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EQUITY FOR SUSTAINED GROWTH: PERNAMBUCO STATE EQUITY ASSESSMENT

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EQUITY FOR SUSTAINED GROWTH:

PERNAMBUCO STATE EQUITY ASSESSMENT

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Introduction

Born in Pernambuco, Joao Cabral de Melo Neto is one of the best Brazilian poets of the twentieth century. In *Vida e Morte Severina*, his beautiful dramatic poem, Cabral describes the long journey of a man from the interior, migrating to the coastal area of the state in search of a better future. Severino, the poem says, lives a life undistinguishable from many others ("…As there are many *Severinos*"):

"And all of us Severinos
With the same lives
Will die of the same
Severe Severino death,
The death died
Of old age before thirty
Of an ambush before twenty
And of hunger day by day…"[1]

A *severe, Severino life* was indeed the fate of most people in Pernambuco—historically, one of the poorest states of Brazil. The poem, in its vivid and musical metrics, describes the hardships and challenges faced by people living in the poorest regions of the Brazilian Northeast, in Brazil as a whole or—for that matter—in many other places of Latin America. Focusing on Pernambuco, to the interior of the state, circumstances such as gender, location and race have historically been correlated with lower socioeconomic achievement; a situation that mimics that of the rest of the country. Governments in the state have tried to overcome the development gaps by establishing policies that increase the coverage of services and create better opportunities.

The state of Pernambuco has undergone an important transformation over the last fifteen years. This has been the result of the more stable macroeconomic environment in Brazil as a whole, but it is also related to important policy reforms, including the expansion of the SUAPE port, the introduction of incentives for private investors and extensive investments in social services. The present report aims to analyze the policy factors associated with Pernambuco's progress and challenges in closing gaps—with the rest of Brazil, within its territory, and between individuals—through equitable growth.

Starting from the aggregate, the report first describes how Pernambuco has fared with respect to the rest of Brazil, both in terms of economic and social welfare performance, over the last decade (2001-2012). In a context of widespread economic growth, Pernambuco has done particularly well in recent years, similar to or above the national average. A key challenge concerns the longer-term, where—

[1] Original, in Portuguese: "*E se somos Severinos / iguais em tudo na vida, / morremos de morte igual, / mesma morte severina: / que é a morte de que se more / de velhice antes dos trinta, / de emboscada antes dos vinte, / de fome um pouco por dia…".* Translation to English borrowed from Milton, John (1998), "*Severino* in English", *Cadernos de Literatura em Tradução*, n. 2, p. 107-11.

notwithstanding the positive performance of recent years—the same level of growth may not be as easily sustained.

The solid economic performance has been reflected in an improvement of social indicators, also associated with the government's *interiorização* strategy, a policy developed explicitly to increase the coverage of public services in underserved areas, with a focus on the interior of the state. The decline in poverty rates displays a trajectory towards convergence with Brazil and recently, a faster than national decline of the Gini has brought Pernambuco's income inequality below the national and Northeast level.

The study then delves into what is happening in the interior of the state, looking at territorial inequalities and horizontal aspects of equity. To shed light on the Government's *interiorização* development strategy, the report analyses first whether economic convergence is taking place between municipalities within Pernambuco. It is. The variation in income per capita among municipalities in Pernambuco has been steadily declining in recent years (*sigma convergence*), suggesting that the improvement in equitable access to services has translated into inequality reductions among municipalities. Furthermore, poorer municipalities have grown more than richer ones (*beta convergence*), with positive effects on poverty reduction. In both cases, the evidence reflects that *interiorização* policies are being effective in the promotion of equitable growth.

Following economic convergence, we look at how the region is faring in terms of social welfare. Social progress is assessed through a composite measure monitoring income inequality, monetary poverty, multiple deprivations, and children's likelihood to access basic services (measured through the Human Opportunity Index, HOI). Indeed, between 2001 and 2011, Pernambuco progressed more in terms of social welfare than the rest of the country and the Northeast, and is in fact, converging with Brazil in terms of how equitably opportunities are distributed. The substantial increase in access to opportunities has been pushed by changes both in the coverage and in the *equity of access* to services and assets. Significantly, looking at the state as a whole, the expansions in access to services have been carried out in such a way that the provision has been increasing for traditionally excluded groups (such as individuals in rural areas, or those born to parents with lower education). When broken down by circumstance, the distribution of opportunities is found to be determined, above all, by geographic location, followed by the education of the household head. Given that geographic location is highly correlated with characteristics of otherwise excluded groups, by addressing territorial gaps, other inequalities are being tackled by association.

Zooming in at the municipality level, a key level in a federal state such as Brazil, all municipalities have seen improvements in wellbeing, suggesting that *interiorização* policies are also being effective in this aspect of shared prosperity. Furthermore, the municipalities with the initially lowest levels of social welfare have improved relatively more than initially better-off municipalities.

While *all* municipalities have seen economic and social improvements and initially worse-off municipalities have improved more than the better off, the gap between richer and poorer, both in terms of GDP per capita and in terms of the diamond of social welfare, has only gotten bigger as the absolute change needed by poorer municipalities to catch up is large. A policy response more focused

on building up capacity in the provision of access to services in these municipalities could thus be of help in achieving territorial equity. The establishment of a municipal fund (*Fundo Estuadual de Apoio ao Desenvolvimento Municipal* – FEM) [2] in March 2013, which complements the funds received by municipalities through the *Fundo de Participação dos Municípios* (FPM)[3], goes in that direction, and the findings of the equity assessment are expected to inform the next steps of this fund in light of the first year of its implementation.

The last sweep in this zoom-in process looks at what is happening to people: how are households faring in terms of poverty, access to services, economic opportunities? Despite the progress achieved in the reduction of growth gaps and in the equitable coverage of social services, economic dynamics still shape productivity patterns. Individuals move to the areas where there are more economic opportunities, triggering the presence of agglomerations poles in the state—the most important one being the Metropolitan Area of Recife (MAR). The report thus identifies 'push' and 'pull' factors of migration, to shed light on the municipalities more desirable to live or work in and why. Gravity models are used to understand the policies and conditions that attract (or repel) people to migrate between municipalities. Economic factors such as employment rates, the share of services in the economy, and income per capita are found to pull people towards municipalities. As could be expected, people move to where economic activity and jobs are, especially those in the service industry, and where better public services (urban infrastructure) exist. On the other hand, factors that push people to migrate include extreme poverty, high income inequality, and literacy.[4]

What has this meant for the households of Pernambuco? A mobility analysis using synthetic panels shows that Pernambuco is doing slightly better than Brazil regarding intra-generational economic mobility. Between 2003 and 2011, Pernambuco saw a larger share of the poor leaving poverty than did Brazil and the Northeast region. Also, a slightly bigger proportion of the population joined the middle

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[2] The State Fund to Support Municipal Development - FEM was announced by Governor Eduardo Campos in February 2013 and aims to support municipalities in the implementation of projects that contribute to local development and allow the resumption of investments whose performance had been compromised by the weakening of municipal finances

The total amount provided to the fund in 2013 is R$ 228 million. The goal is for those available resources to be used in major works and interventions that can improve the quality of life and development of the municipality. Investments are expected to be in the areas of urban and rural infrastructure, education, health, security, social development, environment and sustainability. Resources are equivalent to an average monthly transfer from the Municipalities Participation Fund (FPM) received by each municipality in 2012. Transfers from the FEM are to be released in four installments: the first 30 % of the total allocated to the municipality on May 15, 2013, the second, also of 30 %, 60 days after the first one, and the third, 20 %, by declaration of the mayor of application of resources. The fourth and final 20 % is to be transferred upon submission to the State Government by the municipal administration of the final invoice of the work. The amounts allocated to each county based on the criteria of the FPM.
See. http://www.fem.seplag.pe.gov.br/web/portal-fem;jsessionid=72F9E40F4F1191A08F73CF467B71027D

[3] The *Fundo de Participação dos Municípios* (FPM) is the main mechanism through which the Federal State transfers resources to municipalities, per article 159 of the federal constitution. This allocation is calculated annually by the *Tribunal de Contas da União* (TCU) and based primarily on the number of inhabitants of the municipality (currently based on the 2010 census) as well as on GDP per capita of the state. Municipalities are in turn classified in 3 categories: capitals (federal and states) about 10% of the FPM in 2012; *reserva (*Municipalities with more than 142, 633 inhabitants) about 3.6% of the FPM in 2012; and finally the *interior* (i.e. all other municipalities) which represents over 86% of the FPM.
See. http://www3.tesouro.fazenda.gov.br/estados_municipios/download/CartilhaFPM.pdf

[4] Why literacy is found to be a push and not a pull factor is likely related to the fact that being able to read and write facilitates an individual's ability to migrate.

class in Pernambuco compared to the rest of the country and the Northeast. Nevertheless, very few people *originally* in poverty were able to join the middle class and virtually no one in extreme poverty at the beginning of the period had escaped poverty by the end. These findings have important implications towards sustaining future inclusive growth.

Decomposing the changes in poverty and inequality, we find that even though public transfers have played a part, labor income—consistent with regional findings for Latin America—has played a critical role in the improvement of these indicators. Given the importance of income from labor, the report concludes with an analysis of labor market dynamics. Unemployment and informality rates have fallen and labor force participation has grown in the state—although a good part of this progress has concentrated in the Metropolitan Area of Recife. Indeed, in 2009, household per capita income in the interior of the state was half that of MAR. Within the interior of the state, the area around the new port is concentrating the lion's share of new jobs. While the state lags behind others with respect to educational outcomes, the skill gap of the workforce is even larger in the interior, posing a constraint to access the benefits of the growing sectors.

The overall assessment reflects that Pernambuco's policies have yielded positive outcomes in both economic growth and social indicators. An extra push in providing improved access to services and increased social protection from extreme poverty may be necessary on the way forward for municipalities lagging behind, in order to overcome persistent regional disparity in social welfare. Also crucial is the investment in skills and productivity across the labor markets, to deepen and sustain the achievement in poverty reduction and improvements in equity.

Finally, a key policy message refers to the distinction between policies that aim to have an influence over endowments and those that attempt to impact returns. Policies can seek to have an impact, for instance, over a person's education (endowment), or over the price at which the market values that person's education i.e., wages (returns). Pernambuco is found to have followed both: increasing access to services has successfully increased endowments, while the state has also followed a strategy of investing, via subsidies, in returns—influencing, for example, the location of private sector investment. Previous evidence suggests that universalizing access to services throughout the territory (independently of location) and equipping individuals with the endowments necessary to take advantage of economic opportunities, wherever they are, is more cost-effective than endeavoring to define where the poles of economic activity and specific sectors of private investment are to be located. This report thus recommends a stronger focus on endowments, and the better tuning of those endowments in access, relevance (notably in terms of education and skills) and quality, and less so on returns.

The rest of the report is organized as follows. Section 1 provides a brief description of the context and conceptual framework, and the objective pursued in the report. Section 2 shows the evolution of trends; while the drivers behind poverty and inequality reduction are presented in Section 3. The analysis of social progress convergence is introduced in Section 4. Section 5 describes the gravity analysis of migration flows, while Section 6 looks at mobility in and out of poverty. A characterization of labor market dynamics is provided in Section 7. Section 8 describes policy suggestions on the way forward and final remarks.

1. Context and framework

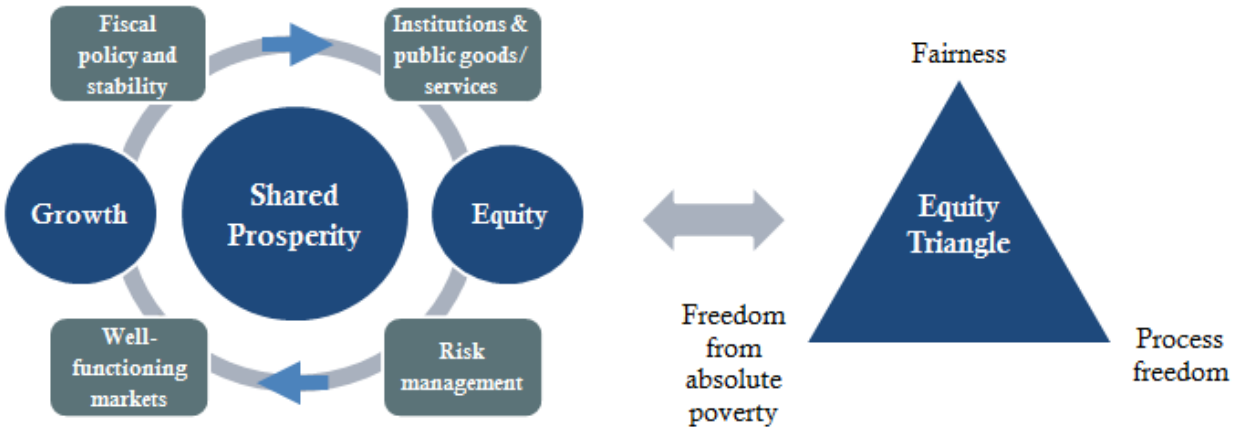
Over the past decade, Brazil's strong GDP growth has also benefited the traditionally poorer state of Pernambuco. Poverty reduction, both moderate and extreme, has accompanied this growth. The reduction in poverty has followed similar trends to Brazil and the Northeast. Similarly, inequality has also been declining in the state, leading the state to a lower level of inequality than Brazil or the Northeast by the end of the decade. While Pernambuco is headed in the right direction, it is still behind Brazil in terms of both GDP per capita and monetary and non-monetary poverty dimensions, and within-state disparities remain.

Pernambuco faces two main challenges: establishing the foundations to sustain growth and ensuring that territorial and horizontal inequities fall concurrently. In recent years, policy makers have turned their attention to the large heterogeneity in social and economic indicators within Pernambuco. Explicitly, these objectives have fallen under the concept of *interiorização*, a strategy to close development gaps in the state through fiscal instruments and increased coverage of services in lagging areas.

The State Equity Assessment aims to analyze some of the policy instruments associated with Pernambuco's progress in narrowing territorial gaps through equitable growth, and to highlight policy challenges on the way to making the strategy sustainable.[5] There are concerns that the existing structure of fiscal policy and levels of endowments (i.e. human and physical capital) may compromise the long-term feasibility and fiscal sustainability of the current growth pattern, given the current economic context in the country. While growth can be a driver of poverty reduction, the vice-versa also holds true. If equity—understood under the concepts of equality of opportunity; the ability to make autonomous decisions regarding life plans, and the elimination of extreme poverty—constitutes a key priority for policymakers, it can enhance both the strength of economic growth and its sustainability. In order to promote shared prosperity, growth and equity must go hand in hand. Four policy areas that are particularly conducive to promoting shared prosperity include: 1. Maintaining an equitable and sustainable fiscal policy; 2. Strengthening fair, transparent institutions that deliver quality public goods and services; 3. Enabling an environment of well-functioning markets that are accessible for all economic levels of society; and, 4. Improving risk management at both the macro and household level. These channels reinforce each other, thus forming a virtuous cycle (see Figure 1).

[5] Being aware of attribution problems, we look at the policies associated with the state's progress without making claims regarding causality.

Figure 1: Virtuous Circle of Shared Prosperity with a comprehensive definition of Equity



Within this context, the present report continues the World Bank's current dialogue with the state of Pernambuco in its efforts to improve equity and inclusive growth in the long-term. The study utilizes a variety of stocktaking and diagnostic tools, going beyond income measures, to inform policy actions that seek to reduce poverty and inequality in Pernambuco. The policy discussion is contextualized, drawing on the priorities set forth within the Pernambuco Government's Management Model—which has also benefited from the Bank's technical assistance and financial support. The Government's strategy rests on three pillars: *Nova Economia (interiorização strategy)*, *Quality of Life*, and *Government for Results*, which are consistent with the channels that promote shared prosperity (see Box 1 and Figure 2).

Box 1. Shared Prosperity and the Pernambuco Strategy

Improving shared prosperity involves promoting both economic growth *and* equity. As shown next, within the context of the channels that promote shared prosperity (Figure 1), the scheme followed in the report is consistent with Pernambuco Government's Model.

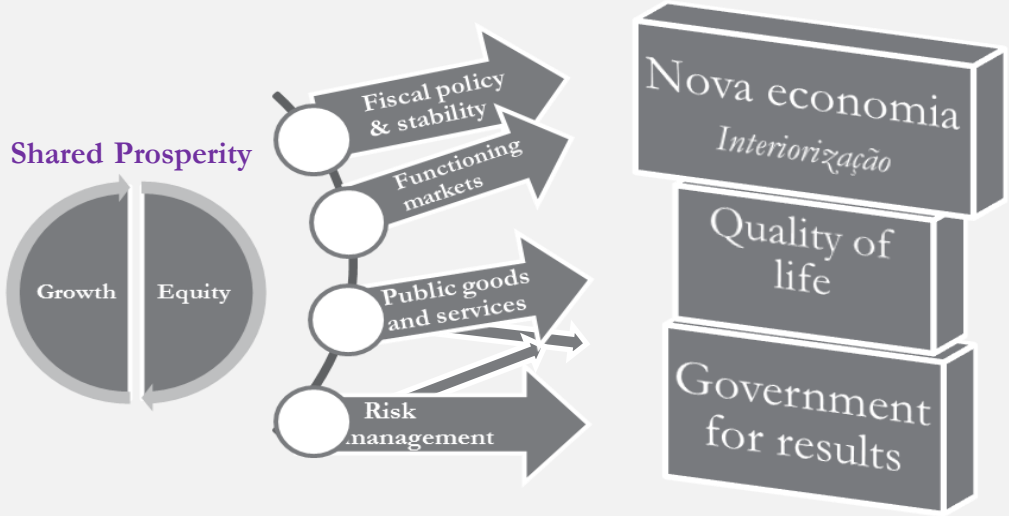
The Government's *All for Pernambuco—Results-focused, Democratic and Regionalized Management strategy* rests on three main pillars. The first, *Nova Economia* (New Economy), seeks to guarantee the continuation of the current pace of economic growth and ensure its inclusiveness—both in terms of spreading the benefits of growth to the interior of the state (*interiorização* strategy); and in ensuring that these benefits reach all individuals, regardless of race, gender, and other dimensions of inequality. There is a clear understanding that reaching the remaining poor and reducing vulnerability will require additional efforts and increased efficiency in public spending. In the context of the channels conducive to shared prosperity, *Nova Economia's* redistribution of funds to marginalized areas and people, takes place through the fiscal policy and stability channel, while by fostering well-functioning markets, *Nova Economia* can ensure continued economic growth.

The second pillar refers to improving the *quality of life* of the citizens of Pernambuco, through the improvement of access to services and the protection of citizens. The relevant channels for this pillar include the delivery of quality public goods and services, and the improvement in risk management.

The third pillar focuses on *government for results*, establishing the conditions for better government by increasing the capacity and efficiency of public administration. This pillar thus helps ensure that expenditures are monitored towards results, and that goods and services are allocated fairly and efficiently, also touching upon the public goods and services and fiscal policy channels.

The following figure illustrates the consistency between the shared prosperity virtuous cycle and Pernambuco's Management strategy.

Figure 2: Shared prosperity policy channels linked to Pernambuco's management strategy



To assess equitable growth within Pernambuco, the report employs a zoom-in framework of shared prosperity using a variety of equity indicators and diagnostics.[6] We begin by broadly comparing the state's monetary and non-monetary indicators of poverty with the national and regional trends. The report then uses a spatial lens to compare the trends between municipalities and between *região de desenvolvimento* within Pernambuco in the framework of the *interiorização* policy priority. Along these lines, the report also identifies push and pulls factors of migration, which shed light on the identification of which municipalities are more desirable to live or work in and why. Finally, zooming in further, economic mobility at the household level is considered along with trends in the role of labor market dynamics, which affect the welfare and agency of individual workers.

Drawing from the findings of these diagnostics, the report presents policy recommendations consistent with the state's *Nova Economia* strategy to promote growth and equity. Throughout the report, the analysis draws from the framework on the virtuous cycle of shared prosperity presented in Box 1. For instance, the interventions related to the non-monetary dimensions of poverty and inequality relate to the *institutional and public goods and services* policy channel; the role of economic dynamics, labor market and incentives to the *well-functioning markets* area; while fiscal incentives and the role of transfers in the reduction of monetary poverty to the *fiscal policy and stability* channel. All the convergence and spatial analysis rests on the notion of equity regarding equality of opportunities, namely: the place where an individual is born should not determine her opportunities—whereby regional inequality is viewed as a circumstance.

[6] This report considers a comprehensive definition of "equity", which entails that citizens must have equal access to opportunities, be able to live in dignity (i.e. elimination of absolute poverty), and have the autonomy and voice to participate fully in their communities and decide over life plans they have reasons to value. This definition allows for a cohesive characterization of intra and inter-generational mobility, chronic and transient poverty, and between-group inequities that potentially thwart the possibility of certain vulnerable populations to fully participate and benefit from the development process (Cord and Lopez-Calva, 2013).

Box 2. Pernambuco's Evolving Economic Structure

Pernambuco is experiencing an investment boom which is expected to further modify the economic structure of the state in the near future – with implications for growth and shared prosperity, notably through labor markets. By some estimates, Pernambuco will receive about R$ 100 billion in investment by 2016, two thirds of which to be directed towards the industrial sector. The composition of the state's manufacturing output will also continue to change most notably in relation to the Suape Industrial and Port Complex driving the expansion of firms related to the shipbuilding, off-shore oil and gas, petrochemical, automobile and steel sectors.

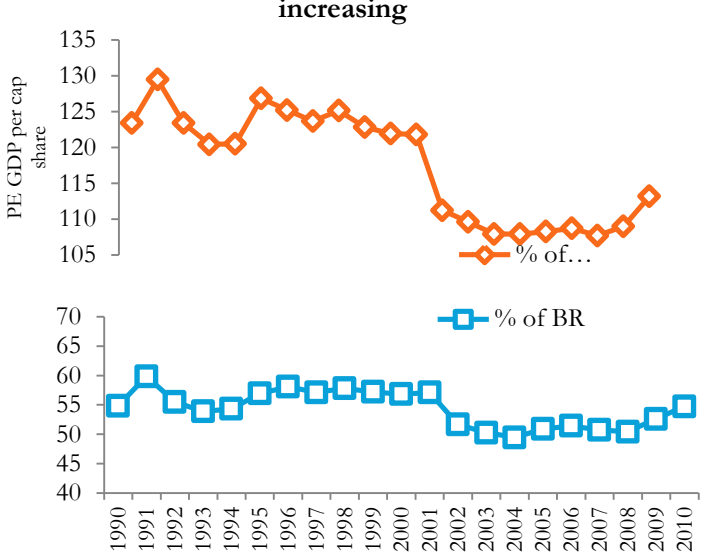
Pernambuco is also an important tourism destination both for entertainment and business. The tourism is an important source of employment and income for many semi and skilled workers both along the seashore and in the interior. Pernambuco also headquarters a hub for the IT industry with sites such as Porto Digital and others technological parks. Created in 2000, Porto Digital is one of the pillars of the state's "New Economy" (Nova Economia) strategy. It is home to 260 firms selling for over R$ 1 billion per year, two thirds of which are exported to the rest of Brazil and abroad. The future of the State´s economy is no longer restricted to manufacturing but also encompasses business in the modern tertiary. Health, education and services related to the so-called "creative economy" (filmmaking, video, etc.) are also becoming key sectors for the state's economy.

2. Good economic, social performance translated into a positive decade

2.1 Pernambuco is making an economic comeback after a setback at the start of the decade

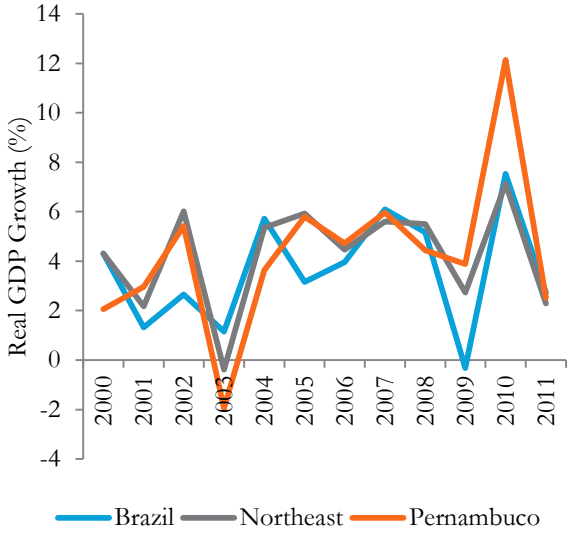
Pernambuco's GDP growth rates since 2008 are leading the state to diverge further from the Northeast and to converge with the national average. During the 1990s and the early 2000s Pernambuco's per capita GDP represented, on average, 56.6 percent of Brazil's; this proportion fell to 51.7 percent in 2000, leaving Pernambuco to hover around 50 percent of Brazil's GDP per capita until 2008 (Figure 3). The tide shifted in 2009 as Pernambuco performed better than the Northeast and Brazil during the global financial crisis and the subsequent recovery period. In 2010, the estimated GDP growth rate reached the highest level in a decade for the state, the region and the country, with Pernambuco leading the way at 12.1 percent, before slowing back down in 2011 (Figure 4).

Figure 3: The share of Pernambuco's per capita GDP is increasing



Source: Ipeadata/IBGE

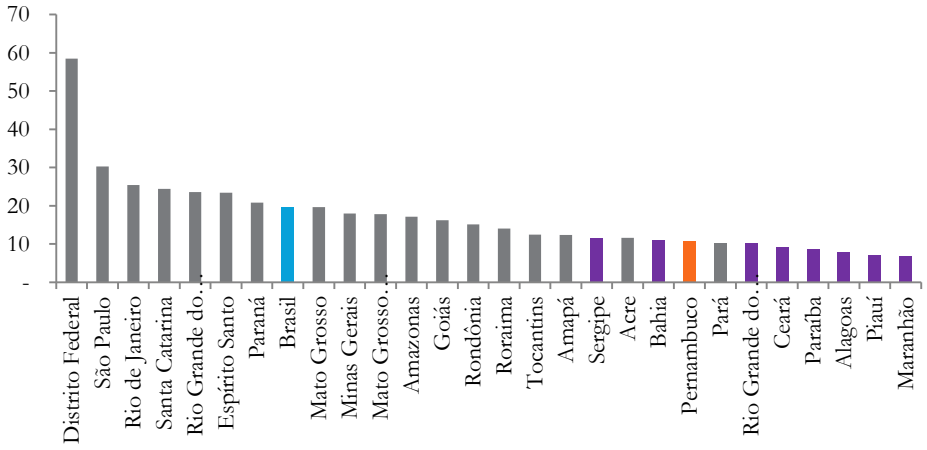
Figure 4: Pernambuco has recently grown its GDP faster than Brazil and the Northeast (%)



Source: IBGE/SUFRAMA; World Development Indicators (World Bank)

While Pernambuco's economic growth has been relatively strong compared to Brazil, the overall trend remains rather flat, which is concerning in a longer-term context—where the same level of growth may not be easily maintained. Sustaining above-average growth is necessary for Pernambuco to catch up with Brazil. While economic growth has reflected into a 3 percent average annual increase in GDP per capita in the state over the decade, in absolute numbers Pernambuco still lags behind: the state accounts for 4.6 percent of Brazil's population, yet it only represents 2.5 percent of its GDP; and GDP per capita is only 54.8 percent of that in Brazil, making it the eighth poorest state in Brazil (2010) (Figure 5).

Figure 5: Pernambuco remains one of the poorest states in Brazil where the Northeast continues to lag behind (GDP per capita by State 2010 R$ thousands)



Source: IBGE, in partnership with State Statistics, State Government and the Superintendency of the Manaus Free Zone - SUFRAMA; Datasus.

While unemployment and labor force participation have not shifted much over the decade, economic growth in Pernambuco has been accompanied by a decrease in informality and increase in skill levels. From 2001 to 2012, labor force participation only rose 5 points and unemployment fell by less than 2 points from 2001 to 2012 in Pernambuco leaving it with a smaller labor force compared to Brazil (59.2% vs. 65.9%) and higher unemployment (9.5% compared to 6.1%). However, an increase of 15.6 percentage points for the share of the adult population achieving a secondary level of education and a decrease of 12.9 percentage points in the informality rate in Pernambuco indicate that job quality has increased. Indeed the real hourly wage has risen by almost 50 percent over the decade, reaching R$ 7.56 in 2012, though this falls well below the Brazil average wage of R$11.30.

2.2 Poverty and inequality

Similar to the Pernambuco's outpacing of economic growth in recent years, Pernambuco has also reduced income inequality (as measured by the Gini index) faster than the Northeast and Brazil since 2008. While Pernambuco started the decade with the highest level of income inequality at 0.62 compared to 0.60 in the Northeast and 0.59 in Brazil, by 2012, it had the lowest at 0.51 compared to 0.54 in the Northeast and 0.52 in Brazil. Despite a significant increase in poverty in 2004, this represents an 11 point reduction in income inequality over the decade, over half of which occurred since 2008.

The declining poverty rate in Pernambuco is consistent with the trend in the Northeast and Brazil, displaying a trajectory towards convergence. From 2001 to 2012, Pernambuco reduced poverty by 68.2%, slightly above Brazil's 66.1% reduction and the Northeast region's 62.9% reduction.[7] However, poverty is still significantly higher in Pernambuco at 12.8% than in Brazil at 8% (2012). Trends in the reduction of extreme poverty, a key objective of both federal and state's governments, are similar, with reductions in the share of the population living in extreme poverty of 67.3% in Pernambuco, 64.6% in the Northeast, and 62.6% in Brazil.

The extreme poverty uptick during 2003—the only period of GDP decline in Pernambuco—suggests that vulnerability to extreme poverty during crises still poses substantial risks. From 2002 to 2003, the poverty headcount increased by 18.2% in Pernambuco, compared to 7.1% in both Brazil and the Northeast. Moderate poverty also rose, but to a lesser extent (7.2% in Pernambuco), with the majority of the change due to the increase in poverty of the extreme poor. This likely reflects the moderate poor falling into extreme poverty and the vulnerable falling into poverty during economic crises.

[7] R$140 poverty line (R$70 extreme poverty line) established by the Brazilian government for its main social program, Bolsa Familia

Figure 6: Pernambuco has reduced income inequality the fastest in recent years

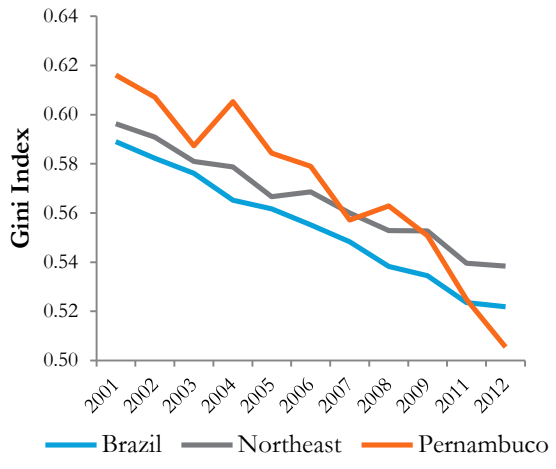
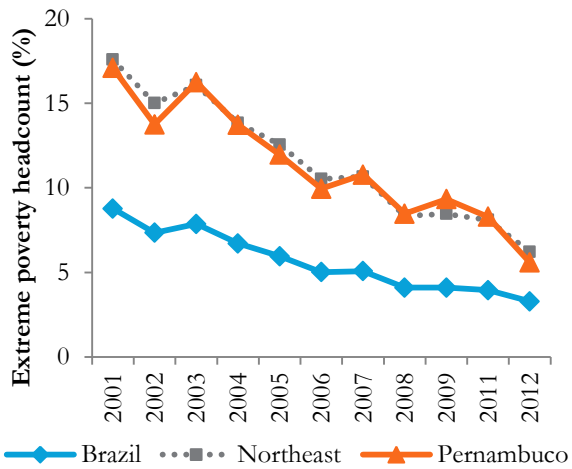


Figure 7: Extreme poverty (R$70 line)



Source: PNAD. *Note:* Incomes used are adjusted for cost of living

Pernambuco expanded the coverage of key public services over the decade, with access rates higher than those in the Northeast and closing the gap with Brazil. The Pernambuco Government expanded access to the sewage network—the dimension with the highest deprivation rates across areas—by more than the Northeast region and Brazil. Since 2001, 58.4% more Pernambucanos have access to sanitation compared to an increase in access in the Northeast of 46% and in Brazil of 18.4%. This helped shrink the sanitation gap in access rates between Pernambuco and Brazil by 11 percentage points, but at 61.8% access, Pernambuco still falls 14.8 percentage points behind Brazil and is just above the rate in the Northeast. Similarly, faster growth in access to safe water, 8 years of education for at least one member of the household, and possession of assets in Pernambuco has reduced access gaps from the rate in Brazil. However, at least 10% of the population in Pernambuco is deprived of access to sanitation, access to safe water, educational attainment, and/or school enrollment and 7% of the population is deprived of three or more of the dimensions considered.[8]

While access to education in Pernambuco is high and the quality of education has risen, both still remain challenges to be addressed, especially to the interior of the state. In 2010, 96.4 percent of urban 10 to 14-year-olds in the state attended school, compared to 94.3 percent of rural children in the same age group.[9] In terms of school-completion lags, Pernambuco reduced the age-grade distortion rate by nearly 36 percent from its 2000 level. However, at over 44 percent in 2011, the state's age-grade distortion rate remains higher than Brazil's (32.8 percent), and implies that close to half the students in Pernambuco do not graduate from secondary school on time. As of 2010, the percentage of people aged 10 or older in Pernambuco who have a below-primary-school-level education is higher at

[8] The dimensions considered are access to sanitation, safe water, shelter, school enrollment, electricity, at least one member of the household having 8 years of education, and possession of 2 out of the 3 assets of telephone, refrigerator, and clean (gas/electric) cooking stove.

[9] The school attendance rate in Brazil, the Northeast, and MAR in the same year lied between 95 and 97 percent for both urban and rural children 10 to 14 years of age.

57.8 percent than Brazil's (50.2 percent), while the percentage of people with a college degree is lower at 5.7 percent than in Brazil (8.3 percent). Furthermore, the illiteracy rate of people ages 15 years and older surpasses 20 percent in all regions of Pernambuco, except for Recife's metropolitan area (8.9 percent) and *Sertão do São Francisco* (15 percent). Illiteracy is highest in *Agreste Meridional*, at 31.6 percent. This high illiteracy rate is not present in the case of younger generations, indicating that schooling has improved. For instance, in 2011, only 3.6 percent of people ages 15 to 24 in Pernambuco were illiterate. While this figure is still more than twice the rate in Brazil (1.5 percent), it is much lower than the rate when older people are considered.

3. Labor income and transfers have driven poverty reduction and improvement of equity in Pernambuco

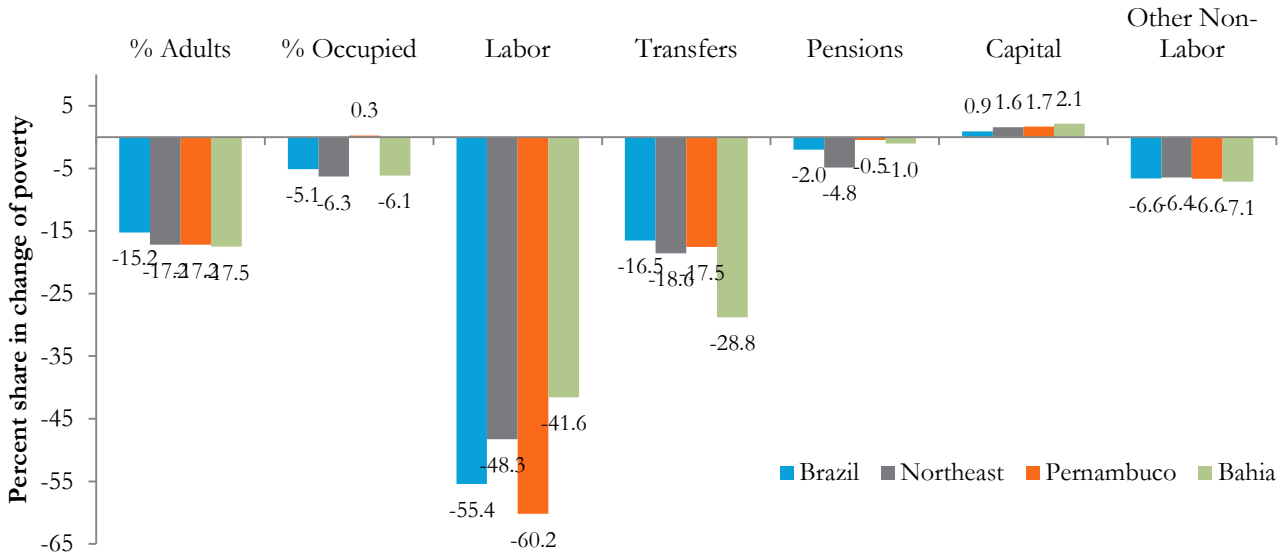
3.1 Poverty decomposition: 2001–2011

Within a decade of economic growth, both in Pernambuco and the rest of Brazil, which components have contributed the most to the observed changes in poverty and inequality? To answer this question, this section of the analysis employs a method called the Shapley decomposition of changes in welfare indicators as proposed by Azevedo, Sanfelice and Nguyen (2012), following Barros et al. (2006). It takes advantage of the additive property of a welfare aggregate by changing each component at a time to calculate their contribution to the observed changes in poverty and inequality.

Labor income played a bigger role in reducing moderate and extreme poverty in Pernambuco than it did in the Northeast and the country as a whole. Throughout the decade (2001-2011), income from labor contributed more to reducing poverty than an increase in the share of occupied adults (the case in other Latin American countries). The increase in income per employed adult was thus the main factor in the reduction of poverty, as the poor benefitted from higher incomes either from working more hours or through higher earnings per hour. Pernambuco has some room left to continue reducing poverty through the labor market as the percentage of employed adults only contributed 3.02 percent to the reduction of moderate poverty and not at all in the reduction of extreme poverty. As demographics are different (and play a different role) in the Northeast than in Brazil as a whole—the share of adults and youth in the Northeast and Pernambuco is higher--more of these adults, especially those in extreme poverty, need to be incorporated into the workforce.

Transfers have also played an important role, especially in the case of extreme poverty. The impact of transfers on the reduction of extreme and moderate poverty was stronger in the Northeast region (18.55 percent and 10.63 percent, respectively) and Pernambuco (17.53 percent and 9.9 percent) than in Brazil (16.5 and 8.89 percent). This is not surprising given the higher level of poverty in the Northeast and the explicit regional targeting of such populations by *Brasil Sem Miséria* and *Bolsa Família*. An interesting comparison is that with Bahia, where transfers represented a much larger component of the poverty and equity reduction (See Figures 8 and 9).

Figure 8: Labor income contributed the most to reducing extreme poverty ($2.5 USD) 2001–2011

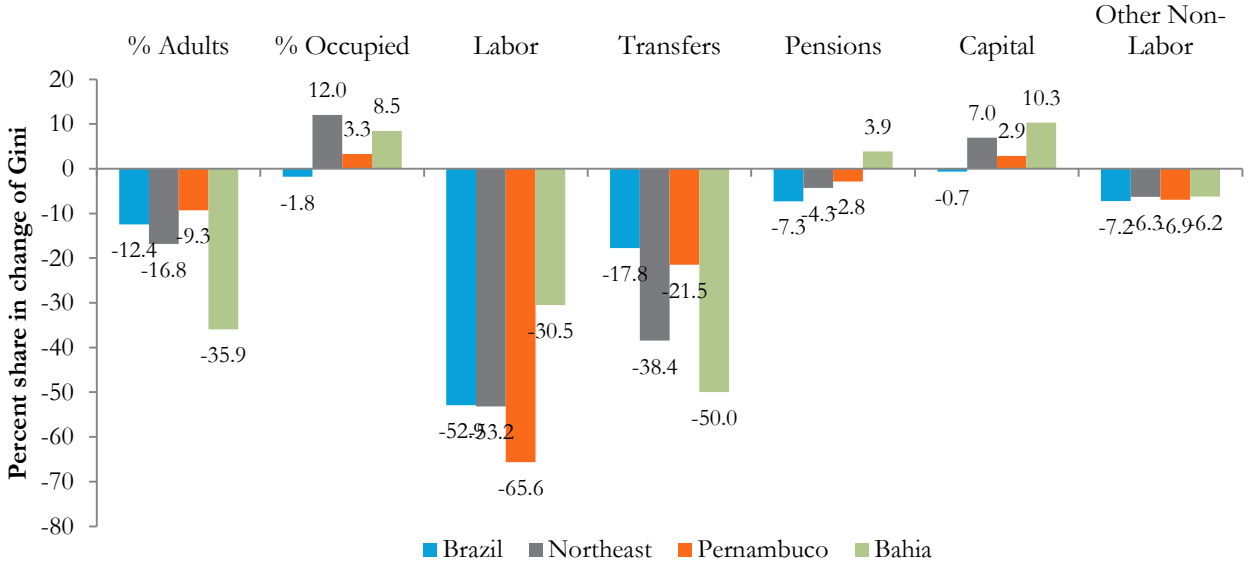


Source: WB calculations from PNAD

3.2 Inequality decomposition: 2001–2011

Labor income has also played a critical role in the reduction of inequality. Labor incomes accounted for a 65.6 percent share of the inequality reduction in Pernambuco, higher than in the Northeast region (53.2 percent) and Brazil (52.9 percent). Comparatively, in Bahia, labor income played less than half of the role it did in Pernambuco while transfers accounted for the majority share of the change in income inequality. The impact of income from labor on inequality in Pernambuco further supports the results found in the poverty decomposition, indicating that the employed poor are not only benefitting from economic growth, but they are benefiting more than the wealthy. On the other hand, the share of occupied adults has a negative effect on the reduction of inequality, a somewhat surprising finding that does not have a straightforward interpretation but may indicate that poorer adults are having a tougher time entering or staying in the labor market, a situation that could be further accentuated in case of economic shock or with an evolution of the labor demand towards higher skilled jobs. This effect is more pronounced in urban – particularly in the metropolitan area - than in rural areas, and is also confirmed when looking more specifically at decompositions of labor income.

Figure 9: Labor income also dominated in the reduction of income inequality 2001-2011



Source: WB calculations from PNAD

The importance of transfers across areas, particularly in the Northeast, reflects the significant role that they have played in tackling inequality over the past decade. Interestingly, when restricting the analysis to recent years, i.e. 2009-11, transfers appear to play a substantially less important role (accounting for less than three percent), a trend, which, if it continues into the future, indicates that further gains in inequality reduction as a result from transfers can be expected to be more limited.

4. There has been economic and social progress across municipalities

4.1 Economic convergence within Pernambuco

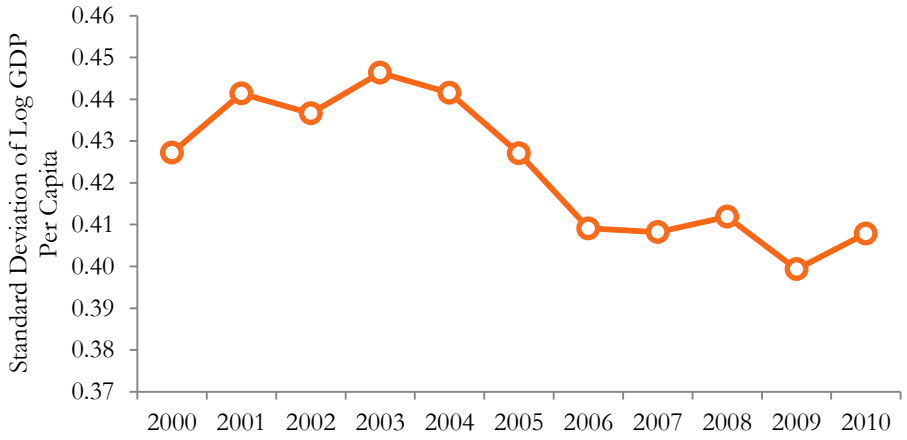
Is there convergence within Pernambuco? It has been shown above that, as GDP per capita grows at a faster rate in Pernambuco than in the rest of Brazil, the state is "catching-up" or converging to the nation. Here, the report looks into whether there is economic convergence *within* Pernambuco.

In the classical economics literature, the term "convergence" can take on two meanings: *sigma* and *beta*. "Sigma-convergence" refers to a reduction in the dispersion of levels of income across economies. "Beta-convergence", on the other hand, occurs when poor economies grow faster than rich ones. While the two concepts are related, they represent two different ideas: dispersion of economies in the former and mobility of economies in the latter. In either case, evidence of convergence within Pernambuco would reflect that the *interiorização* policies are being effective and that prosperity is shared.

Indeed, the variation of GDP per capita among municipalities in Pernambuco has dropped over time, becoming lowest in recent years. The results indicate that sigma-convergence has indeed been taking place from 2005 onwards, as the variation has declined from 0.45 in 2003 to 0.41 by 2010 (Figure 10). This convergence is particularly encouraging as it suggests that the improvement in access to

services in underserved municipalities of recent years has translated into inequality reductions between municipalities.

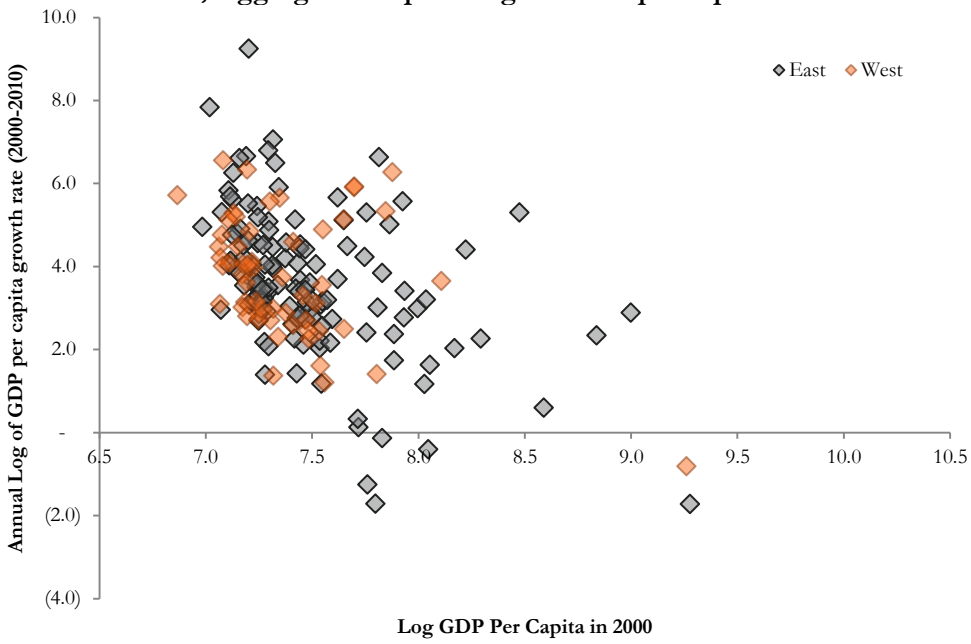
Figure 10: Sigma convergence has occurred since 2005 in municipalities', log per capita GDP



Source: IBGE, in partnership with State Statistics, State Government and the Superintendence of the Manaus Free Zone – SUFRAMA.

Furthermore, poorer municipalities have strengthened their economies by relatively more than richer municipalities. A high rate of GDP beta-convergence took place between 1996 and 2000; it became insignificant from 2000 to 2005; but it picked up again between 2005 and 2010, though at a slower pace than that of the previous decade. This means that if the current rate of convergence was to continue, in 10 years the gap in GDP per capita amongst municipalities would be less than half the level in 2005.

Figure 11: In Pernambuco, lagging municipalities grew GDP per capita the most in relative terms



Source: IBGE/Suframa

The evidence described here indicates that, in an overall context of growth for the state, economic growth is taking place across the territory and that it is taking place in lagging municipalities faster than in richer ones. The analysis presented in the next section explores whether the same can be said of social welfare, measured as a composite index of equity-related indicators.

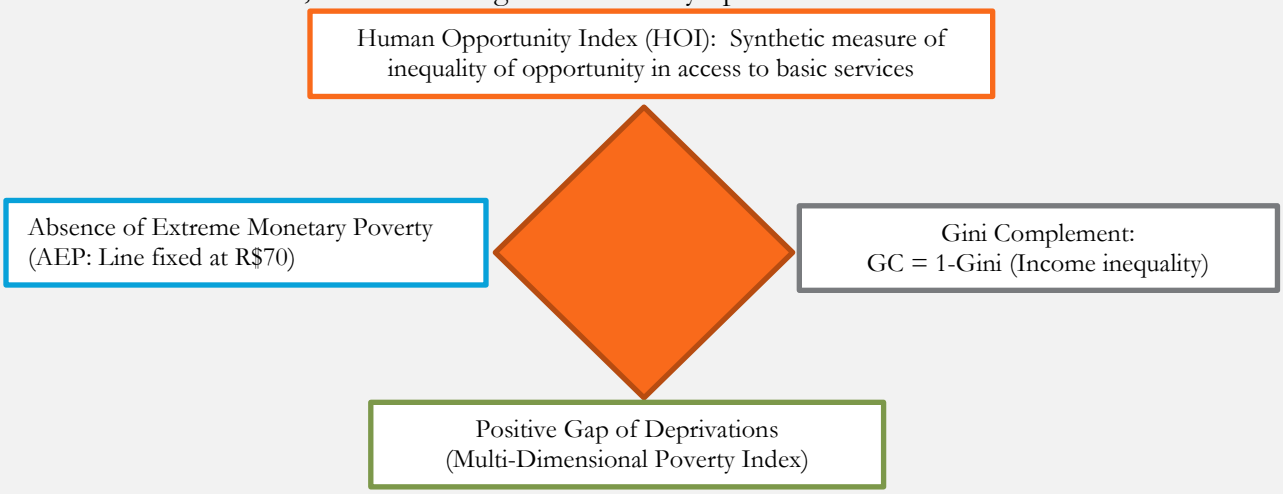
4.2 Social welfare convergence

In this section, diamonds of social progress are constructed to map achievements and gaps in different aspects of social welfare for multiple time periods. Within the framework of shared prosperity, we use this instrument to analyze social welfare, constructing a diamond for the state of Pernambuco to compare it with Brazil and the Northeast. The analysis is then extended to both Pernambuco's *região de desenvolvimento (RD)*, and its municipalities to shed light on the achievements of the state's *interiorização* objective.

The diamond's four axes are composed by the Gini index, the absence of extreme monetary poverty, the positive gap of deprivations, and the Human Opportunity Index (HOI) (see Box 3 for details on the HOI). Each of the four indicators is placed on a scale of zero to one, with one representing the socially optimal outcome. The area of the diamond, then, represents the composite indicator of social welfare and can take on a maximum value of two. Comparing the diamonds over time provides a sense of social progress for the area considered, and can inform the design and evaluation of the different components of social policy by looking at the decomposition of changes in the indicators.

Box 3. A Composite Index to Measure Social Welfare : the Diamond of Social Progress

To construct the diamond of social progress, 4 key aspects of social welfare are taken into account and placed on a scale of 0 to 1, with 1 standing for the socially optimal outcome



- **Human Opportunity Index:** H = HOI
- **Positive gap of deprivations**: PGD = $\frac{6-d}{6}$ (Multi-Dimensional Poverty Index)
  - where d is the average number of deprivations out of the 6 considered
- **Gini complement**: GC = 1- Gini (income inequality)
- **Absence of extreme poverty**: AEP = 1- poverty headcount (70 reais)

These dimensions are then used to calculate the area of the diamond with multi-dimensional measures alternating with income measures, where the maximum area (socially optimal) of the diamond is 2 (See Annex 3).

4.2.1 Pernambuco vis-à-vis Brazil and the Northeast

Created by the World Bank's Latin America unit in 2008, the HOI measures inequalities in human opportunity and can help implement programs to most effectively overcome them. The HOI estimates how personal circumstances which an individual cannot be held accountable for—like birthplace, gender, or socioeconomic background—affect a child's probability of accessing the basic services necessary to succeed in life, such as education, health care, adequate nutrition or running water. The HOI combines, in a single measure, how far along a society is toward providing universal coverage of these basic services, as well as how equitably these services are distributed. With this information, policymakers can better design and target basic services more equitably. The HOI runs from zero to 100; a society that has achieved universal coverage of all services would score at 100.

The HOI is coverage corrected for equity. The HOI measures the availability of services that are necessary to progress in life (say, running water), discounted or "penalized" by how unfairly the services

are distributed among the population. So, two countries that have identical coverage may have different HOIs if the citizens that lack the service are all female, or black, or poor, or have many siblings or, more generally, share a personal circumstance beyond their control. In theory, the HOI can increase by changing people's circumstances (the "composition effect"), providing more services to all ("scale effect"), or distributing service more fairly ("equalization effect").

Box 4. The Human Opportunity Index (HOI)

The Human Opportunity Index is a synthetic measure of inequality of opportunity in basic services for children running from 1 to 100. The index is inspired by the social welfare function proposed by Sen (1976), and holds that a development process in which society attempts to equitably supply basic opportunities requires ensuring that as many children as possible have access to those basic opportunities, with a target of universalism. It requires distributing available basic opportunities increasingly toward the more disadvantaged groups.

The Human Opportunity Index summarizes both elements in a composite indicator:

- ✓ How many opportunities are available, that is, the coverage rate of a basic service; and
- ✓ How equitably those opportunities are distributed, i.e., whether the distribution of that coverage is related to exogenous circumstances.

An increase in coverage of a basic service at the national level will always improve the index. But, if that increase in coverage is biased toward a disadvantaged group (for example, a poor region), it will further reduce inequality of opportunity, increasing the index more than proportionally.

The HOI methodology used in the Pernambuco Equity Assessment follows Lopez-Calva and Ortiz-Juarez's (2012) construction of a distribution-sensitive human development index by calculating access to services based on geometric means of the average of access of circumstance groups.

From 2001 to 2011, Pernambuco progressed more in terms of social welfare than Brazil and the Northeast. Looking at multiple indicators of social progress reveals that Pernambuco has made great strides in development over the past decade. In fact, Pernambuco increased the diamond of social progress index by 64.4 percent compared to a 54.9 percent improvement in the Northeast and a 25 percent improvement in Brazil. This progress has caused Pernambuco to pull ahead of the Northeast along these dimensions and to close the gap with Brazil by 68.7 percent.

Close to half of Pernambuco's progress was driven by a significant improvement in the HOI, pushed in turn by expansions in equitable access to assets and sanitation. 51.4 percent of the change in the area of the diamond in Pernambuco between 2001 and 2011 was due to improvements in the HOI. Driving the change in the HOI was a 77 percent increase in the share of children living in households with basic assets (adjusted by equity) and a large increase in access to sanitation and safe water (up 204.9 percent and 56.5 percent, respectively). In fact, access to sanitation contributed 43.9 percent of the change in the HOI while possession of basic assets contributed 21.26 percent. But, equitable access to sanitation in Pernambuco remains a key issue because, despite significant

improvements, its HOI (83.6 out of 100) is still low. Equitable access to electricity (99.9) and school enrollment (98.5) is near universal, but more progress is still needed in terms safe water (81.4).

Decomposing the HOI by services reveals that the improvement in the HOI is due not only to changes in coverage but to changes in the *equity of access* to sanitation but not to assets. For instance, if the HOI for Pernambuco was neutral to changes in distribution, the changes in the coverage of sanitation and assets would have contributed 5.9 and 6.8 points, respectively to the HOI's increase between 2001 and 2011.[10] In comparison, when accounting for equity in the expansion of coverage, the HOI increase attributable to these dimensions is 13.3 and 6.4 points, respectively. This reveals that access to sanitation has not only expanded in terms of coverage, but that equity of access has improved as well. By contrast, the improvement to the HOI due to assets was driven by an increase in coverage only.

Figure 12: Equity-adjusted HOI decomposition

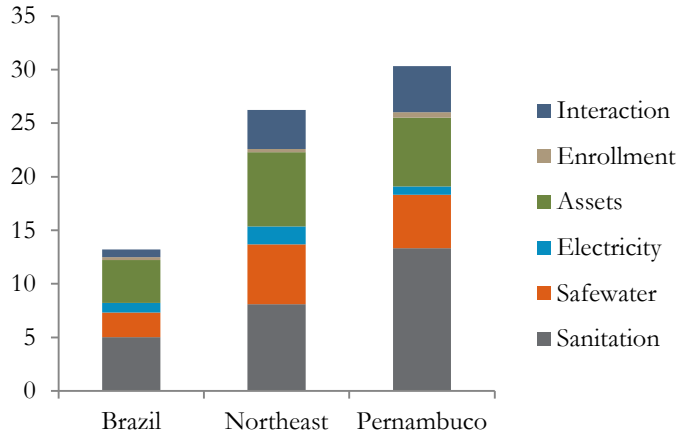
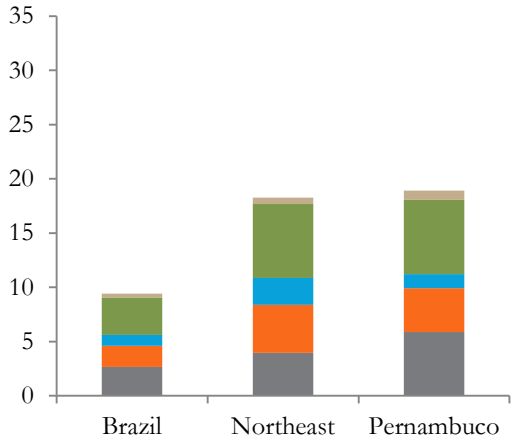


Figure 13: Coverage only HOI decomposition



Source: PNAD 2001/2011

Pernambuco is converging with Brazil in terms of how equitably opportunities are distributed. The HOI in 2011 would have been 4.1 points higher in Pernambuco, if equity were not considered. This 'equity penalty' is similarly low in Brazil (2.7 points) and the Northeast (5.2 points). This represents a drastic improvement in equitable distribution when compared to 2001, when both the Northeast and Pernambuco received a penalty on the HOI (of 15.5 and 13.2 points, respectively) significantly higher than in Brazil (6.5 points). However, Pernambucano children located in rural locations, regardless of parental education, race, or gender, have lower access rates to water and sanitation than children in urban areas.

When broken down according to circumstance, the distribution of opportunities follows a clear pattern with location as the main determinant of access, followed by household education. Table 1 shows a striking pattern in the access to goods and services in Pernambuco. Across the board, children located in rural locations have lower access rates than children in urban areas. The level of education of the household head is the next determinant of access, both within rural and urban locations (e.g., within a given location but regardless of race or sex, children living with a household head who has

[10] Using the arithmetic mean, as opposed to the geometric mean employed to adjust for equity.

below-primary-level education have, on average, lower access rates than those with a head who has a primary education). This is particularly important, since children of all coverage groups—who represent more than five percent of the population—belong to households with a head who has a–below-primary-school-level of education. Following household head education is race: white children receive more coverage than afro-descendants—except for a group which represents only 0.03 percent of the population (~606 children), and refers to rural, male afro-descendant children who live with a household head that has a tertiary level education. Following is the gender breakdown, with females generally receiving more opportunities than males, although the breakdown is less consistent.[11]

Table 1: Coverage rates for children 12 and under by group, in ascending order of average coverage, Pernambuco 2010

Average Coverage (%)	% of PE population	Location	HH education	Race	Gender	Sanitation (%)	Safe Water (%)	Assets (%)
55	6.9	Rural	< Primary	Black	Male	15	24	46
56	6.4	Rural	< Primary	Black	Female	14	24	47
57	3.2	Rural	< Primary	White	Male	15	24	53
58	3.2	Rural	< Primary	White	Female	15	25	53
63	0.5	Rural	Primary	Black	Male	19	37	65
64	0.5	Rural	Primary	Black	Female	23	38	62
64	0.3	Rural	Primary	White	Male	19	38	65
65	0.3	Rural	Primary	White	Female	22	36	69
69	0.3	Rural	Secondary	Black	Female	27	44	73
69	0.4	Rural	Secondary	Black	Male	27	46	75
69	0.2	Rural	Secondary	White	Female	29	43	76
71	0.2	Rural	Secondary	White	Male	27	49	80
72	0.0	Rural	Tertiary	Black	Female	31	51	86
77	0.0	Rural	Tertiary	White	Female	31	67	89
77	0.0	Rural	Tertiary	White	Male	27	66	95
79	0.03	Rural	Tertiary	Black	Male	35	68	92
80	14.7	Urban	< Primary	Black	Male	52	80	71
80	13.8	Urban	< Primary	Black	Female	53	81	71
82	7.8	Urban	< Primary	White	Female	57	81	74
82	7.7	Urban	< Primary	White	Male	58	82	75
86	3.5	Urban	Primary	Black	Male	57	89	85
86	3.3	Urban	Primary	Black	Female	58	89	85
88	2.2	Urban	Primary	White	Male	63	90	88
88	2.3	Urban	Primary	White	Female	63	91	89
89	4.5	Urban	Secondary	Black	Male	61	93	94
90	4.3	Urban	Secondary	Black	Female	63	93	94
92	3.8	Urban	Secondary	White	Male	69	94	95
92	3.7	Urban	Secondary	White	Female	69	95	96
94	0.8	Urban	Tertiary	Black	Male	80	96	98
95	0.8	Urban	Tertiary	Black	Female	81	96	99
96	1.4	Urban	Tertiary	White	Male	87	97	99
97	1.3	Urban	Tertiary	White	Female	89	97	99

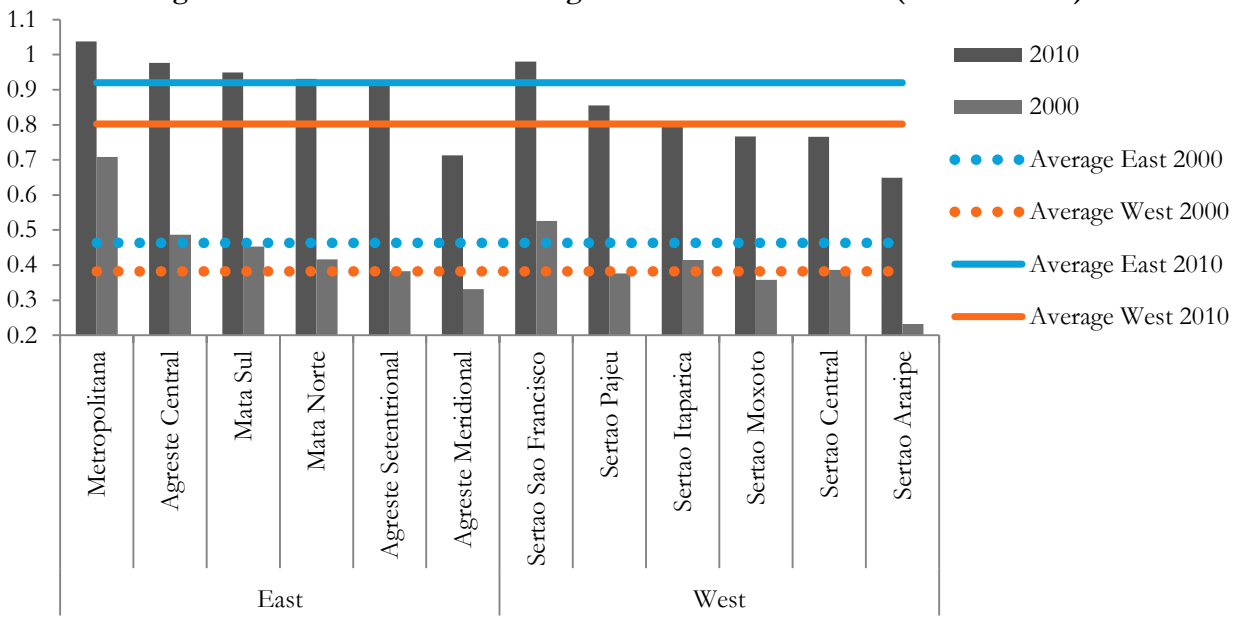
[11] These patterns hold up when looking at specific dimensions with the exception that children living in rural households headed by someone with tertiary education generally have more access than those in urban households headed by someone with a below-primary-level of education. Table 1 excludes electricity and enrollment as these dimensions are above 95 percent for all groups.

Source: Census 2010
Notes: 1) Average Coverage denotes the simple average of coverage rates for sanitation, safe water, electricity, assets, and school enrollment. 2) Race, here, includes only afro-descendants (pretos and pardos in the Census) and whites. Other races represent ~1.6 percent of the population and are excluded in the HOI calculations. 3) HH education represents the highest education level completed by the household head.

4.2.2 Development Regions (*Regiões de Desenvolvimento*)

All *Regiões de Desenvolvimento* (RDs) in Pernambuco registered social progress, although Western RDs still performed below Eastern RDs and the regional gap is growing. Between 2000 and 2010, the diamond area of every RD expanded. This progress is not trivial—the average change in RDs located in the Western part of the state was 116.5 percent, slightly outperforming the RDs in the Eastern region, which changed at an average of 105.7 percent—and it reflects the advancement that the state has made toward fulfilling its *interiorização* objective. In absolute terms, however, Eastern RDs outperformed Western ones, causing the gap in the social diamond between the East and West to rise by 45.3 percent from 2000 to 2010. As Figure 14 shows, all of the Eastern RDs (left-hand side) had a larger social diamond in 2010 than all of the Western RDs (right-hand side). The only exceptions refer to the Western *Sertao Sao Francisco* area (which performed all-around second best, only behind the *Metropolitana* RD) and the Eastern *Agreste Meridonal* (which performed all-around second worst, only ahead of *Sertao Araripe*).

Figure 14: Diamond Area of the *regiões de desenvolvimento* (2000 and 2010)

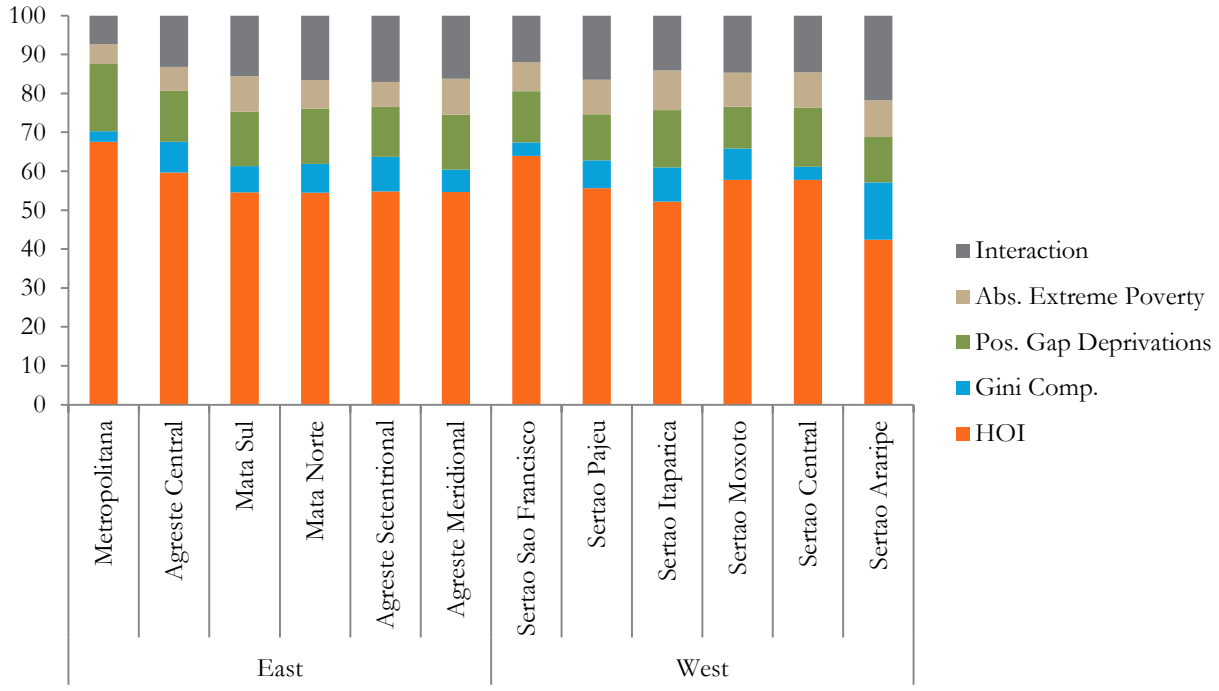


Source: Census 2000/2010

Social progress extended across dimensions with improvements in the HOI contributing the most. Each of the four indicators considered in the diamond of social progress improved, in every RD, between 2000 and 2010. As Figure 15 illustrates, the HOI contributed the most to the changes in the diamond for each RD; while, in general, the changes in the Gini index contributed the least, as can be expected given the construction of the diamond index given that the Gini generally moves by less than the HOI. Interestingly, the two RDs for which the Gini contributed more than another indicator refer to the RDs which changed the most in relative terms—*Agreste Setentrional* and *Sertao Araripe*. At the same

time, the RD that had the lowest contribution from and the lowest change in the Gini also experienced the least total change (absolute and percentage-wise) in social progress (*Metropolitana*). This may indicate the existence of untapped potential for fiscal redistribution, which could have important impacts on social progress, especially for an RD like *Metropolitana*, which, in 2010, outperformed all other RDs in terms of HOI (0.82), positive gap of deprivations (0.87), and absence of extreme poverty (91.5 percent), yet performed the worst in terms of Gini (0.65).

Figure 15: Share of change in social progress: 2000 to 2010



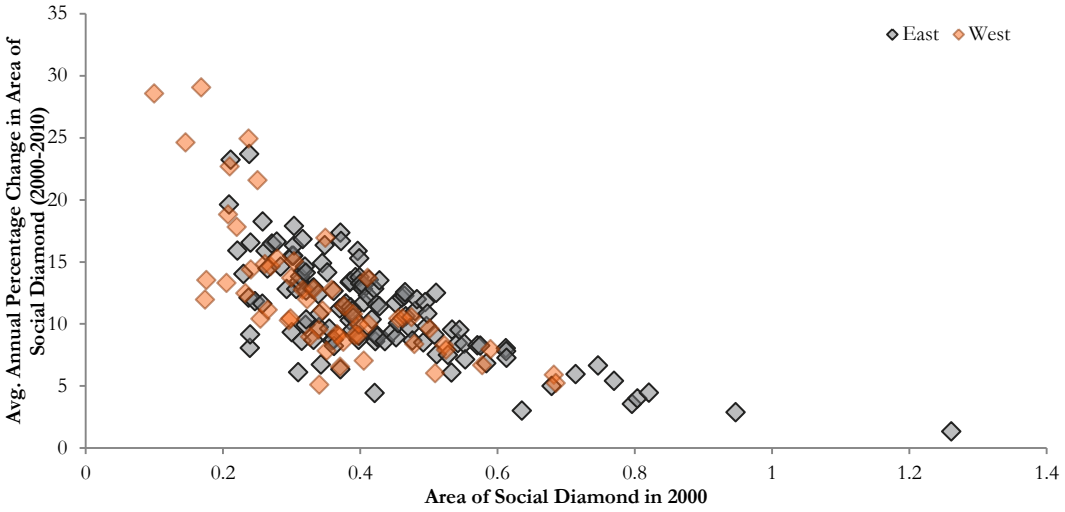
Source: Census 2000/2010

4.2.3 Municipalities

Municipalities in the interior are lagging, according to indicators of social welfare, though there is evidence of social convergence. Using a composite index of social welfare[12], in 2000, 53.6% of municipalities located in the Western *Regiões de Desenvolvimento* (the *Sertões*) ranked among the bottom 40% of municipalities in the state compared to only 34% of municipalities in the East. In 2010, the gap remained, with 58.9% of the western municipalities among the bottom 40 percent compared with 31.8% of those in the East. Note that while this ranking by location has not improved, the bottom 40% of 2000 did better in improving the social welfare index from 2000 to 2010 (14.3% annually, on average) than the top 60 (9.62%, on average).

[12] The "diamond index" of social welfare comprises the positive complements of Gini and extreme poverty as well as access to basic services, and the HOI. It is calculated as the area of a diamond composed of these elements on the vertices (with monetary indicators across from each other and non-monetary indicators across from each other) and runs from 0 to 2.

Figure 16. Social welfare has improved the most in lagging municipalities

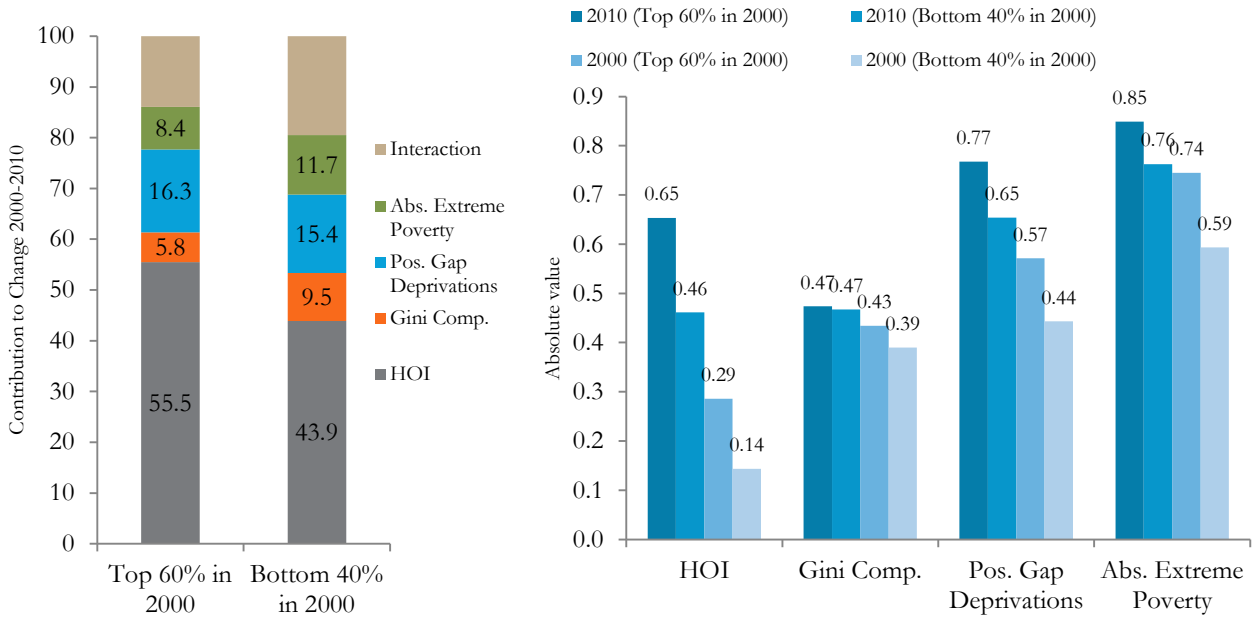


Source: Census 2000, Census 2010
Note: Incomes used are adjusted for cost of living and the poverty line used is R$70; Circumstance groups for the HOI are based on urban/rural location, gender of child, race of child, education level of household head and calculations are based on children 12 years old and under. Excluding Ipojuca from GDP chart (the highest GDP per capita in 2000 and 2010).

Improvements in monetary dimensions of welfare played a larger role in increasing social welfare in initially less developed municipalities. Reductions in income inequality and absolute poverty played a larger role in expanding the diamond of social welfare in municipalities in the bottom 40% by the diamond of social welfare index in 2000 than those in the top 60% with contributions among the bottom 40 of 9.5% and 11.7% percent, respectively, compared to 5.8% and 8.4% among the top 60 (Figure 17). Conversely, improvements in the HOI and eliminating deprivations played a larger role in the top 60 of 2000 vis-à-vis the bottom 40.

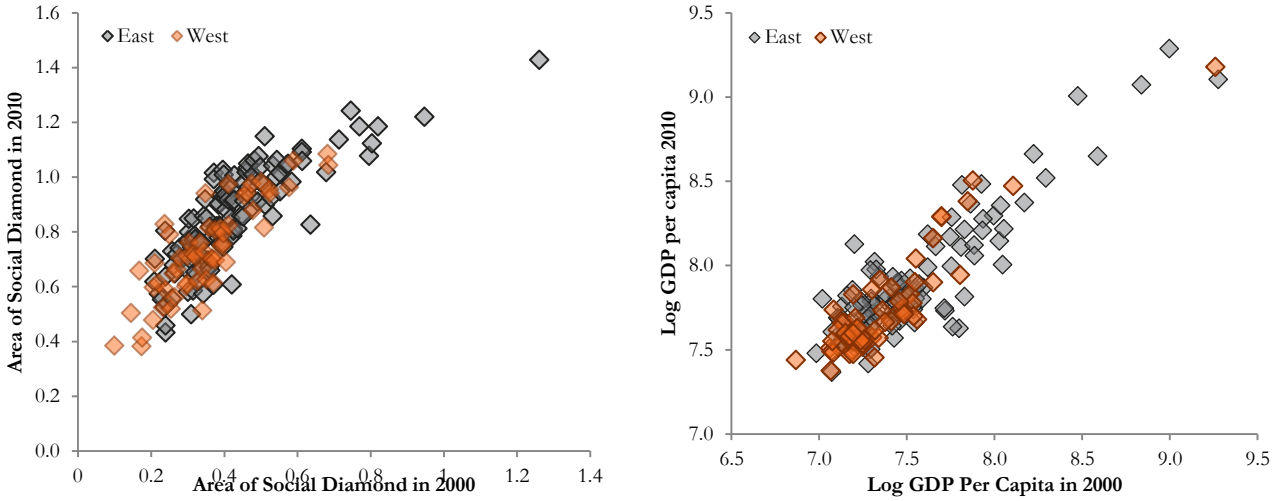
This has caused the gap between initially developed compared to less developed municipalities to shrink in terms of monetary dimensions but to rise in terms of the equitable distribution of opportunities. The gap between the bottom 40 by social diamond in 2000 and the top 60 in terms of the gini complement, positive gap of deprivations, and absence of extreme poverty all shrank between 2000 and 2010–by 85.7%, 11.1%, and 43.1%, respectively; however, the gap in the HOI rose by 34.2%, from 14 points to 19 points. Given the difference in the importance of HOI to change in social welfare (11.6 percentage points), this is not surprising, but it does point to the necessity to focus on investing in human capital and providing people with an equal starting point, which has short and long-term consequences for social welfare and economic progress, in addition to focusing on monetary outcomes, which is more of a solution for short term problems, albeit important ones.

Figure 17. Changes in poverty and income inequality are bringing the bottom 40% of municipalities closer to the average while the gap in the HOI has risen



Source: Census 2000, Census 2010
Note: Bottom 40% and Top 60% refer to Bottom 40 and Top 40 by social diamond index in 2000. Incomes used are adjusted for cost of living and the poverty line used is R$70; Circumstance groups for the HOI are based on urban/rural location, gender of child, race of child, education level of household head and calculations are based on children 12 years old and under

Figure 18. Despite trends towards convergence, the gap between bottom and top municipalities remains clear



Source: Census 2000, Census 2010
Note: Incomes used are adjusted for cost of living and the poverty line used is R$70; Circumstance groups for the HOI are based on urban/rural location, gender of child, race of child, education level of household head and calculations are based on children 12 years old and under. Excluding Ipojuca from GDP chart (the highest GDP per capita in 2000 and 2010).

The social and economic convergence across municipalities is a good signal that the state's equitable development is in line its *interiorização* strategy. But, **the convergence has been insufficient to close the gap between richer and poorer municipalities** – a challenge that will be more difficult to address under less favorable economic circumstances. For instance, the difference in GDP per capita between

municipalities in the bottom 40% and those in the top 60% in 2000 is still R$1,579 (more than the R$1,229 gap in 2000). And the difference in the social welfare index between the bottom 40% by social welfare in 2000 and the top 60% is 0.253 points - greater than that in 2000 (0.202 points). So, the lagging municipalities continue to face specific spatially and capacity-related challenges, impeding their ability to catch-up to wealthier municipalities and requiring strategic interventions.

5. Gravity analysis of migration flows and associated factors

The analysis of social progress is further enhanced when accounting for the migration movement in Pernambuco. While a number of these migrations occur within municipalities, to better understand what municipal policies and conditions attract (and repel) people, this analysis is conducted on migrations between municipalities. Evidence from the gravity models can further inform the results of the economic growth and social welfare within municipalities presented above by throwing light on how these factors interact and what this interaction means for policy makers in terms of setting priorities to enhance territorial equity. This is especially important to plan the next steps of the *interiorização* strategy to ensure its cost-effectiveness and sustainability, notably as it relates to social welfare, economic growth, and labor markets. Before analyzing the pull and push factors of migration at the municipal level, a broad overview of migration by *região de desenvolvimento* is presented to give a sense of general migration patterns over the last decade.

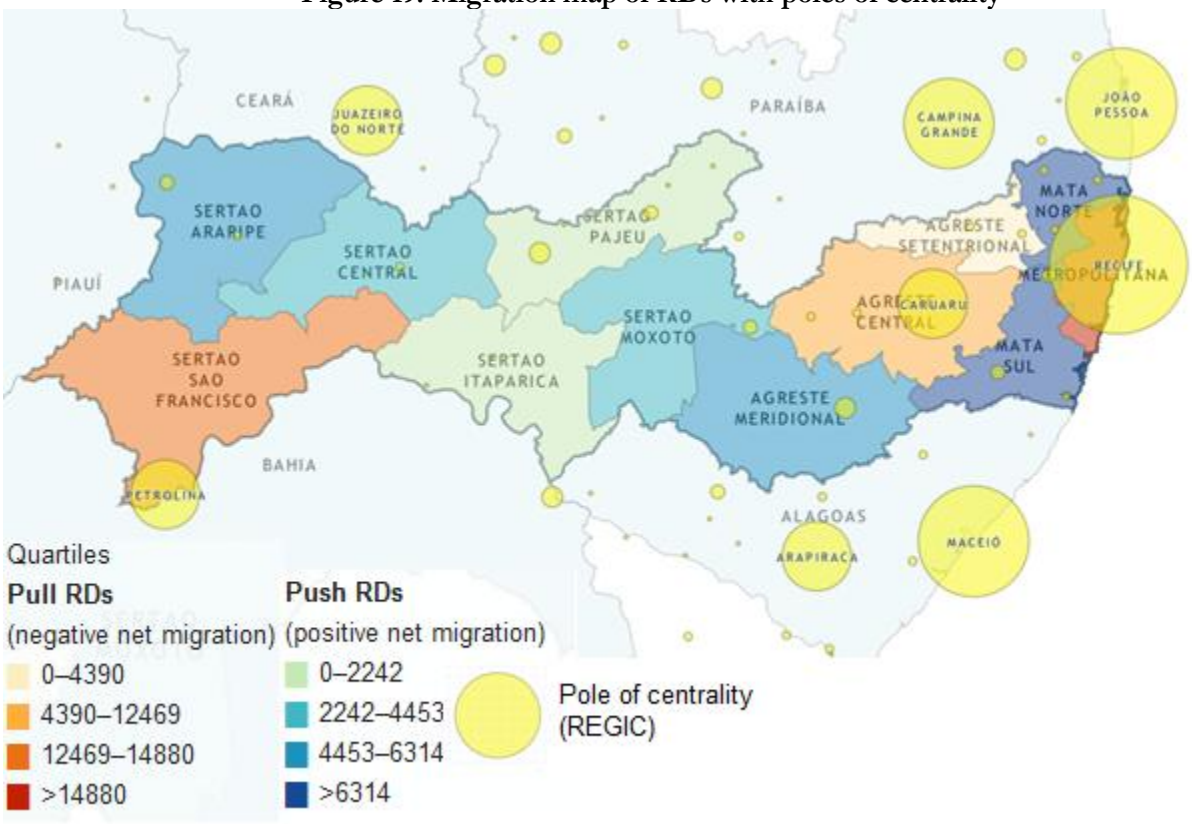
5.1 Net migration flows[13]

Within state migration in Pernambuco indicates that migrations are moving to RDs with poles of centrality. As shown in Figure 19, within Pernambuco, migrants are moving to *Metropolitana* (48.5 percent of negative net migration), *Sertão Do São Francisco* (24.1 percent of negative net migration), and *Agreste Central* (20.2 percent of negative net migration) and *Agreste Setentrional* (7.1 percent of negative net migration). This is not surprising given that *Metropolitana* contains the metropole Recife while *Sertão Do São Francisco* and *Agreste* Central have the two regional capitals for Pernambuco as classified by the REGIC survey—*Petrolina* and Caruaru, respectively, the latter of which also has a localized sphere which may be influencing immigration into *Agreste Setentrional* as well.

Proximity also plays a role in migration choices between RDs with higher shares of immigrants for the top destinations coming from nearby RDs. The RD sending the most people to *Metropolitana*, *Agreste Central*, and *Agreste Setentrional* is *Mata Sul*. In fact, almost 50 percent of positive net migration in Pernambuco can be attributed to *Mata Sul*. Following *Mata Sul* for positive net migration are Mata Norte (10.9 percent) and *Agresete Meridional* (10.2 percent), due in most part to proximity to *Metropolitana* in the former and *Agreste Central* in the latter. In the case of *Sertão do São Francisco*, the top two places immigrants come from are the neighboring RDs of *Sertão Araripe* and *Sertão Central*.

[13] Figures are citing migration flows from the last placed lived if a person moved since 2000. Similar patterns emerge using migration flows from the place lived in 2005 if it was different than in 2010.

Figure 19: Migration map of RDs with poles of centrality



Source: REGIC survey and Census 2010
Note: Net migration represents movements within PE from the previous municipality of residence if an individual had moved to the 2010 municipality of residence since 2000.

5.2 Push and pull factors

Determining the drivers of migratory flows from municipalities in the interior of Pernambuco to urban centers can shed light on factors that policies can potentially influence. To do so, the analysis rests on a gravity model based on economic and demographic characteristics of the municipality of origin and destination to identify push and pull factors at the municipality level.[14] This assessment can shed light on the role that household vis-à-vis geographical endowments play in explaining economic growth patterns and their spatial implications on social welfare.

Gravity models can provide useful insights to the state of territorial development, identifying where the attraction poles lie. Determining the drivers behind attraction poles can provide policy makers with more evidence over the strength of economic agglomeration effects to inform *interiorização,* as well as what is working in terms of *quality of life*, since migration can be a way for citizens to "vote with their feet" (See Tiebout, 1956). Additionally, negative social welfare factors preventing people from migrating can be pinpointed to better understand what could be keeping people from exerting agency.

[14] The model, following Soloaga and Lara (2005) defines the migrant flow from municipality *i*, which currently resides in municipality *j*, in terms of the demographic, socioeconomic, and geographic factors.

For example, an external factor such as low literacy may limit an individual's choice to migrate, impacting the socioeconomic set of opportunities and choices available to them.

Extreme poverty, high income inequality, and literacy are all push factors in migration. People will likely choose to migrate if they feel that the gains from living elsewhere will be higher than the cost—monetary and social—of moving. Some people, however, may not be able to move if they cannot meet this cost, reflecting the array of development factors that play a role in the migration decision. The analysis indicates that while extreme poverty at the municipality of destination is a push factor, both high income inequality and literacy are push factors at the municipality of origin. Being able to read may be a prerequisite to migration, which may explain why literacy is a push, rather than pull, factor. Access to running water as a push factor appears more counterintuitive, but it may also be explained by a minimum level of development or health as being a requirement to migrate. In addition to demographic factors pushing people to migrate, such as larger household sizes at the origin and destination, and greater population sizes, and higher shares of females in the population at the origin also acts as a push factor.

Economic factors such as employment rates, the share of services in GDP, and GDP per capita are pulling people towards municipalities. Additionally, the share of 25 to 49 year olds is also an attracting factor at the origin and destination; although, the sign changes for the destination once the squared term is included. At the same time, population density at the origin is also a pull factor. These factors indicate that people are likely moving to where economic activity and jobs are, especially those in the service industry. Access to sanitation also appears as a pull factor at the origin suggesting that urban infrastructure plays a role in attracting migrants.

Distance from Recife appears to attract migrants at the destination yet it acts as a push factor at the origin. This may indicate that people from municipalities located further from Recife are more mobile but do not move very far. This is corroborated by the expected result that increased distance between origin and destination suppresses migration.

Table 2: Push and Pull factors of migration considering the municipality of Origin

Pushing people to migrate out of the origin (+) effect on migration at origin -- "push"	**Keeping people from migrating out of the origin** (-) effect on migration at origin -- "pull"
Average Household Size	Share of 25 to 49 year olds
Access to Running Water	Employment
Share of Industry in GDP	Access to Sanitation
LN Population	LN GDP per capita
Percent Female	Share of Services in GDP
Poles of centrality	Population Density
LN Expenditures Per Capita	LN Population Squared
Gini	
Literacy Rate	
Distance from Recife	

Source: DataSus; Census 2000/2010; IBGE; Ipeadata

Note: Push and pull factors of outmigration that appear as significant at 99 confidence level in all/most of the results from 2000 and 2005 regressions appear in this table. Outmigration pairs include municipalities within Pernambuco, migration between PE municipalities and neighboring states, and migration between PE municipalities and the municipalities of Rio de Janeiro and São Paulo. For full results see Appendix 1.

Table 3: Push and Pull factors of migration considering the municipality of Destination

Keeping people from migrating to the destination (-) effect on migration at destination -- "push"	**Pulling people to migrate to the destination** (+) effect on migration at destination -- "pull"
Average Household Size Access to Running Water Share of Industry in GDP (2005 only) Percent of households in extreme poverty Percent of the population that is Catholic Low pole of centrality Distance from Recife Squared	Share of 25 to 49 yr. old (up to a point, then push) Employment LN Taxes Per Capita Higher pole of centrality Share of 25 to 49 year olds Squared Distance from Recife

Source: DataSus; Census 2000/2010; IBGE; Ipeadata

Note: Push and pull factors of outmigration that appear as significant at 99 confidence level in all/most of the results from 2000 and 2005 regressions appear in this table. Outmigration pairs include municipalities within Pernambuco, migration between PE municipalities and neighboring states, and migration between PE municipalities and the municipalities of Rio de Janeiro and São Paulo. For full results see Appendix 1.

6. Mobility out of poverty

Economic mobility, or the ease with which individuals can improve their economic status over time, is crucial for sustained poverty reduction in a state such as Pernambuco, where poverty rates remain above the national average. A key element of equity in society is the elimination of extreme poverty, as is reflected in the *quality of life* objective of the state. Determining, not only the degree of upward or downward mobility in Pernambuco—especially in terms of moving out of poverty—but also which members of society are most vulnerable, can provide key inputs to policies regarding both poverty reduction and protection from vulnerability.

To measure intra-generational economic mobility, this analysis relies on the construction of "synthetic panels". This methodology uses two cross sections of data (Census 2000 and Census 2010) to compare whether or not someone is actually poor in one period to an approximation of whether they are poor in another period (See Box 4). The analysis can thus show the number of people who stayed poor, rose out of poverty, or fell back into poverty between the time periods. Movements into and out of vulnerability to poverty and the middle class are also tracked in order to understand the extent to which people are able to move across income groups.[15]

[15] Income groups are based on the Secretaria de Assuntos Estratégicos 2012 report "Comissão para Definição da Classe Média no Brasil."

Box 5. On synthetic panel methodology

Following the synthetic panel approach recently developed by Dang, Lanjouw, Luoto and McKenzie (2011), the equity assessment analysis looks to identify those who left and those who stayed in poverty, and the potential hypotheses that lie behind the trends. The main advantage of this approach is that it does not need to impose much structure on the individual income generating process. Instead, it allows us to calculate lower and upper bounds on the movements in and out of poverty, depending on the assumption regarding the individual-specific error term. Synthetic panel are built using two cross-section datasets, by estimating the relationship between income and two sets of variables:

i. Time-invariant variables at the household level: traits such as gender, year of birth and parental education that do not change throughout a life time – for each year;

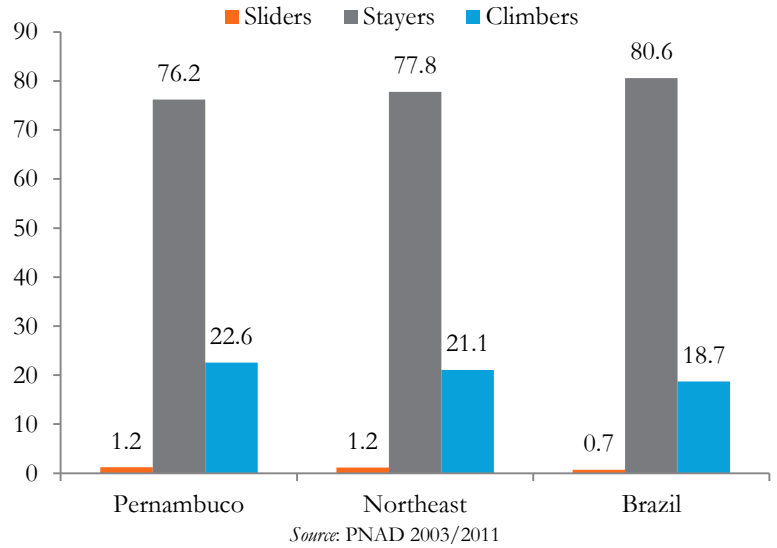
ii. Time-variant variables at the municipality area level such as: unemployment rate, population of working age, displacement rate etc.

Combining the observed and predicated household income, it is possible to study the movements in and out of poverty over the period, and the characteristics of those who stayed below the poverty line, those who escaped poverty, and those that fell below the cut-off.

Note: Different assumptions about the residuals yield the lower and upper income bounds–the assumption that error terms between periods are perfectly correlated systematically underestimates mobility between periods. This functional form is thus used to estimate the lower-bound on mobility. Conversely, assuming that the error terms are perfectly uncorrelated overstates the amount of mobility; this equation is thus employed to calculate the upper bound on mobility.

6.1 Mobility vis-à-vis the Northeast and Brazil

Figure 20: Mobility out of poverty (%) 2003 to 2011



Source: PNAD 2003/2011

A larger percentage of the population, but a smaller percentage of the poor, left poverty in Pernambuco than in Brazil from 2003 to 2011. In 2003, a larger percentage of the population in Pernambuco was poor (39.3 percent) compared to Brazil (22.4 percent). By 2011, 11.5 percent of the population in Pernambuco was able to leave poverty, compared to 8 percent in Brazil. As a percent of the initial level of the poor, this leaves Pernambuco slightly behind Brazil as 29.3 percent of the poor in Pernambuco left poverty while 35.9 percent of the poor in Brazil left poverty. Compared to the Northeast however, Pernambuco pushed more people out of poverty both as a percentage of the total population and as a percentage of the poor.

A slightly larger percentage of the population joined the middle class in Pernambuco compared to Brazil and the Northeast (Tables 4 and 5). Of the total population, 11.1 percent of people in Pernambuco graduated to the middle class compared to 10.9 percent in Brazil and 9.7 percent in the Northeast. This pushed the middle class to 47.3 percent of the population in 2011 in Pernambuco, which still represents almost a third less of the population vis-à-vis Brazil, where 69.2 percent of people are in the middle class.

However, very few people originally in poverty were able to join the middle class and virtually no one in extreme poverty in 2003 had escaped poverty by 2011. Only 0.2 percent of those originally poor in Pernambuco were able to gain economic security, while 1.1 percent of the poor in Brazil moved into the middle class. Furthermore, of those originally extremely poor in Pernambuco, while 27.2 percent improved their incomes, virtually none left poverty, indicating that there remain barriers limiting people from rising economically and, if they are able to do so, from substantially increasing their incomes.

Table 4: Economic mobility in Pernambuco (2003 to 2011)

		2011			
		Extreme poor	Poor	Vulnerable	Middle class +
2003	Extreme poor (< 70 reais)	12.0%	4.5%	0.0%	0.0%
	Poor (70 – 140 reais)	0.1%	11.3%	11.5%	0.1%
	Vulnerable (140 – 251 reais)	0.0%	0.6%	12.3%	11.0%
	Middle class + (> 251 reias)	0.0%	0.0%	0.7%	36.2%

Source: PNAD 2003/2011

Table 5: Economic mobility in Brazil (2003 to 2011)

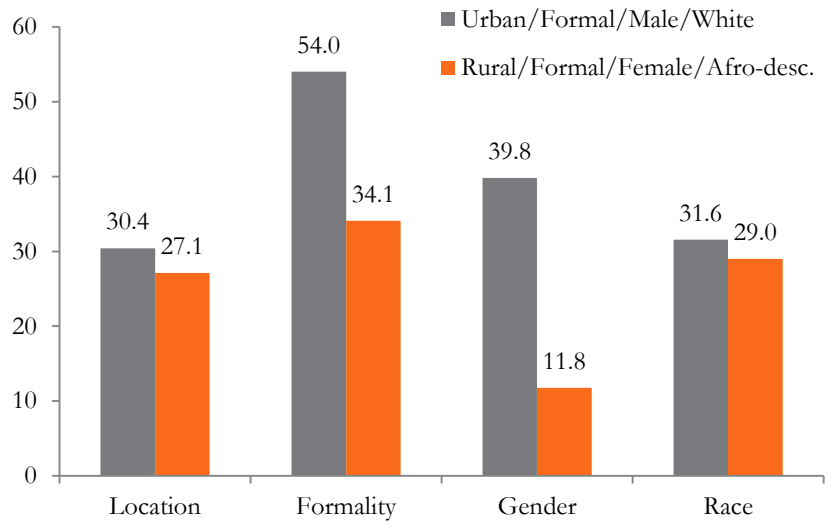
		2011			
		Extreme poor	Poor	Vulnerable	Middle class +
2003	Extreme poor (< 70 reais)	5.5%	2.8%	0.0%	0.0%
	Poor (70 – 140 reais)	0.1%	6.0%	7.8%	0.3%
	Vulnerable (140 – 251 reais)	0.0%	0.3%	8.8%	10.7%
	Middle class + (> 251 reias)	0.0%	0.0%	0.4%	57.4%

Source: PNAD 2003/2011

6.2 Characteristics of households

Rural households and households headed by informal workers, females, and afro-descendants[16] have a harder time rising out of poverty in Pernambuco compared to urban households and households headed by formal workers, males, and whites (see Figure 21). Between 2003 and 2011, 30.4 percent of urban households which were poor in the beginning of the period escaped poverty compared to 27.1 percent of originally poor rural households. Similarly, a slightly higher share of households headed by whites left poverty compared to afro-descendants. While rates of upward mobility were higher for both groups, a larger gap between the shares of poverty leavers was found between formal and informal workers in Pernambuco, at 54 percent compared to 34.1 percent of households escaping poverty in each group, respectively. However, the largest disparity in the share of originally poor households that left poverty occurred between males and females. In Pernambuco, while 39.8 percent of male headed households left poverty, only 11.8 percent of female headed households were able to do so. These trends are consistent across the Northeast and Brazil, with a slightly larger gap between blacks and whites and between males and females, and a smaller gap between urban and rural locations and formal and informal workers.

Figure 21: Share of poverty leavers by characteristic of the head of household in Pernambuco



Source: PNAD 2003/2011

Counter to intuition, a higher share of households headed by people with lower levels of education graduated from poverty, compared to households headed by people with higher levels of education. From 2003 to 2011, one third of households headed by individuals with below-primary-level school education graduated from poverty, compared to 18.2 percent of households headed by individuals whose highest level of education was primary school and to only 11 percent of households headed by individuals who completed secondary school. This result should be read in light of the construction and infrastructure boom in Pernambuco over the past decade that has led to an increase in lower-skilled labor demand, and indeed allowed for a larger number of poorer household to

[16] Afro-descendants, here, refer to the combination of "pretos" and "pardos" in the PNAD survey.

engage in the labor force, as shown in our previous analysis of the factors that have most contributed to poverty reduction in the state. Additionally, no households headed by an individual with a college degree escaped poverty. These results can be explained by the fact that few households with higher levels of education were in poverty to begin with (8.9 percent of the poor in 2003 had a secondary level education and less than one percent had a college degree), so the sample of households that were in poverty in 2003 and had these levels of education were probably poor for reasons that may have made it harder to escape from poverty. In other words, it is unlikely that increased education is keeping people from leaving poverty, but rather, the fact that these individuals are poor despite their higher education may indicate a selection bias in this group.

7. Labor markets, skills, and earnings mobility

Given the importance of labor income in explaining poverty and inequality, and the role of the labor and economic forces in determining migration in Pernambuco, this section presents an overview of labor market dynamics. The analysis covers territorial and sectoral trends, wage determinants, and workers' transitions across sectors and firms.

7.1 Territorial disparities in the labor market

Over the past decade, Pernambuco experienced growth in labor force participation and an important decline in unemployment and informality; yet, most of this progress has concentrated in the Metropolitan Area of Recife (MAR). Since 2000, labor market participation has grown at a 1.6 percent annual rate.[17] Due to faster employment creation, the unemployment rate fell in the Recife Metropolitan area, and the share of the labor force employed informally decreased (from 64 to 60 percent between 2001 and 2009).[18] In 2011, there were over 112 thousand more formal jobs in the state than in 2010.[19] Importantly, average income from the main job increased at a two percent annual rate over the last decade, bringing up living standards along the employment creation. Progress however is heterogeneous. More than 70 percent of the state's GDP is being produced in the coastal area; while, in 2009, household per capita income in the interior of the state was half that of the MAR.

Weak skills foundations in the interior of the state pose an important constraint for inclusive growth. Pernambuco lags behind other states in Brazil with respect to educational outcomes. According to the 2010 Population Census, 57.8 percent of individuals 10 years old or older in the state have a schooling level below primary school while the national average is 50.2 percent. In terms of tertiary education, the share of the population in the state who completed a college degree, at 5.7 percent, also lag behind the national average (8.3 percent). Importantly, skill gaps are even broader to the interior of the state. The previous specialization pattern in the interior of the state (agriculture and tourism) is in strong contrast to the MAR's. The skill profile of the existing workforce limits their access to the benefits of the expanding sectors, and imposes a constraint for firms' growth potential. Through job

[17] Ipeadata/IBGE.
[18] Idem.
[19] Ministry of Labor.

creation, new investment can transform lagging areas and promote regional development. Nevertheless, business viability—and therefore, private sector willingness to invest—depends to a great extent on the quantity and quality of human resources available. The state is taking steps towards removing these constraints to growth (see Box 5).

Box 6. Expanding training and education in Pernambuco

Fostering employability is a key area for the Pernambuco government to tap into a large unrealized growth potential and promote inclusive growth. Given the skill gaps, expanding vocational training and technical education have been made a priority by the state. In the port area, the government, in strong communication with employers, invested in vocational training for the existing workforce and professional education for school-age children. The same model is now being followed in the areas where the FIAT factory is being installed. Through this model, the government expects to continue attracting new investments to the interior, bringing jobs and prosperity for the people. Shorter-courses for the existing workforce were also complemented by the expansion of technical education for school-age children and young adults. In early 2007, Pernambuco had only seven state vocational schools–technical schools (*Escolas Tecnicas Estaduais*) with a total enrollment of 1,300 students. In 2012, this had grown to 29 schools and 15,000 students. Additionally, a Vocational Training distance education system was established which now offers 11 distance learning courses, distributed in 23 poles, where about 4,600 students are enrolled.

7.2 Trends in wages in Pernambuco

Hourly wages in Pernambuco are still lower than in Brazil across sectors, but have grown much faster than the national rate in public services and services. The average hourly wage rate in Pernambuco varies across sectors, from R$2.66 in agriculture to R$12.56 in public services (Figure 22). The general trends in payment scale by sector vary similarly with the national level with electricity, agriculture, and commerce on the lower end, and public services and services on the upper end. Between 2009 and 2011, high annualized growth rates in the hourly wage were prevalent in the agriculture, public services, and services sectors in Pernambuco, and growth in electricity was much higher in Brazil, while growth in public services and services was more modest (Figure 23). These high growth rates may reflect an increase in the demand for labor. On the other hand, they also may indicate a shortage in the supply of qualified workers.

Figure 22: Hourly wage rate in 2011 by sector (R$ 2005)

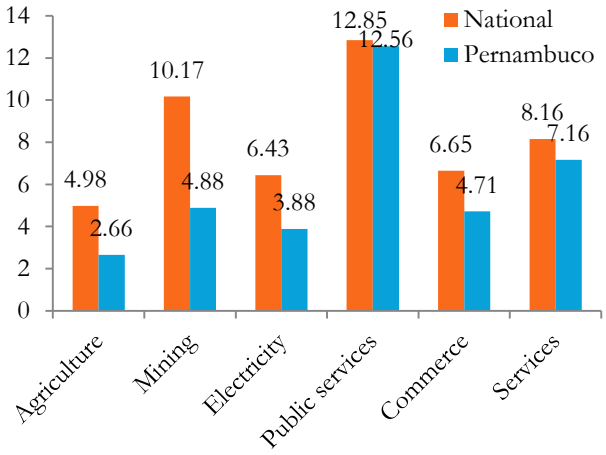
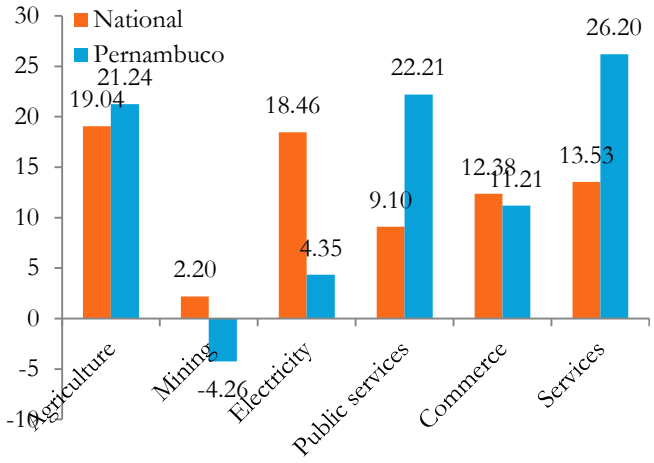


Figure 23: Annualized growth rate of hourly wage 2009-2011 by sector (%)



Source: PNAD 2009/2011

Age, formality, gender, and skill are all significant factors in determining hourly wages at both the national level and in Pernambuco. Controlling for these factors shows that skill level and formality are the greatest determinants of hourly wage, with gender close behind. These factors affect wages in the directions expected, namely, higher skill level, working in a formal job, and being male all contribute positively to hourly wage. Age also plays a role, increasing wage to a certain point and falling thereafter. While the impact of skill level and formality on hourly wage has fallen from 2009 to 2011, the impact of gender as a determinant of wage has increased. This may be attributable, in part, to a surge in construction jobs, which generally employs unskilled and semi-skilled workers (See Table 6).

Table 6. Earnings Function 2009/2011

	National 2009	Pernambuco 2009	National 2011	Pernambuco 2011
Semi skill	0.385***	0.406***	0.351***	0.398***
	(0.004)	(0.019)	(0.005)	(0.021)
Skilled	0.999***	1.033***	0.951***	0.973***
	(0.005)	(0.026)	(0.006)	(0.028)
age	0.063***	0.041***	0.058***	0.038***
	(0.001)	(0.004)	(0.001)	(0.005)
age2	-0.001***	-0.000***	-0.001***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
formal	0.391***	0.518***	0.330***	0.377***
	(0.004)	(0.018)	(0.004)	(0.020)
male	0.233***	0.186***	0.244***	0.226***
	(0.004)	(0.017)	(0.004)	(0.019)
Constant	-0.811***	-0.660***	-0.535***	-0.365***
	(0.017)	(0.077)	(0.019)	(0.090)
Observations	163,232	8,582	146,504	6,817
R-squared	0.353	0.358	0.287	0.287

Source: PNAD 2009/2011. *Note*: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

This corroborates the evidence presented in the mobility analysis, highlighting the importance of labor income in pushing people out of poverty. As the characteristics of those who earn more are generally consistent with the characteristics of those who escaped poverty, there is, not surprisingly, a clear link between wage earnings and the ability to escape poverty. The one difference between the two analyses refers to the substantial impact of skill level in determining wages (vis-à-vis the levels of education in households exiting from poverty). The evidence here confirms the strong, positive impact of education on wages, and substantiates the hypothesis that the reason that the more educated poor exhibit lower economic mobility is linked to dimensions beyond skill level making these people poor regardless of their level of education rather than the unlikely outcomes that their low mobility is attributable to higher educational attainment.

The skill premium continues to be, on average, slightly higher in Pernambuco than in Brazil, although it has declined faster in the state than in the country. In Pernambuco, skilled workers (those with *ensino medio* or a higher level of education) earn, on average, 3.7 times the rate of unskilled workers (those with less than *ensino fundamental* or primary school). The equivalent ratio for Brazil as a whole is 3.1. From their level in 2009, these figures represent a decrease in the skill premium of 14.3 percent and 13 percent for Pernambuco and Brazil, respectively, as hourly wages grew faster for unskilled workers than for skilled workers between 2009 and 2011. The higher skill premium in Pernambuco is likely related to the fact that there are less skilled workers as a percentage of the population in Pernambuco (38.8 percent) than in Brazil (42.5 percent). Semi-skilled workers (complete *ensino fundamental*) experienced the largest increase in hourly wages over this period in Pernambuco, at an over 27 percent annualized growth rate. This may be related to the recent uptake in construction which may not be sustainable going forward; however, higher wage rates for traditionally marginalized people (taking education as a proxy for marginalization) has positive implications for declines in income inequality. On the other hand, if the decline in the skill premium is driven by expansion of education without focusing on quality or failing to connect education to skills and jobs in the labor market, this could indicate a dilution of the positive effects of education on productivity.

Figure 24: Hourly wage rate (R$ 2005) in 2011 by skill level

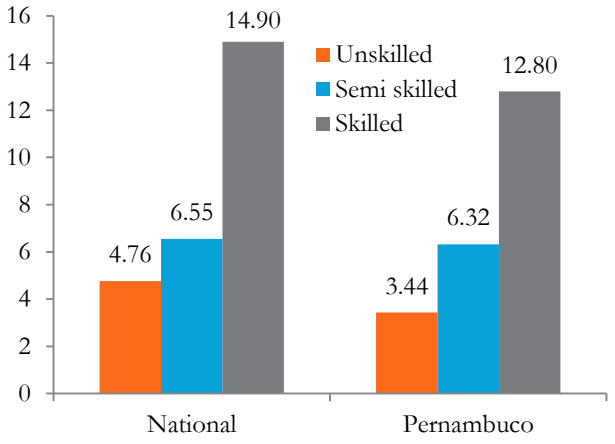
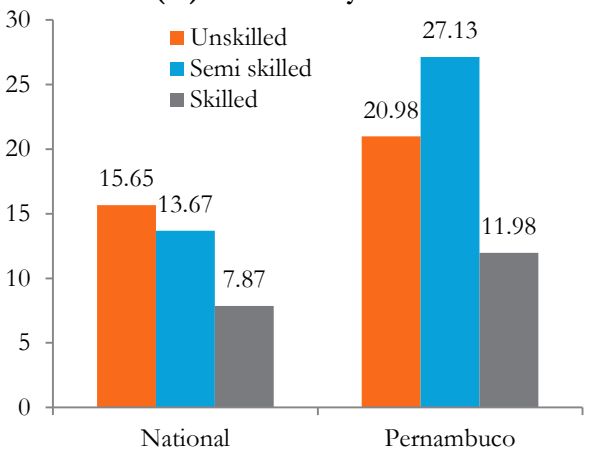


Figure 25: Annualized growth rate of hourly wage (%) 2009-2011 by skill level



Source: PNAD 2009/2011

While the skill premium has decreased, inequality within each skill group has risen between 2001 and 2011. Overall, the Gini based on hourly wages, changed very little between 2001 and 2011. However, within the unskilled and semi-skilled groups the Gini rose by 0.03; and by 0.05, within the group of skilled workers. Analyzing the income distribution by skill and age group reveals that workers aged 40-65 in the skilled group have seen the largest increase in inequality (0.05), while those in the unskilled and semi-skilled group experienced in 2011 the largest level of inequality (0.61 each). These levels of inequality may be reflective of territorial returns to labor and sectoral differences—addressed below.

Figure 26: Gini of wage by age and skill (2011)

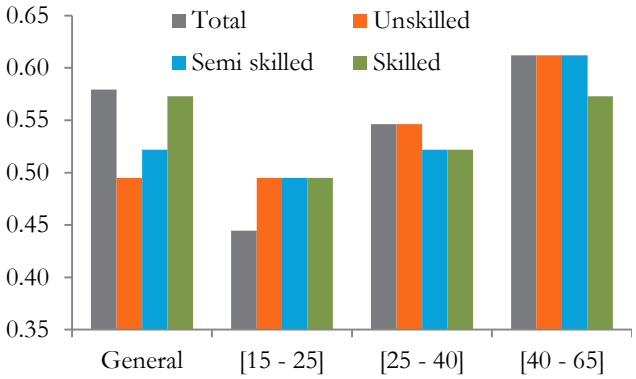
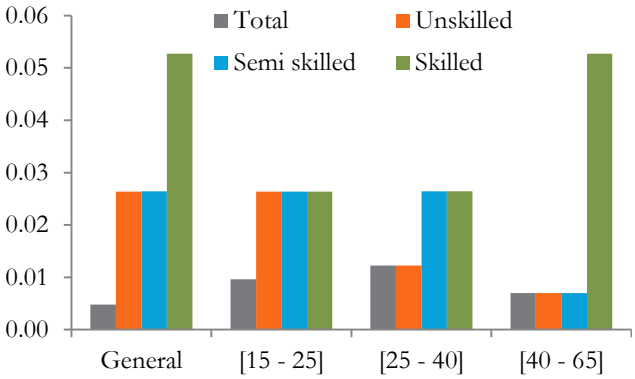


Figure 27: Absolute change in Gini 2001-2011 by age and skill



Source: PNAD 2009/2011

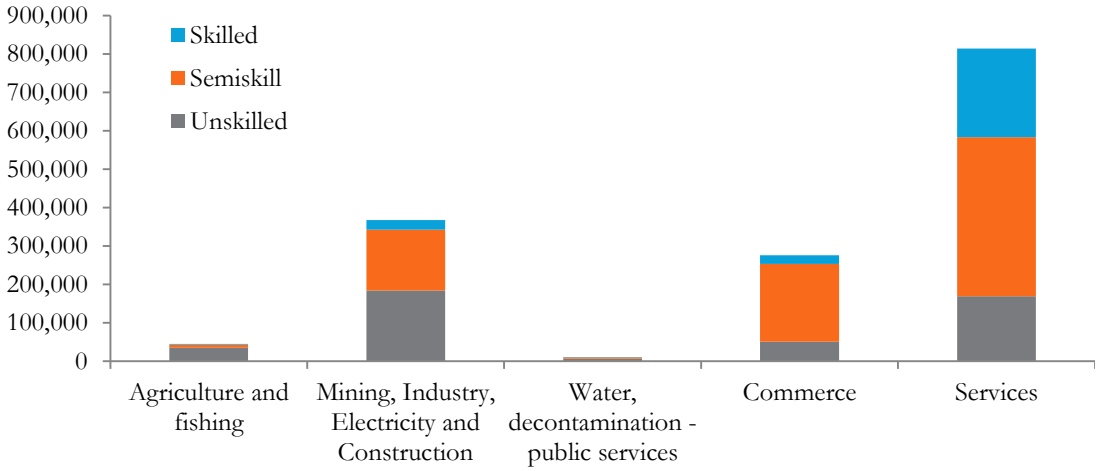
7.3 Sectors and mobility

The fastest growing demand for skilled labor in Pernambuco lies in the service sector, while semi-skilled workers continue to make up the bulk of the full work force.[20] This may help explain why the share of services in the economy was a major pull factor in the migration analysis. Additionally, demand for skilled labor[21] increased between 2010 and 2011 in every sector, except for water decontamination (public services)—where net employment for all skill types decreased. By contrast, employment for unskilled workers fell in three of the five sectors considered, and exhibited more than one percentage point positive growth for only the mining/industry/construction sector, consistent with the hypothesis that a construction boom is driving down skill premiums when skills are actually in demand in all other sectors. These trends indicate that, on one hand, Pernambuco is moving towards higher productivity sectors, and, on the other, within all sectors, jobs are becoming more skill intensive. Continued investment in skills acquisition will thus prove to be an essential element of the government's strategy in sustaining inclusive growth. Furthermore, it will be important to maintain focus on the

[20] The analysis in this component uses longitudinal matched employer-employee data and the components of the Brazil skills and jobs report to analyze skill usage (proxied by educational attainment) and workers' transitions in Pernambuco.
[21] Skilled labor here refers to workers with more than *Ensino Médio*schooling. Semi-skilled refers to some or complete *Ensino Médio* schooling, while unskilled is up to *Ensino Fundamental*.

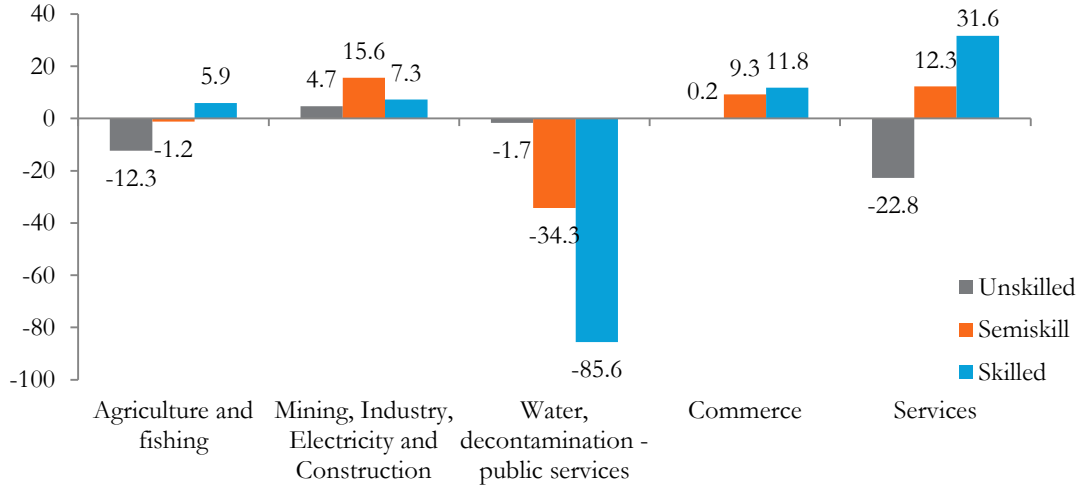
quality of skills acquisition (i.e. education) as jobs requiring skilled services may demand more intensive specialization. For instance, worker transitions are low in services and commerce, both high skill fields. In Pernambuco, 2.7 percent and 5.7 percent of workers employed in services and commerce, respectively, worked in another sector in 2011 compared to 2010. By contrast, 8.5 percent of workers in water decontamination and 7.0 percent of workers in agriculture came from another sector.

Figure 28: Number of jobs in Pernambuco 2011



Source: RAIS. *Note:* Formal sector only.

Figure 29: Growth rate (%) of net employment in PE 2010-2011



Source: RAIS. *Note:* Formal sector only.

8. The way forward

The analyses reflect that, in line with the state's policy priorities, Pernambuco has seen positive results in terms of both economic growth and equity in recent years. **Falling poverty and inequality rates across the state, and social progress within every municipality over the past decade, show that the state is fulfilling its *quality of life* objective.** The increase in the equitable coverage of opportunities has shown an impact on living standards and reduced inequalities faced by disadvantaged

groups. **Continued economic growth, GDP and social welfare convergence among municipalities corroborates an improvement of territorial equity, in line with the state's *Nova Economia* strategy.**

Zooming in at the municipality level, however, the results reveal that the gap between municipalities may be too large for lagging municipalities to catch up at the current pace of improvement. The sigma and beta-convergence evidence presented indicates that economic growth is taking place and it is taking place in lagging municipalities faster, relatively, than in leading ones. The social diamond analysis also shows equity-focused indicators have improved in all municipalities, and have improved relatively faster in lagging ones. However, the gap between initially lagging municipalities and stronger ones in terms of both GDP per capita and the social diamond index has risen. This indicates that better municipalities in 2000 improved by more over the decade in absolute terms and has implications for policy makers in terms of strengthening the social welfare focus of the *interiorização* policy objective, and prioritizing expenditure, notably through mechanisms such as the *Fundo Estuadual de Apoio ao Desenvolvimento Municipal* – FEM. This will be particularly important to ensure the sustainability of the results achieved so far, and to face the challenges that remain in a less favorable economic context of slower growth and higher inflation.

Lagging municipalities may need an extra push in providing quality access to public goods and services to overcome initially low levels of social welfare. The divergence between relative and absolute levels of change observed in municipalities in Pernambuco implies that lagging municipalities will need to improve at a much faster rate relative to their initial positions than leading municipalities in order to catch up. Focusing on economic growth alone is not sufficient to close equity gaps across the state as this could lead to the creation of "convergence clubs"— where some municipalities belong to a group that enjoys capacity and uses resources well, while others grow economically but lag behind in the capacity to provide services (see Quah 1995). Because municipalities with higher initial starting points of social welfare can devote fewer resources/capacity to short-term necessities—such as income transfers to alleviate monetary poverty—they can focus more on building infrastructure and strengthening peoples' non-monetary endowments. Municipalities with initially lower levels of social welfare have multiple issues to address, and thus, may need a bigger push, monetarily and in terms of capabilities, to deal with issues that are not short-term such as quality education and public infrastructure projects. Because of this virtuous circle of shared prosperity, such a push could have large payoffs. However, rather than concentrating solely in terms of increasing resources, these efforts could focus more on building up technical capacity—as translating resources into results appears to pose more challenges than access to resources in and of itself. For instance, the amount of *Bolsa Familia* resources distributed to the Northeast surged from 3 billion reais in 2005 to 10.9 billion in 2012 (the next highest region, the Southeast, received less than half this amount in 2012), growing at more than double the rate of transfers to municipal governments in the Northeast through *Fundo de Participação dos Municípios* (FPM). At the same time, the value of FPM transfers to the Northeast was higher than any other region in 2012.[22] Thus, the Northeast is receiving considerable financial support through different mechanisms,

[22] MDS/SAGI, Estudo Técnico 30/2013.

but to translate this support effectively and efficiently into further grains in poverty and equity and progress on *Bolsa Familia* goals, municipal capacity is and will be critical.

Focusing on improving endowments allows people to maximize their own welfare as well as the state's. In addition to focusing on endowments in human and physical capital—for instance, through the provision of services to improve education and health—policy-makers can also influence outcomes (employment or income levels) by providing subsidies or by creating conditions conducive to an appropriate business environment. Regional development strategies often combine the two types of interventions. Skoufias and Katayama (2009) present evidence that in Brazil, policies aimed at affecting outcomes (e.g. directing the location of investment through tax subsidies) tend to be less cost-effective than policies that focus on endowments. Investing in endowments and establishing the conditions that lead to an endogenous redistribution of economic opportunities (e.g. investing in human capital and infrastructure) tends to be more cost effective as people are able to migrate to thriving areas (supporting the evidence of agglomeration effects—economies of scale and networks).

Indeed, the results from the gravity model reflect that the main economic poles continue to offset other forces and attract population. Focusing on returns may therefore indicate an inefficient use of resources, which could be used instead to address the circumstances forcing people to migrate such as high inequality and extreme poverty, or those *preventing* them from migrating such as illiteracy. As people become free from poverty traps, they are able to choose the best place suited for their skills. By focusing on human and physical capital (infrastructure, services, quality of services), equity is directly addressed, whereas focusing on returns provides a less efficient path to achieve both economic growth (due to the weakening of agglomeration effects within the state) and social welfare (as it is addressed only indirectly). Increased horizontal equity can contribute to sustainable pockets of economic growth throughout the state, leading to increased economic mobility, activity and revenues, sustaining the virtuous cycle of shared prosperity. To promote this, the state can support well-functioning labor markets by continuing efforts to endow people with high-productivity skills. It can also ensure that fiscal policy focuses expenditures more on endowments than on returns. The importance of using resources as efficiently as possible is clear within the context of sustainable fiscal management.

The improvement of skills and productivity across the different sectors of Pernambuco's labor markets, formal and informal, will be key in maintaining and deepening the reduction of poverty and inequality. Labor income has played a critical role in reducing both poverty and inequality in the state. Within the macro context of slower growth in Brazil, investment in high productivity skills and jobs will make up a key dimension in the state's continued convergence with the rest of the country. Evidence from the labor analysis indicates that demand for skilled labor is indeed increasing in Pernambuco. While the skill premium is decreasing—which could be due to increases in the supply side—it continues to be the main determinate of wage in Pernambuco. In this sense, providing quality services to lift human capital levels as well as ensuring that markets are well-functioning to match these skills, will contribute to economic growth and sustainability—both in support of the *Nova Economia* policy priority as well as in poverty reduction, through increased income. Continuing to redistribute human capital, infrastructure, and supporting the poorest municipalities, especially in terms of capacity building, will contribute to increased equity. To expand the progress to date in the *interiorização* objective,

it will be necessary to focus on improving endowments to the interior of the state, with added attention to issues such as gender and ethnicity to promote the agency of all *pernambucanos* and their ability to benefit and contribute to their state's development.

References

Alkire, Sabina and James Foster (2011) "Counting and multidimensional poverty measurement", *Journal of Public Economics*, 95(7), 476-487.

Aroca, P. and W. Maloney (2005) "Migration, trade, and foreign direct investment in Mexico", *World Bank Economic Review* 19: 449-472.

Azevedo, Joao Pedro, Viviane Sanfelice and Minh Cong Nguyen (2012) Shapley Decomposition by Components of a Welfare Measure. World Bank. (mimeo).

Barros, Ricardo Paes de. Carvalho, Mirela de. Franco, Samuel. Mendoça, Rosane (2006). "Uma Análise das Principais Causas da Queda Recente na Desigualdade de Renda Brasileira." In: Revista Econômica. Volume 8, número 1, p.117-147. Univers deral Fluminense. Rio de Janeiro.

Barros, R., Ferreira, F., Vega, J., & Chanduvi, S. (2009). Measuring Inequality of Opportunities in Latin America and Caribbean. The World Bank.

Bourguignon, François, Francisco H. G. Ferreira and Michael Walton (2007). "Equity, efficiency and inequality traps: A research agenda," Journal of Economic Inequality, 5(2), pp. 235-256.

Cord, L. and L. F. Lopez-Calva (2013). "The Equity Challenges in Latin America: Opportunities, Markets and Institutions", mimeo, The World Bank.

Dang, Hai-Anh, Peter Lanjouw, Jill Luoto and David McKenzie (2011) "Using Repeated Cross-sections to Explore Movements in and out of Poverty", Policy Research Working Paper 5550, The World Bank.

Ferreira, Francisco H.G., Julian Messina, Jamele Rigolini, Luis-Felipe López-Calva, Maria Ana Lugo, and Renos Vakis (2013). "Economic Mobility and the Rise of the Latin American Middle Class". Washington, D.C: World Bank.

Frey, W.H. and K.L. Liaw (2005) "Interstate migration of Hispanics, Asians and Blacks: Cultural constraints and middle class flight" Population Studies Center, University of Michigan, Institute for Social Research, Research Report 05-575.

Lopez-Calva, L. F., & Ortiz-Juarez, E. (2012). "A Household-Based Distribution-Sensitive Human Development Index: An empirical application to Mexico, Nicaragua and Peru." *Social Indicators Research,* 109(3), 395–411.

MDS/SAGI (2013). "Evolução das transferências constitucionais e do Programa Bolsa Família entre os anos 2005 e 2012: uma análise comparativa ." Estudo Técnic 30/2013. http://aplicacoes.mds.gov.br/sagirmps/simulacao/estudos_tecnicos/pdf/69.pdf.

Quah, Danny (1995). "Empirics for Economic Growth and Convergence." Centre for Economic Policy Research Discussion Paper No.1140.

Sen, A.K. (1976) "Poverty: An ordinal approach to measurement." *Econometrica*, 44, 219-231.

Skoufias, Emmanuel and Katayama, Roy (2009). "Sources of Welfare Disparities across and within Regions of Brazil: Evidence from the 2002-03 Household Budget Survey," Policy Research Working Paper Series 4803, The World Bank.

Soloaga, Isidro and Gabriel Lara (2005). "What drives internal migration in Mexico? A Gravity Model Approach", Working Paper, El Colegio de Mexico.

Stuart, A.G., and J.P. Mattey (1996). Leaving Los Angeles: Migration, Economic Opportunity, and the Quality-of-Life. Los Angeles, Southern California Studies Center, University of Southern California.

Todaro, Michael P. (1969). "A Model for Labor Migration and Urban Unemployment in Less Developed Countries", *The American Economic Review* (AER), 59(1), 138 - 48.\

World Bank (2012). Poverty Dynamics in Brazil: Patterns, Associated Factors and Policy Challenge by Rogerio Bianchi-Santarossa, Andres Castaneda, Ana Fruttero, Samantha Lach, Luis-Felipe Lopez-Calva, Maria Ana Lugo, Jordan Solomon

World Bank (2010). Human Opportunity for Children in Brazil: An Assessment with the Human Opportunity Index.

World Bank (2006). World Development Report 2006: Equity and Development. Washington, DC: World Bank.

Annex 1: Results from the gravity model

Table 7: Outmigration

	Since 2000	Since 2000	Since 2000	2005	2005	2005
VARIABLES	LNoutmig	LNoutmig	LNoutmig	LNoutmig	LNoutmig	LNoutmig
orig_LN_pop05	0.746***	1.671***	4.112***	0.543***	1.990***	4.303***
	(0.0318)	(0.217)	(0.419)	(0.0363)	(0.252)	(0.473)
orig_popDensity	-0.000110***	-0.000578***	2.28e-05	-7.93e-05***	-0.000396***	0.000177
	(1.86e-05)	(7.62e-05)	(0.000105)	(2.04e-05)	(8.51e-05)	(0.000118)
orig_perc15_24_2000	-0.303	-70.65	-61.16	-2.731	-131.7**	-100.3*
	(2.326)	(51.22)	(51.13)	(2.692)	(60.01)	(59.88)
orig_perc25_49_2000	-7.668***	-22.17*	-18.82	-4.748**	-39.57***	-25.71*
	(1.840)	(12.83)	(13.45)	(2.134)	(14.84)	(15.57)
orig_percfemale00	9.051***	11.79***	5.701**	14.78***	16.59***	8.098***
	(2.477)	(2.567)	(2.701)	(2.812)	(2.964)	(3.130)
orig_hh_size00	0.200*	0.721***	0.375***	0.487***	0.762***	0.419***
	(0.112)	(0.129)	(0.133)	(0.129)	(0.150)	(0.155)
orig_LN_GDPPC05	-0.221***	-0.342***	-0.214***	-0.151**	-0.298***	-0.180**
	(0.0632)	(0.0656)	(0.0694)	(0.0717)	(0.0754)	(0.0801)
orig_employment00	-1.966***	-1.332***	-1.981***	-0.943**	-0.589	-1.386***
	(0.374)	(0.377)	(0.387)	(0.431)	(0.437)	(0.450)
orig_shareInd05	7.422***	5.772***	7.628***	8.200***	6.021***	6.598***
	(0.454)	(0.465)	(0.888)	(0.516)	(0.537)	(0.998)
orig_shareServ05	-7.109***	-5.531***	-7.030***	-8.121***	-5.722***	-5.859***
	(0.370)	(0.427)	(0.867)	(0.417)	(0.492)	(0.974)
orig_infant_mortality00	0.000404	0.000681	0.000400	0.00138	0.00169	0.00184
	(0.00114)	(0.00110)	(0.00112)	(0.00133)	(0.00129)	(0.00131)
orig_NurseSuperiorRate2000	0.383***	0.442***	0.332**	0.192	0.311*	0.397**
	(0.141)	(0.139)	(0.146)	(0.165)	(0.163)	(0.170)
orig_gini00	0.990***	1.422***	0.774**	1.587***	2.051***	1.245***
	(0.378)	(0.369)	(0.377)	(0.443)	(0.436)	(0.447)
orig_xtrm_povHC00	0.529	0.541	0.499	1.834	0.831	0.689
	(1.195)	(1.212)	(1.212)	(1.399)	(1.426)	(1.424)
orig_water2000	0.891***	1.004***	0.592***	0.643***	0.721***	0.291
	(0.173)	(0.175)	(0.180)	(0.202)	(0.205)	(0.212)
orig_trash2000	-0.0380	0.00526	-0.266*	0.0170	0.0514	-0.201
	(0.151)	(0.148)	(0.150)	(0.174)	(0.172)	(0.175)
orig_sanitation2000	-0.332***	-0.158	-0.0234	-0.416***	-0.281*	-0.0111
	(0.124)	(0.126)	(0.132)	(0.140)	(0.144)	(0.152)
orig_literacy00	1.120**	2.048***	1.809***	1.078*	2.335***	2.220***
	(0.538)	(0.547)	(0.555)	(0.631)	(0.645)	(0.653)
orig_distance_recife	0.00139***	0.000878*	0.00213***	0.000828***	0.000192	0.00182***
	(0.000165)	(0.000492)	(0.000508)	(0.000187)	(0.000567)	(0.000585)
orig_LN_ExpendituresPC05	0.396***	0.406***	0.569***	0.314***	0.456***	0.568***
	(0.0967)	(0.108)	(0.118)	(0.110)	(0.124)	(0.136)
orig_LN_TaxesPC05	-0.000380	0.109**	0.00685	0.000283	0.103*	-0.000895
	(0.0477)	(0.0464)	(0.0479)	(0.0544)	(0.0533)	(0.0550)
orig_shareHousingUrban05	0.216	0.398	0.222	-0.569	-0.290	-0.296
	(0.318)	(0.322)	(0.340)	(0.362)	(0.368)	(0.393)
orig_perc_catholic00	-0.482	-0.293	0.430	0.716	0.709	1.290**
	(0.547)	(0.540)	(0.552)	(0.631)	(0.626)	(0.640)
orig_perc_evangel	-2.397**	-2.409**	-0.577	0.853	0.382	1.914*
	(0.969)	(0.952)	(0.994)	(1.116)	(1.104)	(1.155)
orig_poles3			2.994***			2.956***
			(0.336)			(0.376)
orig_poles4			2.079***			1.770***

			(0.315)			(0.354)
orig_poles5			-0.100			-0.166
			(0.186)			(0.207)
orig_poles6			0.494***			0.201
			(0.155)			(0.175)
orig_poles7			0.589***			0.529***
			(0.141)			(0.157)
orig_poles8			0.505***			0.236**
			(0.0951)			(0.105)
orig_poles9			0.202***			0.149*
			(0.0710)			(0.0806)
orig_poles10			0.114			-0.0407
			(0.107)			(0.121)
orig_LN_pop05SQ		-0.0426***	-0.162***		-0.0649***	-0.176***
		(0.00897)	(0.0198)		(0.0104)	(0.0224)
orig_popDensitySQ		4.89e-08***	2.15e-09		3.19e-08***	-1.26e-08
		(7.91e-09)	(9.78e-09)		(8.85e-09)	(1.10e-08)
orig_perc15_24_2000SQ		145.3	131.5		291.2**	224.6
		(120.9)	(120.6)		(141.5)	(141.1)
orig_perc25_49_2000SQ		29.78	22.66		58.85**	33.75
		(20.82)	(22.00)		(23.98)	(25.36)
orig_distance_recifeSQ		3.62e-08	-1.02e-06*		5.95e-07	-8.26e-07
		(5.80e-07)	(5.93e-07)		(6.64e-07)	(6.78e-07)
dest_LN_pop05	0.569***	0.0190	0.114	0.392***	-0.158	-0.289
	(0.0318)	(0.217)	(0.419)	(0.0363)	(0.252)	(0.473)
dest_popDensity	-1.70e-05	5.92e-05	0.000152	-3.82e-05*	-1.35e-05	-2.29e-05
	(1.86e-05)	(7.62e-05)	(0.000105)	(2.04e-05)	(8.51e-05)	(0.000118)
dest_perc15_24_2000	4.360*	-54.41	-61.06	4.867*	-50.82	-63.15
	(2.326)	(51.22)	(51.13)	(2.692)	(60.01)	(59.88)
dest_perc25_49_2000	6.810***	-34.89***	-26.53**	6.614***	-33.54**	-32.70**
	(1.840)	(12.83)	(13.45)	(2.134)	(14.84)	(15.57)
dest_percfemale00	-8.618***	-4.589*	-1.838	-8.292***	-4.911*	-1.112
	(2.477)	(2.567)	(2.701)	(2.812)	(2.964)	(3.130)
dest_hh_size00	-0.452***	-0.238*	-0.213	-0.449***	-0.338**	-0.253
	(0.112)	(0.129)	(0.133)	(0.129)	(0.150)	(0.155)
dest_LN_GDPPC05	-0.121*	-0.0228	0.0710	-0.0500	0.0196	0.0546
	(0.0632)	(0.0656)	(0.0694)	(0.0717)	(0.0754)	(0.0801)
dest_employment00	2.611***	2.272***	1.917***	2.504***	2.196***	2.061***
	(0.374)	(0.377)	(0.387)	(0.431)	(0.437)	(0.450)
dest_shareInd05	0.849*	-0.0478	-1.804**	-0.728	-1.453***	-3.274***
	(0.454)	(0.465)	(0.888)	(0.516)	(0.537)	(0.998)
dest_shareServ05	-1.239***	-0.825*	0.590	0.214	0.424	1.950**
	(0.370)	(0.427)	(0.867)	(0.417)	(0.492)	(0.974)
dest_infant_mortality00	0.000940	0.000328	-0.000254	0.00208	0.00155	0.00114
	(0.00114)	(0.00110)	(0.00112)	(0.00133)	(0.00129)	(0.00131)
dest_NurseSuperiorRate2000	-0.216	-0.164	0.00531	-0.0177	-0.0174	0.00999
	(0.141)	(0.139)	(0.146)	(0.165)	(0.163)	(0.170)
dest_gini00	-0.223	0.280	0.553	-0.803*	-0.396	0.0319
	(0.378)	(0.369)	(0.377)	(0.443)	(0.436)	(0.447)
dest_xtrm_povHC00	-6.358***	-8.293***	-7.636***	-4.121***	-6.369***	-6.035***
	(1.195)	(1.212)	(1.212)	(1.399)	(1.426)	(1.424)
dest_water2000	-0.469***	-0.560***	-0.424**	-0.345*	-0.457**	-0.343
	(0.173)	(0.175)	(0.180)	(0.202)	(0.205)	(0.212)
dest_trash2000	-0.0257	0.113	0.0755	0.0347	0.129	0.132
	(0.151)	(0.148)	(0.150)	(0.174)	(0.172)	(0.175)
dest_sanitation2000	0.166	0.250**	0.197	0.234*	0.258*	0.157
	(0.124)	(0.126)	(0.132)	(0.140)	(0.144)	(0.152)

dest_literacy00	0.261	-0.122	0.339	-0.00444	-0.450	0.0697
	(0.538)	(0.547)	(0.555)	(0.631)	(0.645)	(0.653)
dest_distance_recife	0.00268***	0.00646***	0.00603***	0.00200***	0.00615***	0.00540***
	(0.000165)	(0.000492)	(0.000508)	(0.000187)	(0.000567)	(0.000585)
distance_km	-0.00663***	-0.0145***	-0.0147***	-0.00509***	-0.0122***	-0.0124***
	(0.000144)	(0.000329)	(0.000329)	(0.000163)	(0.000375)	(0.000374)
dest_LN_ExpendituresPC05	0.220**	-0.0453	-0.278**	0.0289	-0.198	-0.325**
	(0.0967)	(0.108)	(0.118)	(0.110)	(0.124)	(0.136)
dest_LN_TaxesPC05	0.223***	0.266***	0.233***	0.237***	0.268***	0.259***
	(0.0477)	(0.0464)	(0.0479)	(0.0544)	(0.0533)	(0.0550)
dest_shareHousingUrban05	0.626**	-0.133	-0.787**	0.383	-0.336	-0.914**
	(0.318)	(0.322)	(0.340)	(0.362)	(0.368)	(0.393)
dest_perc_catholic00	-1.882***	-1.814***	-1.508***	-2.007***	-2.033***	-2.158***
	(0.547)	(0.540)	(0.552)	(0.631)	(0.626)	(0.640)
dest_perc_evangel	0.172	0.312	0.557	-0.963	-0.724	-1.327
	(0.969)	(0.952)	(0.994)	(1.116)	(1.104)	(1.155)
dest_poles3			0.337			-0.234
			(0.336)			(0.376)
dest_poles4			0.506			-0.113
			(0.315)			(0.354)
dest_poles5			0.362*			0.265
			(0.186)			(0.207)
dest_poles6			0.498***			0.436**
			(0.155)			(0.175)
dest_poles7			-0.181			-0.0355
			(0.141)			(0.157)
dest_poles8			-0.487***			-0.340***
			(0.0951)			(0.105)
dest_poles9			-0.116			-0.0963
			(0.0710)			(0.0806)
dest_poles10			-0.219**			-0.210*
			(0.107)			(0.121)
dest_LN_pop05SQ		0.0210**	0.0131		0.0224**	0.0265
		(0.00897)	(0.0198)		(0.0104)	(0.0224)
dest_popDensitySQ		-9.43e-09	-1.79e-08*		-2.72e-09	-3.18e-09
		(7.91e-09)	(9.78e-09)		(8.85e-09)	(1.10e-08)
dest_perc15_24_2000SQ		140.0	154.4		137.6	164.9
		(120.9)	(120.6)		(141.5)	(141.1)
dest_perc25_49_2000SQ		74.00***	55.83**		71.38***	67.44***
		(20.82)	(22.00)		(23.98)	(25.36)
distance_kmSQ		1.20e-05***	1.24e-05***		1.08e-05***	1.12e-05***
		(4.79e-07)	(4.79e-07)		(5.40e-07)	(5.40e-07)
dest_distance_recifeSQ		-5.14e-06***	-4.57e-06***		-5.49e-06***	-4.82e-06***
		(5.80e-07)	(5.93e-07)		(6.64e-07)	(6.78e-07)
Constant	-15.07***	-1.028	-11.69	-16.17***	4.765	-6.135
	(2.381)	(8.756)	(9.078)	(2.705)	(10.17)	(10.60)
Observations	9,898	9,898	9,898	7,214	7,214	7,214
R-squared	0.349	0.400	0.411	0.312	0.360	0.374

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: "Since 2000" represents migration from the last placed lived if the person moved since 2000. 2005 represent migration for people from where they were living in 2005 if it was different from 2010.
Origin/destination pairs include municipalities within Pernambuco, migration between PE municipalities and neighboring states, and migration between PE municipalities and the municipalities of Rio de Janeiro and São Paulo.

Table 8: Net migration

	Since 2000	Since 2000	Since 2000	2005	2005	2005
VARIABLES	LNnetmig	LNnetmig	LNnetmig	LNnetmig	LNnetmig	LNnetmig
orig_LN_pop05	-0.0243	0.110	0.591	0.0690	0.241	0.704
	(0.0374)	(0.287)	(0.528)	(0.0467)	(0.386)	(0.629)
orig_popDensity	-2.73e-05	-4.60e-05	-7.49e-06	-9.71e-06	-7.81e-05	-2.70e-05
	(1.98e-05)	(0.000101)	(0.000132)	(2.16e-05)	(0.000113)	(0.000150)
orig_perc15_24_2000	6.481***	-16.42	-8.732	2.596	-17.22	-13.43
	(2.502)	(50.52)	(50.59)	(3.143)	(63.94)	(64.00)
orig_perc25_49_2000	-5.260***	48.13***	46.16***	-5.874**	20.92	27.64
	(1.916)	(14.52)	(15.32)	(2.398)	(18.33)	(19.15)
orig_percfemale00	5.806**	4.073	3.317	5.987	4.738	4.338
	(2.885)	(2.871)	(2.961)	(3.645)	(3.641)	(3.752)
orig_hh_size00	0.00593	0.0643	0.0324	-0.0317	-0.00508	-0.00888
	(0.122)	(0.129)	(0.132)	(0.155)	(0.162)	(0.166)
orig_LN_GDPPC05	0.164**	0.0914	0.0862	0.146*	0.104	0.100
	(0.0682)	(0.0710)	(0.0744)	(0.0809)	(0.0867)	(0.0911)
orig_employment00	-1.813***	-1.280***	-1.127***	-0.991**	-0.598	-0.580
	(0.390)	(0.393)	(0.404)	(0.480)	(0.489)	(0.503)
orig_shareInd05	2.240***	2.683***	0.941	2.573***	1.949*	0.243
	(0.631)	(0.739)	(1.294)	(0.886)	(1.056)	(1.883)
orig_shareServ05	-1.807***	-2.261***	-0.466	-2.125***	-1.497	0.194
	(0.533)	(0.709)	(1.268)	(0.779)	(1.022)	(1.854)
orig_infant_mortality00	-7.98e-05	6.24e-05	0.000547	-0.000792	-0.000798	-0.000290
	(0.00109)	(0.00107)	(0.00110)	(0.00137)	(0.00136)	(0.00139)
orig_NurseSuperiorRate2000	-0.313**	-0.333**	-0.371***	-0.0586	-0.0427	-0.0392
	(0.133)	(0.133)	(0.143)	(0.174)	(0.175)	(0.185)
orig_gini00	0.0892	0.0318	-0.0843	0.523	0.517	0.460
	(0.394)	(0.387)	(0.400)	(0.491)	(0.487)	(0.500)
orig_xtrm_povHC00	2.275**	3.087***	2.893**	-0.922	-0.156	0.113
	(1.112)	(1.170)	(1.176)	(1.424)	(1.502)	(1.509)
orig_water2000	0.136	0.233	0.191	0.180	0.284	0.282
	(0.174)	(0.180)	(0.184)	(0.222)	(0.229)	(0.235)
orig_trash2000	-0.0298	-0.0572	-0.0647	-0.0416	-0.0251	-0.0607
	(0.148)	(0.146)	(0.148)	(0.184)	(0.182)	(0.186)
orig_sanitation2000	-0.00501	-0.145	-0.140	-0.177	-0.223	-0.217
	(0.125)	(0.127)	(0.133)	(0.155)	(0.157)	(0.165)
orig_literacy00	-0.0447	0.113	-0.196	-0.138	-0.153	-0.304
	(0.524)	(0.536)	(0.550)	(0.662)	(0.684)	(0.702)
orig_distance_recife	-0.000604***	-0.00256***	-0.00219***	-5.94e-06	-0.00270***	-0.00232***
	(0.000182)	(0.000579)	(0.000600)	(0.000225)	(0.000745)	(0.000777)
orig_LN_ExpendituresPC05	-0.0645	0.0564	0.122	-0.0520	0.0221	0.0737
	(0.0995)	(0.114)	(0.122)	(0.122)	(0.145)	(0.154)
orig_LN_TaxesPC05	-0.113**	-0.126**	-0.124**	-0.131**	-0.144**	-0.158**
	(0.0497)	(0.0496)	(0.0510)	(0.0596)	(0.0602)	(0.0616)
orig_shareHousingUrban05	-0.447	-0.237	-0.000860	-0.457	-0.228	-0.0262
	(0.326)	(0.338)	(0.352)	(0.402)	(0.418)	(0.439)
orig_perc_catholic00	0.721	1.016*	1.069*	2.504***	2.733***	2.856***

	(0.569)	(0.570)	(0.579)	(0.698)	(0.702)	(0.712)
orig_perc_evangel	-0.690	-0.0985	0.119	3.930***	4.178***	4.391***
	(1.016)	(1.016)	(1.049)	(1.250)	(1.252)	(1.289)
orig_poles3			0.311			0.310
			(0.406)			(0.457)
orig_poles4			-0.722*			-0.489
			(0.434)			(0.631)
orig_poles5			0.0914			0.273
			(0.309)			(0.532)
orig_poles6			-0.226			-0.258
			(0.195)			(0.228)
orig_poles7			-0.0831			-0.121
			(0.144)			(0.177)
orig_poles8			0.127			0.0403
			(0.0905)			(0.112)
orig_poles9			0.0358			-0.0778
			(0.0709)			(0.0864)
orig_poles10			0.164			0.130
			(0.100)			(0.125)
orig_LN_pop05SQ		-0.00338	-0.0257		-0.00771	-0.0285
		(0.0127)	(0.0254)		(0.0171)	(0.0300)
orig_popDensitySQ		5.50e-09	2.80e-09		7.87e-09	3.63e-09
		(1.05e-08)	(1.24e-08)		(1.16e-08)	(1.40e-08)
orig_perc15_24_2000SQ		50.13	34.57		42.74	34.96
		(119.6)	(119.7)		(151.4)	(151.4)
orig_perc25_49_2000SQ		-91.43***	-86.44***		-45.89	-56.04*
		(24.08)	(25.61)		(30.30)	(31.89)
orig_distance_recifeSQ		1.96e-06**	1.52e-06*		3.03e-06***	2.60e-06**
		(7.69e-07)	(7.86e-07)		(1.02e-06)	(1.04e-06)
dest_LN_pop05	-0.0677**	-0.172	-0.944**	0.0481	-0.543**	-1.494***
	(0.0308)	(0.210)	(0.405)	(0.0382)	(0.264)	(0.509)
dest_popDensity	6.00e-05***	0.000489***	0.000237**	5.63e-05**	0.000261***	1.21e-06
	(1.84e-05)	(7.02e-05)	(9.87e-05)	(2.35e-05)	(8.81e-05)	(0.000125)
dest_perc15_24_2000	3.323	-17.01	-14.89	7.569***	48.46	50.28
	(2.350)	(56.11)	(56.53)	(2.912)	(71.37)	(72.13)
dest_perc25_49_2000	-0.628	24.55*	20.11	-1.223	48.74***	44.20**
	(1.913)	(13.33)	(13.90)	(2.423)	(16.70)	(17.60)
dest_percfemale00	-6.428***	-12.75***	-8.302***	-8.801***	-12.61***	-5.613
	(2.390)	(2.640)	(2.830)	(2.936)	(3.300)	(3.555)
dest_hh_size00	0.0983	-0.462***	-0.307**	-0.168	-0.366**	-0.204
	(0.115)	(0.142)	(0.148)	(0.142)	(0.178)	(0.186)
dest_LN_GDPPC05	0.196***	0.235***	0.183**	0.192**	0.242***	0.234**
	(0.0632)	(0.0675)	(0.0722)	(0.0790)	(0.0848)	(0.0913)
dest_employment00	1.193***	0.557	1.063**	-0.0710	-0.163	0.294
	(0.388)	(0.401)	(0.418)	(0.495)	(0.509)	(0.535)
dest_shareInd05	-1.787***	-0.678	-2.586***	-2.457***	-0.944*	-3.646***
	(0.416)	(0.427)	(0.858)	(0.513)	(0.534)	(1.010)
dest_shareServ05	1.414***	0.196	1.899**	2.425***	0.663	2.972***
	(0.337)	(0.380)	(0.834)	(0.411)	(0.469)	(0.980)
dest_infant_mortality00	-0.00174	-0.00144	-0.000771	-0.00170	-0.00127	-0.000938
	(0.00125)	(0.00122)	(0.00125)	(0.00158)	(0.00155)	(0.00158)

dest_NurseSuperiorRate2000	-0.719***	-0.701***	-0.639***	-0.652***	-0.727***	-0.746***
	(0.161)	(0.161)	(0.171)	(0.192)	(0.193)	(0.206)
dest_gini00	-0.742*	-1.235***	-0.952**	-0.473	-0.936*	-0.534
	(0.384)	(0.384)	(0.390)	(0.494)	(0.498)	(0.509)
dest_xtrm_povHC00	-2.107	-1.888	-1.877	-1.609	-0.0328	0.466
	(1.370)	(1.392)	(1.400)	(1.703)	(1.740)	(1.756)
dest_water2000	-0.530***	-0.543***	-0.304	-0.380*	-0.287	0.0771
	(0.181)	(0.185)	(0.192)	(0.229)	(0.232)	(0.244)
dest_trash2000	0.125	0.0111	0.171	0.244	0.123	0.241
	(0.161)	(0.161)	(0.167)	(0.201)	(0.202)	(0.210)
dest_sanitation2000	0.568***	0.199	0.0423	0.539***	0.266	0.00749
	(0.130)	(0.136)	(0.144)	(0.158)	(0.169)	(0.181)
dest_literacy00	-0.131	-0.664	-0.925	-0.803	-1.451*	-1.525*
	(0.579)	(0.605)	(0.617)	(0.737)	(0.770)	(0.793)
dest_distance_recife	-0.000734***	0.00185***	0.00139***	-0.000668***	0.000448	-0.000464
	(0.000167)	(0.000509)	(0.000525)	(0.000209)	(0.000636)	(0.000657)
distance_km	0.00200***	0.00584***	0.00591***	0.00116***	0.00556***	0.00567***
	(0.000148)	(0.000343)	(0.000345)	(0.000184)	(0.000421)	(0.000425)
dest_LN_ExpendituresPC05	-0.371***	-0.255**	-0.348***	-0.310**	-0.318**	-0.505***
	(0.0993)	(0.113)	(0.125)	(0.122)	(0.139)	(0.155)
dest_LN_TaxesPC05	-0.0128	-0.0898*	-0.0312	-0.0859	-0.155**	-0.105*
	(0.0485)	(0.0479)	(0.0498)	(0.0613)	(0.0608)	(0.0634)
dest_shareHousingUrban05	-0.518	-0.642*	-0.470	0.276	0.224	0.0725
	(0.327)	(0.334)	(0.359)	(0.401)	(0.410)	(0.450)
dest_perc_catholic00	0.483	0.122	-0.124	-1.058	-1.018	-1.122
	(0.552)	(0.555)	(0.575)	(0.699)	(0.704)	(0.735)
dest_perc_evangel	1.727*	1.636*	1.025	-2.451**	-1.910	-2.576*
	(0.975)	(0.969)	(1.033)	(1.233)	(1.232)	(1.324)
dest_poles3			-1.285***			-1.460***
			(0.329)			(0.413)
dest_poles4			-1.240***			-1.372***
			(0.307)			(0.378)
dest_poles5			0.298*			0.313
			(0.167)			(0.200)
dest_poles6			-0.232			-0.0408
			(0.147)			(0.185)
dest_poles7			-0.547***			-0.691***
			(0.153)			(0.178)
dest_poles8			-0.139			-0.197
			(0.124)			(0.134)
dest_poles9			-0.0579			-0.128
			(0.0796)			(0.0991)
dest_poles10			0.159			0.159
			(0.134)			(0.157)
dest_LN_pop05SQ		0.00825	0.0454**		0.0281***	0.0725***
		(0.00845)	(0.0189)		(0.0106)	(0.0238)
dest_popDensitySQ		-4.28e-08***	-2.30e-08**		-1.87e-08**	1.43e-09
		(7.19e-09)	(9.08e-09)		(9.13e-09)	(1.15e-08)
dest_perc15_24_2000SQ		62.84	55.93		-92.51	-96.82

		(132.1)	(133.0)		(167.8)	(169.4)
dest_perc25_49_2000SQ		-45.93**	-36.17		-82.06***	-73.93***
		(21.49)	(22.54)		(26.87)	(28.45)
distance_kmSQ		-5.61e-06***	-5.72e-06***		-6.77e-06***	-6.88e-06***
		(5.00e-07)	(5.05e-07)		(6.12e-07)	(6.19e-07)
dest_distance_recifeSQ		-2.35e-06***	-1.82e-06***		-7.49e-07	2.06e-07
		(5.59e-07)	(5.75e-07)		(6.86e-07)	(7.06e-07)
Constant	5.280**	2.771	1.106	5.742*	-2.635	-4.973
	(2.486)	(9.198)	(9.646)	(3.090)	(11.56)	(12.22)
Observations	4,949	4,949	4,949	3,607	3,607	3,607
R-squared	0.105	0.152	0.161	0.134	0.174	0.186

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: "Since 2000" represents migration from the last placed lived if the person moved since 2000. 2005 represent migration for people from where they were living in 2005 if it was different from 2010. Origin/destination pairs include municipalities within Pernambuco, migration between PE municipalities and neighboring states, and migration between PE municipalities and the municipalities of Rio de Janeiro and São Paulo.

Annex 2: Income mobility with synthetic panels

Income mobility analysis using the methodology developed by Dang, Lanjouw, Luoto, and McKenzie (2011).

- Two rounds of cross-sectional data (PNAD 2003 and 2011)

Using the second round, the relationship between income and invariant household characteristics is modeled using OLS and the income is estimated for round 1 with the resulting coefficients as follows :

- $\hat{y}_{i1}^{2L} = \hat{\beta}_1^{\prime x_{i1}^2} + \hat{\varepsilon}_{i2}^2$, where perfect positive correlationof the error term is assumed to establish the lower bound

This yields incomes for both periods, one real, the other estimated, to tack households movements in and out of poverty. E.g., the probability of a household who was poor in period 1 to escape poverty by period 2 where p is the poverty line:

- $Pr(\hat{y}_{i1}^{2L} < p | y_{i2}^2 > p)$

This approach has been validated in a recent paper by Cruces et al. (2011) in the context of Latin America

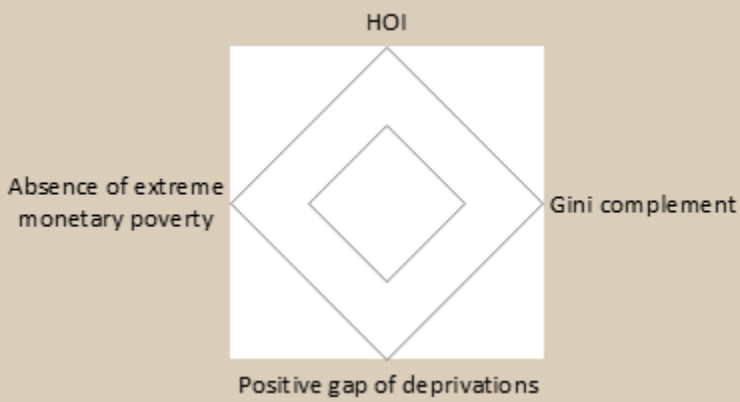
Annex 3: Constructing diamonds of social progress

To construct the diamond of social progress, 4 aspects of social welfare are taken into account and placed on a scale of 0 to 1, with 1 standing for the socially optimal outcome:

- **Human Opportunity Index:** H = HOI
- **Positive gap of deprivations**: PGD = $\frac{6-d}{6}$ (Multi-Dimensional Poverty Index)
  - where d is the average number of deprivations out of the 6 considered
- **Gini complement**: GC = 1- Gini (income inequality)
- **Absence of extreme poverty**: AEP = 1- poverty headcount (70 reais)

These dimensions are then used to calculate the area of the diamond with multi-dimensional measures alternating with income measures to give:

- $Area = \frac{(H+GC)\times(PGD+AEP)}{2}$, where the maximum area (socially optimal) of the diamond is 2



Annex 4: Gravity model of migration

The gravity model of migration is similar to that used by Soloaga and Lara to study push and pull factors of migration between Mexican states and municipalities

It uses OLS regression to determine the factors (X) of importance that are driving immigration from origin to destination municipalities:

- $\ln\left(Emigrants_{o\ to\ d}\right) = \alpha + \beta_1 X_o + \beta_1 X_d + \beta_2 k_{od} + \varepsilon_{od}$, where o is the origin, d is the destination, and k is distance

The coefficients of the origin and destination characteristics are then interpreted to determine whether they are attractive or repellant factors for migrants:

Origin: $+$ $Pull\ (Immigration)$ $-$ $Push\ (Emigration)$

Destination: $+$ $Push\ (Emigration)$ $-$ $Pull\ (Immigration)$

Annex 5: Human Opportunity Index (Geometric Means)

The Human Opportunity Index (HOI), proposed by Barros, Ferreira, Vega, and Chanduvi (2009) in the context of LAC, is a measure of the equitable coverage of basic goods and services ("opportunities") which support human development such as access to water and sanitation, child school enrollment, and possession of a telephone or refrigerator. Coverage of "opportunities" is adjusted for the equity of distribution across "circumstance" groups which are constructed based on characteristics out of an individual's control such as gender, race, location of birth, and parental level of education. Because children are less likely to have control of these characteristics, the HOI is calculated using individuals aged between 0 and 16 years old.

Following Lopez-Calva and Ortiz-Juarez (2012)'s construction of a distribution-sensitive human development index, the HOI calculated in this report utilizes geometric means to adjust coverage in access to goods and services to account for differences in distribution. The value of this approach vis-à-vis the construction of a dissimilarity index ("D-index") and corresponding penalty for unequal distribution (as in Barros, Ferreira, Vega, and Chanduvi (2009) is that it is not path-dependent.

To calculate the HOI using geometric means requires three steps:

1) Calculate the (simple average) **mean access rate** (% of people with coverage) **for each opportunity by circumstance group** (a group is composed of all of the people with the same set of circumstances. eg, group 1 could be comprised of all female who are afro-descendant live in rural locations *and* whose household head has an elementary school level of education)

$$rate_{opp,c} = \frac{1}{n}\sum_{i=1}^{n} coverage_{opp}\,, for\ each\ group\ c$$

2) Take the population weighted **geometric mean** of the average access rates **for each opportunity.** The result is the HOI for each opportunity.

$$HOI_{opp} = \left[\prod_{i=1}^{n}(rate_{opp})\right]^{\frac{1}{n}}$$

Alternatively, this equation can be written as:

$$HOI_{opp} = exp\left[\frac{1}{n}\sum_{i=1}^{n}\ln(rate_{opp})\right]$$

3) To construct the **composite index**, take the **geometric mean of the HOIs** found in step 2.

$$HOI = exp\left[\frac{1}{n}\sum_{i=1}^{n}\ln(rate_{opp})\right]$$

To compare the HOI to coverage rates alone, take the difference between the arithmetic mean of coverage for an opportunity for the population less the HOI for the opportunity.

Annex 6: Speed of convergence in PE

$$\left(\frac{1}{T}\right)\log\left(\frac{Y_{i,(t0+T)}}{Y_{i,t0}}\right) = \alpha - \left(\frac{1-e^{-\beta T}}{T}\right)\log Y_{i,t0} + u_{i,t}$$

	ln growth rate 1996_2000	ln growth rate 2000_2005	ln growth rate 2005_2010	ln growth rate 1996_2010	ln growth rate 2000_2010
$\hat{\alpha}$	0.703***	0.0707	0.210***	0.267***	0.129***
	(0.117)	(0.0578)	(0.0550)	(0.0411)	(0.0459)
$\hat{\beta}$	0.107***	0.00694	0.0219***	0.0395***	0.0132*
	(0.0255)	(0.00810)	(0.00816)	(0.0102)	(0.00708)
N	177	185	185	177	185
R^2	0.290	0.012	0.123	0.357	0.099

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1