of income growth continues households start diversifying their economic activities in order to expand their sources of income and reduce their vulnerability to shocks. At this point the diversification process only occurs at the household level, the so-called *within-household* diversification, whereas in the region, agriculture specialization prevails. This process leads to a stage in which households are able to build an asset and wealth base by specializing in different economic activities, either on-farm or off-farm, with the aim of meeting their needs and lowering their risk and vulnerability whereas the region becomes economically diversified, the so-called *between-household* diversification. The whole process derives from the so-called *diversification-income relationship* that induces structural transformation and rural change through the diversification-specialization linkage (Losch, Fréguin-Gresh and White, 2012). Moreover, to detonate the whole process of diversification and transformation it is required to increase farm incomes in order to encourage rural demand. To satisfy the increased demand, the government must engage in the provision of public goods such as infrastructure, education

and health services, and investment in the agricultural sector especially where the value-chain needs capital.

Oportunidades and other social transfers, such as Procampo, Pal-Sin Hambre, universal pension, temporary employment program, and "Amanecer", are the main sources of income of the poor. Together they account for more than 60% of total household income of quintile 1. In this respect, cumulative scenario four (CSIM4) shows that the elimination of conditional cash transfers may be detrimental for poverty reduction in Chiapas. It may cause a significant fall in the income of the poor, impacting negatively household wellbeing. *Oportunidades* should not be suddenly eliminated without a strategy that may neutralize the regressive effect on income in quintile 1. However, it ought to be ensured that the program's targeting effectively and exclusively reaches the needy. The 20% richest households should not receive transfers from the government which are intended to eradicate poverty. Hence, a redistribution of transfers for poverty reduction, either conditional or not, needs to be pursued urgently. As displayed by the single simulations about *Oportunidades* and other social transfers, the reallocation of cash transfers, *ceteris paribus*, fosters pro-poor growth because it leads to greater changes in the total household income of the poor than in that of the non-poor.

Furthermore, as the current federal government of Enrique Peña Nieto is planning to extend the program's coverage to include the university level, it is necessary to fill in the existing gap between *Oportunidades*' beneficiaries and the labor market. In other words, the program seeks to enhance the human capital of the poor so that they may be able to join the formal labor market to increase their net disposable income and break the intergenerational transmission of poverty. However, within the current structure there is no linkage between beneficiaries and the labor market and there is no certainty that they will find a job in the formal sector, which is the only alternative to achieve a higher level of income and obtain social security benefits. A linkage between beneficiaries and the formal labor market is advisable to be built by implementing active labor market policies[59] with the aim of

[59] For instance, an apprenticeship system so that *Oportunidades* youth can do a fixed-term apprenticeship with a contract and an agreed wage in a formal enterprise. Such system might be co-financed by employers and the national and regional governments. For further information on the relationship between apprenticeships and enhanced job opportunities in the formal labor market see (Picchio & Staffolani, 2013).

increasing the likelihood of *Oportunidades* youth to get a job in the formal labor market. On the other hand, *Oportunidades* workers, *i.e.* parents who are beneficiaries of the program, require on-the-job training with the aim of acquiring new and improving skills so that they may increase their productivity, labor wage, and net disposable income (Levy, 2007). A program to link *Oportunidades* to the (formal) labor market may be co-financed by the corresponding enterprise and national and regional governments.

On the other hand, this study also finds that, contrary to what some think, migration is not a relevant phenomenon in Chiapas. It was initially considered to be included into the empirical analysis and modelling, however, in the end it was left out because it does not play a significant role in this region. According to the 2010 Census of Population and Housing carried out by the National Institute of Geography and Statistics (INEGI), in Chiapas only 0.45% of the population lives in other countries. It is ranked 27th of 31 states and the Federal District (D.F.) on this topic. International migration mainly takes place in other states such as Guanajuato, Zacatecas, Michoacán, Oaxaca and Hidalgo. Moreover, the National Population Council estimates for Chiapas an intra-state migration rate of only 0.53% (CONAPO, 2010).

Klasen (2009) argues that there are seven determinants of pro-poor growth: 1) improved productivity in agriculture; 2) reduced regional inequality; 3) reduced gender inequality; 4) strong state; 5) political economy; 6) improved asset based; and, 7) reduced inequality of disadvantage groups. Moreover, he also points out that in order to achieve reduced regional inequality five elements play a role: a) safety nets; b) infrastructure policies; c) targeted public investment for lagging regions; d) pro-poor fiscal decentralization; and, e) support for migration and remittances. In this respect, the cumulative scenario three, for instance, may lead to pro-poor growth through reduced regional inequality. It shows the potential positive impact on GDP and household income by rising investment in agriculture, construction, and mining while redistributing transfers to the poor in a budget-neutral fashion. Increased investment in agriculture may contribute to raise productivity while increased investment in construction may improve physical infrastructure and the provision of public services. Hence, targeted investment in these two sectors ought to be allocated in those lagging micro-regions in Chiapas. In this regard, as financial resources are scarce, prioritizing, targeting, and

sequencing matter. Consequently, the first investments and interventions are to be carried out, for instance, in the 20 municipalities with the highest levels of extreme poverty identified by the National Council for the Evaluation of Social Development Policy, presented below in table 7.2. In this table, municipalities in bold mean that they are currently receiving benefits from the federal program for the development of priority areas (PDZP). The suggested strategy in this study may start focusing on those extreme-poor municipalities not covered by the PDZP while an assessment is made in the current recipients of PDZP to identify areas in which those municipalities need further support.

TABLE 7.2 MUNICIPALITIES IN EXTREME POVERTY IN CHIAPAS (Percentage of population)

Municipality	%	Municipality	%
San Juan Cancuc	80.5	Tila	69.3
Chalchihuitán	**79.8**	Santiago el Pinar	69.2
Aldama	78.8	**Chanal**	**69.1**
Sitalá	**74.6**	Simojovel	68.6
Larráinzar	73.0	**Maravilla Tenejapa**	**68.2**
Chenalhó	72.3	**Amatenango del Valle**	**67.6**
Mitontic	**71.8**	Altamirano	66.9
Chilón	70.6	Sabanilla	66.3
Pantelhó	70.3	Tumbalá	65.6
Chamula	69.7	Tenejapa	65.2

Source: Own elaboration with data from CONEVAL.

Likewise, to achieve reduced regional inequality, structural transformation, rural change and poverty reduction, it is fundamental to focus on territorial development and the so-called *missing-middle*. From a regional development perspective, dealing with the *missing-middle* refers to the need to develop small and mid-size towns that may act as a bridge to link rural areas to urban centers (Losch, Fréguin-Gresh and White, 2012). The rural-urban linkage for territorial development requires an adequate provision, in terms of quantity and quality, of public goods and services such as education, health, physical infrastructure (roads, bridges, and so forth), water, electricity, and sewer system. In this regard, the cumulative scenario two, the second-best strategy for poverty reduction, shows that an increase in fixed investment in construction combined with higher government consumption in agriculture, construction, and social services such as education and health, along with a 10% cut of government consumption expenditure in public administration, fosters real GDP by 4%,

leading to higher household income and poverty reduction. Furthermore, informality declines in all economic activities, with the exception of construction, educational and health services, and the total household income of the poor grows much more than that of quintile 5. Total household income in quintile 1 rises by 10% while that in quintile 5, by 2%. As a result, poverty falls by 14% and the growth elasticity of poverty reduction shows that for every one-percentage change in GDP poverty goes down by 1.62%. In this context, the time required to exit poverty of households in quintile 1 is 27 years, assuming a sustained growth in real GDP per capita of 1.6%. Thus, the government of Chiapas should reallocate its consumption expenditure in agriculture, construction, education and health services, and invest further in construction through a spatially-targeted approach to focus on micro-regions with the potential to develop rural-urban economic ties.

Santiago Levy (2008) suggests that Mexico ought to move to a universal social security system financed by indirect taxes, especially by an increase in the value-added tax rate. In this respect, the simulation on the value-added tax shows that raising the rate from 16% to 19% does not induce a significant change on household consumption because households borrow. Nonetheless, the level of consumption expenditure shows that the 40% poorest families spend their entire income in consumption while the rest of households have some room for saving. Hence, an increase in the VAT rate harms the poor because they have to borrow to finance and sustain their levels of consumption. The government may compensate and protect the wellbeing of the poor by financing a universal social security system and targeted transfers to quintiles 1, 2 and 3, using the additional resources obtained from the indirect tax revenue, which grows by 14.6% spurred by the VAT. For an effective compensation, however, the government must be more efficient than it is nowadays to allocate such transfers. Perfect targeting might offset the prejudice on the poor, but in its absence badly allocated transfers might have counterproductive effects by deepening income inequality. Finally, given the low non-oil tax revenue that accounts for 8.4% as a share of GDP, a VAT-based tax reform might be part of a second generation of reforms, after the recently approved tax reform of 2013, to finance a comprehensive social reform.

Moreover, Levy also argues that the elimination of labor tax (social security contributions) may lower the incentives for workers to join the informal sector. This research tests such

hypothesis by eliminating both, the federal labor tax and the regional payroll tax. As shown in results of cumulative scenario one, in the light of the assumption that labor is mobile and fully employed, the elimination of labor and payroll taxes accompanied by further fixed investment in agriculture, construction, and manufacturing, pro-poor distributional changes in *Oportunidades* and other social transfers, and pro-poor tax rate changes in income taxes, cause the demanded quantity of informal labor to decline in all economic activities with the exception of construction. In contrast, the sole elimination of labor and payroll taxes, *ceteris paribus*, does not induce any significant change in the demand for informal labor.

With respect to direct taxes, besides the elimination or reduction of the labor tax, changes in corporate and household income tax do not have any significant impact on GDP, factor demand, and total household income in Chiapas. The latter may be attributed to the small size of the formal sector. Formal employment represents only 22% of the total labor force and formal workers typically earn the minimum wage or earn only slightly above it while 19% of the population does not earn any money income at all. And because of the low level of labor income the applicable tax rate is 2%. In consequence, the tax collection from direct taxes is noticeably low and the adjustment of tax rates leads to almost null changes in output, employment, and household income, given the current economic setting of Chiapas.

Finally, a third-best strategy for poverty reduction is given by the cumulative scenario three. It shows that a combination of fixed investment in agriculture, construction and mining, with pro-poor distributional changes in *Oportunidades* and budget-neutral adjustments in other social transfers such as Procampo, Pal-Sin Hambre, temporary employment program and "Amanecer", enhances real GDP by 3%. Moreover, the demanded quantity of informal labor declines in all economic activities with the exception of construction, factor income, and total household income which increase. Formal labor income grows by 3.5% while capital income rises by 8.5%. These policy measures generate pro-poor growth in relative and absolute terms. In relative terms because the income of the poor grow much more than that of the non-poor. The former goes up by 19.7% while the latter by 2%. In absolute terms because poverty falls. Poverty, measured by the Poverty Gap Index, declines by 28% while the growth elasticity of poverty reduction shows that a one-percentage change in GDP causes poverty to go down by 3.63%. The time required to exit poverty, that is, the average

time for the poorest to reach the poverty line, is 59 years, assuming a sustained GDP per capita growth rate of 0.6%.

The following chapter presents conclusions of this study and topics for further research.

8. Conclusion

Oportunidades was conceived as a temporary program to enhance the human capital of the poor with the aim of increasing their probability of finding a job in the formal economy, which would allow them to earn higher wages and raise total household income in order to break the intergenerational transmission of poverty. Conditional cash transfers have a positive impact on health, nutrition and education[60] of beneficiary household members along with positive spillover effects. However, given the current structure of the ongoing social policy and the lack of complementary policies, it is a necessary but insufficient tool for poverty reduction in the absence of sustainable economic growth and formal job creation.

The opportunity cost of financing conditional cash transfers is given by the forgone investments in the agricultural, construction, mining and manufacturing sectors in the regional setting of Chiapas. This work shows that a set of policies composed of a 20%, 10%, and 5% increase in fixed investment in agriculture, construction, and manufacturing, a 19% VAT rate, the elimination of labor and payroll taxes, a 10% increase of the corporate income tax rate, a 10% cut in the household income tax rate for quintile 2, a 50% increase in the educational and food components of *Oportunidades* for quintile 1 along with the elimination of the inclusion error, and pro-poor distributional changes in a budget-neutral fashion in Procampo, Pal-Sin Hambre, temporary employment program, and the regional program "Amanecer", can enhance a self-sustaining process of inclusive economic growth, reduce informality in all sectors (excepting construction), increase factor and household income, reduce poverty, and induce a process of structural transformation and rural change. This process might take place if such investments are carried out with a spatially-driven approach to develop rural-urban linkages for territorial development and cope with poverty traps such as missing and imperfect markets and lack of public goods.

Fixed investment in the agricultural sector refers, for instance, to the acquisition of capital goods such as tractors and machinery for on-farm activity, irrigation systems, and fertilizers, while in the construction sector fixed investment translates into infrastructure and public

[60] Mainly on enrollment and attendance rates (mostly at the secondary level). Nowadays transfers cover until completion of high school increasing, thus, the number of years of schooling of the beneficiaries (Levy & Rodriguez, 2005). Further, the new federal administration plans to extend the program's coverage to include the university level.

works oriented to provide public goods and services at the municipal level in Chiapas. In the case of manufacturing and mining sectors, fixed investment can take the form of capital goods to shift from light industry to a more capital intensive industry in the manufacturing sector. The mining sector is relevant in Chiapas because of its abundant natural resources, but this sector requires larger investment in technology for exploration, extraction, production, refining of crude oil, natural gas and liquids processing, and commercialization.

However, it must be pointed out that the implementation of these policy sets requires, on the one hand, the political will to put into action a pro-poor agenda to enhance inclusive (rural) growth and development, and, on the other hand, the collaboration and coordination of both federal and regional governments to execute, in parallel, economic policies that are within their corresponding jurisdiction.

In the context of the current international debate on income inequality stimulated by Thomas Piketty's book *Capital in the Twenty-First Century*, this research also shows that, with the combination of policies described above, formal labor income can grow at a higher rate than capital income and GDP growth, which has significant implications within the processes of structural transformation and poverty reduction, assuming that the formal labor income growth rate can be sustained over time. If the latter condition can be met, formal labor income would strengthen the financial situation of households allowing them to save or invest a larger share of net disposable income on (1) alternative non-farm economic activities, and/or on (2) health and educational/training services for household members, which would, on the one hand, enhance their potential to obtain better jobs and higher wages in the formal labor market, and, on the other hand, would foster higher rural/urban demand, encouraging economic growth and job creation while decreasing household's dependency on social transfers and leading to poverty reduction.

Likewise, *Oportunidades* has to be complemented by the construction of a linkage with the formal labor market. This might be achieved by implementing active labor market policies so that poor workers may obtain or improve their skills. As conditional cash transfers will be extended by the current federal government to cover beneficiaries at the university level, it is advisable to fill in the existing gap between formal labor markets and *Oportunidades* with

the aim of increasing the likelihood of poor workers to find a formal job so that they may earn higher wages and raise their net disposable income, which would allow them to break the intergenerational transmission of poverty.

Under the current level and structure of household income, *Oportunidades* ought not to be eliminated because it could have a severe negative impact on the poor. Whereas investments in the suggested economic sectors for the provision of public goods and development of the *missing-middle* are executed and the diversification-specialization process takes off, the household selection process for the allocation of transfers that are intended for poverty reduction should be improved. Moreover, the possibility of increasing the transferred amount of cash for the 20% poorest households should also be explored because it might allow them to save a larger share of their income to invest in assets or productive activities. This would eventually help them diversify their income sources and ultimately break the intergenerational transmission of poverty. It is also relevant to make sure that *Oportunidades* and other social programs such as Procampo, Pal-Sin Hambre, temporary employment program, and "Amanecer", exclusively reach the poor. The latter is to be accompanied by a reduction in the government current expenditure in public administration to prioritize investment in lagging micro-regions in Chiapas for poverty reduction.

This study also shows that raising the VAT rate by 18.75% increases the indirect tax revenue by 14.6%, in the regional setting of Chiapas, even though it harms the poor. The negative effects might be compensated through targeted interventions and a redistribution of *Oportunidades* and other non-conditional social transfers. Furthermore, the elimination of social security contributions and the regional payroll tax increases factor and household income, even though the elimination of the payroll tax has a negative impact on the tax revenue of the regional government. Such effect might be offset through federal transfers or grants using the additional federal tax revenue boosted by a higher VAT rate.

Lastly, this study is different from previous CGE-based works on Mexico in that it is focused on the state-level to assess the opportunity cost of financing conditional cash transfers for poverty reduction. It is the first CGE model for the regional economy of Chiapas, the poorest

State in Mexico where *Oportunidades* covers all of the 118 municipalities. With a country-based approach one can reach more general conclusions, which might not necessarily translate into realistic policy alternatives for poverty reduction in lagging regions. This is particularly true in large and heterogeneous countries such as Mexico, a country characterized by its profound regional inequality.

Therefore, a state-level analysis, such as the present study for Chiapas, allows identification of local poverty traps and constraints for poverty reduction. Moreover, the applied CGE in a bottom-up approach for Chiapas allows evaluating productive activities according to the North American Industry Classification System (NAICS), investment targeting, government expenditure, and social transfers, which are broken down into *Oportunidades* by component (food, education, elderly, child, and energy), Procampo, Pal-Sin Hambre, universal pension, temporary employment program, and the regional program known as "Amanecer". Hence, the main contribution of this study is to shed light on the most politically feasible combination of policies (represented by the cumulative scenario one, CSIM1) to create a fiscal and investment flow to enhance inclusive economic growth, reduce poverty, and boost a process of rural change and structural transformation to reach a higher state of economic development in the regional setting of Chiapas.

Further research should focus on the dynamic version of the applied CGE model with the aim of assessing inter-temporal changes in household income to find out how long it would take for households to finally escape and break the intergenerational transmission of poverty and achieve the structural transformation and rural change induced by the diversification-income process. In addition, future research should also explore (1) the extension of the labor supply to evaluate the decision-making process of workers to join the formal sector; and (2) implement an applied model of equalization transfers, as suggested in this study. Finally, it might also be interesting to carry out a similar exercise on the opportunity cost of financing *Oportunidades* at national level to assess the issue from a national perspective to find out complementary alternatives for the eradication of poverty in Mexico.

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Appendix 1: Mathematical Statement for the CGE model

SETS

A_{ac}	activities
$ACES_{a}$	activities with CES fn. at top of technology nest
$ALEO_{a}$	activities with Leontief fn. at top of technology nest
C_{ac}	commodities
CD_{c}	commodities with domestic sales of output
CDN_{c}	commodities without domestic sales of output
CE_{c}	exported commodities
CEN_{c}	non-export commodities
CM_{c}	imported commodities
CMN_{c}	non-imported commodities
CX_{c}	commodities with output
F_{ac}	factors of production
INS_{ac}	institutions
$INSD_{i}$	domestic institutions
$INSDNG_{i}$	domestic non-government institutions
H_{i}	households
E_{i}	enterprises
T_{ac}	taxes
$CINV_{c}$	fixed investment goods
CT_{c}	transaction service commodities
CTD_{ac}	domestic transactions cost account
CTE_{ac}	export transactions cost account
CTM_{ac}	import transactions cost account

PARAMETERS

α_a^a	shift parameter for top level CES function
α_a^{ac}	shift parameter for domestic commodity aggregation fn
α_c^q	shift parameter for Armington function
α_c^t	shift parameter for CET function
α_a^{va}	shift parameter for CES activity production function
$\beta_{a,c,h}^h$	marginal share of consumption spending on home commodity c from activity a for household h
$\beta_{c,h}^m$	marginal share of consumption spending on marketed commodity c for household h
cwts_c	consumer price index weights
δ_a^a	CES activity function share parameter
$\delta_{a,c}^{ac}$	share parameter for domestic commodity aggregation function
δ_c^q	Armington function share parameter
δ_c^t	CET function share parameter
$\delta_{f,a}^{va}$	CES value-added function share parameter for factor f in activity a
dwts_c	domestic sales price weights
$\gamma_{a,c,h}^h$	subsistence consumption of home commodity c from activity a for household h
$\gamma_{c,h}^m$	subsistence consumption of marketed commodity c for household h
$\mathrm{ica}_{c,a}$	intermediate input c per unit of aggregate intermediate
inta_a	aggregate intermediate input coefficient
iva_a	aggregate value added coefficient
$\mathrm{icd}_{c,c'}$	trade input of c per unit of com cp produced & sold dom'ly
$\mathrm{ice}_{c,c'}$	trade input of c per unit of com cp exported
$\mathrm{icm}_{c,c'}$	trade input of c per unit of com cp imported
$\mathrm{mps01}_i$	0-1 par for potential flexing of savings rates
$\overline{\mathrm{mps}}_i$	base savings rate for domestic institution i
qdst_c	quantity of stock change

$\overline{qg}_c$	base-year quantity of government demand
$\overline{qinv}_c$	base-year quantity of private investment demand
rho_a^a	CES production function exponent
rho_c^{ac}	domestic commodity aggregation function exponent
rho_c^q	Armington function exponent
rho_c^t	CET function exponent
rho_a^{va}	CES value-added function exponent
$shif_{i,f}$	share for domestic institution i in income of factor f
$shii_{i,i'}$	share of net income of I' to i (i' ∈ INSDNG'; i ∈ INSDNG)
$supernum_h$	LES supernumerary income
$\theta_{a,c}$	yield of output c per unit of activity a
$sbpd_a$	subsidies of production
ta_a	tax rate for activity a
tam_i	rate of "tenencia" tax (regional) for domestic institution i
te_c	export tax rate
tf_f	direct tax rate for factor f (social security contributions)
$tins01_i$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates
$\overline{tins}_i$	exogenous direct tax rate for domestic institution i
tm_c	import tariff rate
tq_c	rate of sales tax
$trnsfr_{i,f}$	transfer from factor f to institution i
$trnsfr2_{f,i}$	transfers from the rest of the world to factor f
tva_a	rate of value-added tax for activity a
ty_f	rate of payroll tax (regional)

EXOGENOUS VARIABLES

$\overline{CPI}$	consumer price index
$\overline{DTINS}$	change in domestic institution tax share (= 0 for base; exogenous variable)

$\overline{\text{FSAV}}$	foreign savings (FCU)
$\overline{\text{GADJ}}$	government consumption adjustment factor
$\overline{\text{IADJ}}$	investment adjustment factor
$\overline{\text{MPSADJ}}$	savings rate scaling factor (= 0 for base)
$\overline{\text{QFS}_\text{f}}$	quantity supplied of factor
$\overline{\text{TINSADJ}}$	direct tax scaling factor (= 0 for base; exogenous variable)
$\overline{\text{WFDIST}_{\text{f,a}}}$	wage distortion factor for factor f in activity a

ENDOGENOUS VARIABLES

DPI	producer price index for domestically marketed output
DMPS	change in domestic institution savings rates (= 0 for base; exogenous variable)
EG	government expenditures
EH_h	consumption spending for household
EXR	exchange rate
GOVNSHR	government consumption share in nominal absorption
GSAV	government savings
INVSHR	investment share in nominal absorption
MPS_i	marginal propensity to save for domestic nongovernment institution (exogenous variable)
PA_a	activity price (unit gross revenue)
PDD_c	demand price for commodity produced and sold domestically
PDS_c	supply price for commodity produced and sold domestically
PE_c	export price (domestic currency)
PINTA_a	aggregate intermediate input price for activity a
PM_c	import price (domestic currency)
PQ_c	composite commodity price
PVA_va	value-added price (factor income per unit of activity)
PWE_c	world export price
PWM_c	world import price

PX_c	aggregate producer price for commodity
$PXAC_{a,c}$	producer price of commodity c for activity a
QA_a	quantity (level) of activity
QD_c	quantity sold domestically of domestic output
QE_c	quantity of exports
$QF_{f,a}$	quantity required of factor f from activity a
QG_c	government consumption demand for commodity
$QH_{c,h}$	quantity consumed of commodity c by household h
$QHA_{c,h}$	quantity of household home consumption of commodity c from activity a for household h
$QINT_{c,a}$	quantity of commodity c as intermediate input to activity a
$QINTA_a$	quantity of aggregate intermediate input
$QINV_c$	quantity of investment demand for commodity
QM_c	quantity of imports of commodity
QQ_c	quantity of goods supplied to domestic market (composite supply)
QT_c	demanded quantity of commodity as trade input
QVA_a	quantity of aggregate value-added
QX_c	aggregated marketed quantity of domestic output of commodity
$QXAC_{a,c}$	quantity of marketed output of commodity c from activity a
$TABS$	total nominal absorption
$TINS_i$	direct tax rate for institution i (i' ∈ INSDNG)
$TRII_{i,i'}$	transfers from institution i' to i (both in the set INSDNG)
WF_f	average price of factor f
YF_f	income of factor f
YG	government revenue
$YIF_{i,f}$	income to domestic institution i from factor f
YI_i	income of domestic nongovernment institution

EQUATIONS

Price Block

Import price

$$PM_c = pwm_c * (1 + tm_c) * EXR + \sum_{c' \in CT} PQ_c * icm_{c'c} \qquad c \in CM$$

Export price

$$PE_c = pwe_c * (1 - te_c) * EXR - \sum_{c' \in CT} PQ_{c'} * ice_{c'c} \qquad c \in CE$$

Demand price of domestic non-traded goods

$$PDD_c = PDS_c + \sum_{c' CT} PQ_{c'} * icd_{c'c} \qquad c \in CD$$

Absorption

$$PQ_c * (1 - tq_c - sbgs_c) * QQ_c = PDD_c * QD_c + PM_c * QM_c \qquad c \in (CD \cup CM)$$

Marketed output value

$$PX_c * QX_c = PDS_c * QD_c + PE_c * QE_c \qquad c \in CX$$

Activity price

$$PA_a = \sum_{c \in C} PXAC_{a\,c} * \theta_{a\,c}$$

Aggregate intermediate input price

$$PINTA_a = \sum_{c \in C} PQ_c * ica_{c\,a} \qquad a \in A$$

Activity revenue and costs

$$PA_a * (1 - ta_a) * QA_a = PVA_a * QVA_a + PINTA_a * QINTA_a \qquad a \in A$$

Consumer price index

$$\overline{CPI} = \sum_{c \in C} PXAC_{a\,c} * PQ_c$$

Producer price index for non-traded market output

$$DPI = \sum_{c \in C} PDS_c * dwts_c$$

Production and Trade Block

CES technology: Activity production function

$$QA_a = \alpha_a^a * \left(\delta_a^a * QVA_a^{-\rho_a^a} + (1 - \delta_a^a) * QINTA_a^{-\rho_a^a}\right)^{-\frac{1}{\rho_a^a}} \qquad a \in ACES$$

CES technology: Value-added function

$$QVA_a = QINTA_a * \left(\frac{PINTA_a}{PVA_a} * \frac{\delta_a^a}{1-\delta_a^a}\right)^{\frac{1}{1+\rho_a^a}} \qquad a \in ACES$$

Leontief technology: Demand for aggregate intermediate input

$$QINTA_a = inta_a * QA_a \qquad a \in ALEO$$

Leontief technology: Demand for aggregate value-added

$$QVA_a = iva_a * QA_a \qquad a \in ALEO$$

Value-added and factor demands

$$QVA_a = \alpha_a^{va} * \left(\sum_{f \in F} \delta_{fa}^{va} * QF_{fa}^{-\rho_a^{va}}\right)^{-\frac{1}{\rho_a^{va}}} \qquad a \in A$$

Factor demand

$$WF_f * \overline{WFDIST}_{fa} =$$

$$PVA_a * (1 - tva_a) * QVA_a * \left(\sum_{f \in F'} \delta_{fa}^{va} * QF_{fa}^{-\rho_a^{va}}\right)^{-1} * \delta_a^{va} * QF_{fa}^{-\rho_a^{va}-1} \qquad a \in A, \; f \in F$$

Disaggregated intermediate input demand

$$QINT_{ca} = ica_{ca} * QINTA_a \qquad a \in A, \; f \in F$$

Commodity production and allocation

$$QXAC_{ac} + \sum_{h \in H} QHA_{ach} = \theta_{ac} * QA_a \qquad a \in A, \; c \in C$$

Output aggregation function

$$QX_c = \alpha_c^{ac} * \left(\sum_{a \in A} \delta_{ac}^{ac} * QXAC_{ac}^{-\rho_c^{ac}}\right)^{-\frac{1}{\rho_c^{ac}-1}} \qquad c \in CX$$

First-order condition for output aggregation function

$$\mathrm{PXAC}_{a\,c} = \mathrm{PX}_c * \mathrm{QX}_c \left(\sum_{a \in A'} \delta_{a\,c}^{ac} * \mathrm{QXAC}_{a\,c}^{-\rho_c^{ac}}\right)^{-1} * \delta_{a\,c}^{ac} * \mathrm{QXAC}_{a\,c}^{-\rho_c^{ac}-1} \qquad a \in A$$

$$c \in CX$$

Output transformation (CET) function

$$\mathrm{QX}_c = \alpha_c^t * \left(\delta_c^t * \mathrm{QE}_c^{\rho_c^t} + (1-\delta_c^t) * \mathrm{QD}_c^{\rho_c^t}\right)^{\frac{1}{\rho_c^t}} \qquad c \in (CE \cap CD)$$

Exports function

$$\mathrm{QE}_c = \mathrm{QD}_c * \left(\frac{\mathrm{PE}_c}{\mathrm{PDS}_c} * \frac{1-\delta_c^t}{\delta_c^t}\right)^{\frac{1}{\rho_c^t-1}} \qquad c \in (CE \cap CD)$$

Output transformation for non-exported commodities

$$\mathrm{QX}_c = \mathrm{QD}_c + \mathrm{QE}_c \qquad c \in (CD \cap CEN) \cup (CE \cup CDN)$$

Composite supply

$$\mathrm{QQ}_c = \alpha_c^q * \left(\delta_c^q * \mathrm{QM}_c^{-\rho_c^q} + \left(1-\delta_c^q\right) * \mathrm{QD}_c^{-\rho_c^q}\right)^{-\frac{1}{\rho_c^q}} \qquad c \in (CM \cap CD)$$

Imports function

$$\mathrm{QM}_c = \mathrm{QD}_c * \left(\frac{\mathrm{PDD}_c}{\mathrm{PM}_c} * \frac{\delta_c^q}{1-\delta_c^q}\right)^{\frac{1}{1+\rho_c^q}} \qquad c \in (CM \cap CD)$$

Composite supply for non-imported outputs and non-produced imports

$$\mathrm{QQ}_c = \mathrm{QD}_c + \mathrm{QM}_c \qquad c \in (CD \cap CMN) \cup (CM \cup CDN)$$

Demand for transaction services

$$\mathrm{QT}_c = \sum_{c' \in C'} (\mathrm{icm}_{c\,c'} * \mathrm{QM}_{c'} + \mathrm{ice}_{c\,c'} * \mathrm{QE}_{c'} + \mathrm{icd}_{c\,c'} * \mathrm{QD}_{c'}) \qquad c \in CT$$

Institution Block

Factor income

$$\mathrm{YF}_f = \sum_{a \in A} \mathrm{WF}_f * \overline{\mathrm{WFDIST}}_{f\,a} * \mathrm{QF}_{f\,a} + \mathrm{trnsfr2}_{f\,\mathrm{rowd}} * \mathrm{EXR} \qquad f \in F$$

Institutional factor income

$$YIF_{i\,f} = shif_{i\,f} * [(1 - tf_f - ty_f) * YF_f - trnsfr_{rowd\,f} * EXR] \qquad i \in INSD; f \in F$$

Income of domestic non-government institutions

$$YI_i = \sum_{f \in F} YIF_{i\,f} + \sum_{i' \in INSDNG} TRII_{i\,i'} + trnsfr_{i\,govt} + trnsfr_{i\,food} + trnsfr_{i\,educ} + trnsfr_{i\,engy} + trnsfr_{i\,chld} + trnsfr_{i\,eldy} + trnsfr_{i\,proc} + trnsfr_{i\,unpe} + trnsfr_{i\,pals} + trnsfr_{i\,pemt} + trnsfr_{i\,aman} + trnsfr_{i\,rowd} * EXR$$

$$i \in INSDNG$$

Intra-institutional transfers

$$TRII_{i\,i'} = shii_{i\,i'} * (1 - MPS_{i'}) * (1 - TINS_{i'}) * (1 - tam_{i'}) * YI_{i'}$$

$$i \in INSDNG; i' \in INSDNG'$$

Household consumption expenditure

$$EH_h = (1 - \sum_{i \in INSDNG} shii_{i\,h}) * (1 - MPS_h) * (1 - TINS_h) * (1 - tam_h) * YI_h \qquad h \in H$$

Household consumption demand for marketed commodities

$$PQ_c * QH_{c\,h} = PQ_c * \gamma^m_{c\,h} + \beta^m_{c\,h} * \left(EH_h - \sum_{c' \in C} PQ_{c'} * \gamma^m_{c'h} - \sum_{a \in A} \sum_{c' \in C} PXAC_{a\,c'} * \gamma^h_{a\,c'h}\right)$$

$$c \in C; h \in H$$

Household consumption demand for home commodities

$$PXAC_{a\,c} * QHA_{a\,c\,h} = PXAC_{a\,c} * \gamma^h_{a\,c\,h} + \beta^h_{a\,c\,h} * \left(EH_h - \sum_{c' \in C} PQ_{c'} * \gamma^m_{c'h} - \sum_{a \in A} \sum_{c' \in C} PXAC_{a\,c'} * \gamma^h_{a\,c'h}\right)$$

$$a \in A; c \in C; h \in H$$

Investment demand

$$QINV_c = \overline{IADJ} * \overline{qinv}_c \qquad c \in CINV$$

Government consumption demand

$$QG_c = \overline{GADJ} * \overline{qg}_c \qquad c \in C$$

Government revenue

$$
\begin{aligned}
YG = & \sum_{i \in INSDNG} TINS_i * YI_i \\
& + \sum_{f \in F} tf_f * YF_f \\
& + \sum_{a \in A} tva_a * PVA_a * QVA_a \\
& + \sum_{a \in A} ta_a * PA_a * QA_a + \sum_{c \in CM} tm_c * pwm_c * QM_c * EXR \\
& + \sum_{c \in CE} te_c * pwe_c * QE_c * EXR \\
& + \sum_{c \in C} tq_c * PQ_c * QQ_c + \sum_{c \in C} ty_f * YF_f + \sum_{f \in F} YIF_{govn\ f} + \sum_{i \in INSDNG} tam_i * YI_i \\
& + trnsfr_{govt\ govt} * \overline{CPI} + trnsfr_{govt\ rowd} * EXR
\end{aligned}
$$

Government expenditure

$$
\begin{aligned}
EG = & \sum_{c \in C} PQ_c * QG_c + \sum_{i \in INSDNG} trnsfr_{i\ govt} * \overline{CPI} \\
& + \sum_{i \in INSDNG} trnsfr_{food\ govt} \\
& + \sum_{i \in INSDNG} trnsfr_{educ\ govt} \\
& + \sum_{i \in INSDNG} trnsfr_{engy\ govt} \\
& + \sum_{i \in INSDNG} trnsfr_{chld\ govt} \\
& + \sum_{i \in INSDNG} trnsfr_{eldy\ govt} \\
& + \sum_{i \in INSDNG} trnsfr_{proc\ govt} \\
& + \sum_{i \in INSDNG} trnsfr_{unpe\ govt} \\
& + \sum_{i \in INSDNG} trnsfr_{pals\ govt} \\
& + \sum_{i \in INSDNG} trnsfr_{pemt\ govt} + \sum_{i \in INSDNG} trnsfr_{aman\ govt} + * \overline{CPI} \\
& + \sum_{i \in INSDNG} trnsfr_{i\ govr} * \overline{CPI} + trnsfr_{govt\ govt} * \overline{CPI}
\end{aligned}
$$

System Constraint Block

Factor market

$$\sum_{a \in A} QF_{f\,a} = \overline{QFS_f} \qquad f \in F$$

Composite commodity markets

$$QQ_c = \sum_{a \in A} QINT_{c\,a} + \sum_{h \in H} QH_{c\,h} + QG_c + QINV_c + qdst_c + QT_c \qquad c \in C$$

Current account balance for the rest of the world

$$\sum_{c \in CM} pwm_c * QM_c + \sum_{f \in F} trnsfr_{rowd\,f} = \sum_{c \in CE} pwe_c * QE_c + \sum_{i \in INSD} trnsfr_{i\,rowd} + \overline{FSAV}$$

Government balance

$$YG = EG + GSAV$$

Direct institutional tax rates

$$TINS_i = \overline{tins_i} * (1 + \overline{TINSADJ} * tins01_i) + \overline{DTINS} * tins01_i \qquad i \in INSDNG$$

Institutional savings rates

$$MPS_i = \overline{mps_i} * (\overline{MPSADJ} * mps01_i) + DMPS * mps01_i \qquad i \in INSDNG$$

Domestic non-government institutions savings

$$INSSAV_i = MPS_i * (1 - TINS_i) * YI_i$$

Savings-Investment balance

$$\sum_{i \in INSDNG} MPS_i * (1 - TINS_i - tam_i) * YI_i + GSAV + EXR * \overline{FSAV} = \sum_{c \in C} PQ_c * QINV_c + \sum_{c \in C} PQ_c * qdst_c$$

Total absorption

$$TABS = \sum_{a \in A} \sum_{c \in C} PQ_c * QH_{c\,h} + \sum_{a \in A} \sum_{c \in C} \sum_{h \in H} PXAC_{a\,c} * QHA_{a\,c\,h} + \sum_{c \in C} PQ_c * QG_c + \sum_{c \in C} PQ_c * QINV_c + \sum_{c \in C} PQ_c * qdst_c$$

Ratio of investment to absorption

$$\mathrm{INVSHR} * \mathrm{TABS} = \sum_{c \in C} \mathrm{PQ}_c * \mathrm{QINV}_c + \sum_{c \in C} \mathrm{PQ}_c * \mathrm{qdst}_c$$

Ratio of government consumption to absorption

$$\mathrm{GOVSHR} * \mathrm{TABS} = \sum_{c \in C} \mathrm{PQ}_c * \mathrm{QG}_c$$

Appendix 2: Disaggregated Social Accounting Matrix

2012 CHIAPAS MICRO-SAM
(Billions of pesos)

	A_AA	A_MA	A_LA	A_CA	A_MA_TI	A_CA	A_EA	A_FA	P_AC	A_NC	L_CC	C_MC	T_CO	C_EC	F_FC	P_TC	T_TC	T_TC	F_FI	F_ILF	C/T_UT	P_TC	T_VT	S_IT	E_AT	I_IT	C_SE	I_HH	I_HH	I_HH	I_HH	I_HH	I_FR	I_GO	I_AM	I_FO	I_EL	I_ED	I_CH	I_EN	I_PR	I_UN	P/I_PE	I_SL	I_ST	I_RO	I_TO
A_AGRC									26																			3	2																			30
A_MING										27																																						27
A_UTIL											11																																					11
A_CNST												45																																				45
A_MANU													149																																			149
A_TRDE														78																																		78
A_OSER															82																																	82
A_EDUS																25																																25
A_HEAS																	10																															10
A_PADM																		21																															21
C_AGRC	5	0	0	0	29	0	0	0	0	0																	1	1	1	1	0		1											0	1	4	44
C_MING	0	0	0	1	16	0	0	0	0	0																																			3	0	13	33
C_UTIL	0	0	0	0	2	1	2	0	0	0																	0	0	0	1	2		0													0	10
C_CNST	0	0	0	3	0	0	0	0	0	0																							1											40			46
C_MANU	3	2	3	10	68	11	6	0	1	2																	2	3	5	11	44		1											12	1	45	230
C_TRDE	0	0	0	0	0	1	0	0	0	0									27	9	8						0	1	2	8	30															0	88
C_OSER	0	1	0	2	6	8	12	1	1	2																	2	7	13	17	26		2											1		1	102
C_EDUS	0	0	0	0	0	0	0	0	0	0																	2	1	1	1	0		23														29
C_HEAS	0	0	0	0	0	0	0	0	0	0																	1	1	0	0	0		8														10
C_PADM	0	0	0	0	0	0	0	0	0	0																	0	0	0	0	0		21														21
TC_DOME									7	1	0		19																																			27
TC_IMPT									1	0			8																																			9
TC_EXPT									2	1	0		6																																			8
F_FLAB	1	0	0	1	2	7	5	5	3	4																																						30
F_ILAB	16	0	0	4	3	7	10	1	0	1																																						42
F_CAPR	5	23	7	23	21	42	46	16	4	10																																						196
T_LBTX	0	0	0	0	0	0	0	1	0	1																																						3
T_PYTX	0	0	0	0	0	0	0	0	0	0																																						1
T_CPTX	0	0	0	0	0	0	0	0	0	0																																						1
T_VATX									-1	0	-1	1	1	1	3	0	0																															4
T_SLTX									0	0	0	0	1	0	1		0																															2
T_IMTX									0	0	0		0	0	0																																	0
T_EXTX									0	0	0	0	0	0	0	0	0	0																															0
T_AMTX																											0	0	0	0	0																		0
T_INTX																											0	0	1	1	5																		7
T_CITX																																4																4
T_SBPD					-0.1																																												0
I_HHD1																			1	2	0											0	2	1	1	0	1	0	0	0	1	1	0			1	10
I_HHD2																			2	4	1											3	2	0	1	0	1	0	0	0	0	1	0			1	16
I_HHD3																			4	6	1											7	3	0	1	0	0	0	0	0	0	1	0			2	25
I_HHD4																			7	10	2											18	3	0	0	0	0	0	0	0	0	1	0			2	43
I_HHD5																			16	21	23											62	8	0	0	0	0	0	0	0	0	0	0			2	134
I_FRMS																					169																											169
I_GOVT																					0	3	1	1	4	2	0	0	0	7	4	-0.1															95
I_AMAN																																	2														2
I_FOOD																																	3														3
I_ELDY																																	0														0
I_EDUC																																	3														3
I_CHLD																																	0														0
I_ENGY																																	0														0
I_PROC																																	1														1
I_UNPE																																	1														1
I_PALS																																	3														3
I_PEMT																																	0														0
I_SIAC																												1	4	25	74	-66														20	59
I_STCK																																													2		2
I_ROWD									9	4	1		47	9	15	4																															90
I_TOTL	30	27	11	45	149	78	82	25	10	21	44	33	10	46	230	88	102	29	10	21	27	9	8	30	42	196	3	1	1	4	2	0	0	0	7	4	0	10	16	25	43	134	169	95	2	3	0	3	0	0	1	1	3	0	59	2	90	