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Is Local Social Development Associated with Workforce Composition? A Municipal Analysis of Mexico, 1990-2015

Joshua Wassink^{1,2}

¹Department of Sociology University of North Carolina at Chapel Hill

²Carolina Population Center, University of North Carolina at Chapel Hill

Abstract

A critical development goal involves reducing subsistence farming and encouraging entrepreneurship and formal sector employment. A growing number of studies examine cross-national variation in the rates of subsistence farming, marginal self-employment, formal employment, and prosperous entrepreneurship by level of development. However, despite significant regional disparities in development within most low-to-middle-income countries, little is known about how development at the local level is associated with labor market patterns. Using a pooled cross-section containing four waves of data from the Mexican Census (1990-2015), this study investigates the relationship between social development and municipal workforce composition. In the 1980s, Mexico initiated an ambitious and multipronged development agenda intended to reduce extreme regional disparities in educational attainment, housing quality, access to utilities, and poverty. This study measures social development using a multi-dimensional measure that captures educational attainment, housing quality, access to utilities, and poverty. Laborers are separated into employed, own-account workers, and employers, with each category divided into agricultural and non-agricultural. In a second set of analyses, non-agricultural own-account workers are categorized as high and low growth potential and non-agricultural wage workers are separated into informal and formal sector. Results from fixed effects regression models indicate that local development significantly reduces the rate of own-account agricultural work and increases non-agricultural wage labor and employer self-employment. As less developed areas advance, the largest initial increase in non-agricultural work is in the informal sector. But, in more developed communities, social development increasingly predicts growth in formal sector employment and more selective entry into non-agricultural own-account work. The findings suggest that investment in community-level social development has the potential to reduce subsistence self-employment, encourage formal sector work, and promote entrepreneurship. Yet, the greatest gains occur in communities that already have mid to high levels of social development.

Keywords

Development; Self-employment; Formal/informal; Labor/work; Mexico

INTRODUCTION

The majority of workers in low-to-middle-income-countries (LMICs) are either marginally self-employed on their own-account¹ or work in the informal sector of the economy, a conglomeration of small unregulated firms that offer low wages, no health or retirement benefits, and limited opportunities for occupational mobility (De Mel, McKenzie, & Woodruff, 2010; Gindling & Newhouse, 2014; Maloney, 2004; Perry et al., 2007; Phillips, 2011; Tornarolli, Battiston, Gasparini, & Gluzmann, 2014). These workers generally live under conditions of extreme poverty, in many cases subsisting primarily on their own agricultural yields (González de la Rocha, 1994; Walton & Lopez-Acevedo, 2005; World Bank, 2013). Thus, reducing subsistence self-employment and informal sector employment represent key development goals. As a recent UN report observes, a critical aim of post-2015 development policies is to identify “interventions to promote the graduation of the self-employed from one segment to another, higher-earning form of employment” (Fields, 2013).

Cross-country studies consistently show that country-level economic development is associated with less own-account work, a decline in labor market informality, and more entrepreneurship (Firebaugh & Beck, 1994; Gindling & Newhouse, 2014; Tornarolli et al., 2014). Indeed, 40% of self-employed workers in high income countries (HICs) have at least one employee, compared to just 10% of self-employed workers in LMICs (Gindling & Newhouse, 2014). In a cross-sectional analysis of 74 countries, Gindling and Newhouse (2014, p. 325) proposed a three-stage process as economic development transforms countries’ workforces. As LMICs develop, workers shift out of agricultural own account work and into nonagricultural own-account jobs in construction and manufacturing. Then, as countries further develop, workers shift into wage and salaried jobs, largely outside of agriculture. Finally, most remaining agricultural workers become non-agricultural paid workers and, to a lesser extent, upwardly mobile non-agricultural entrepreneurs. Despite evidence of a complex and non-linear relationship between development and workforce composition at the cross-national level, few studies have examined similar within-country processes. Moreover, research at the national level generally employs crude measures of development, such as GDP per capita, which are generally accompanied by improvements across a wide variety of social and economic indicators (Brady, Kaya, & Beckfield, 2007).

In contrast, government interventions intended to promote development generally emphasize improvements in particular outcomes, such as poverty, educational attainment, or housing quality (Lewis, 2005; Parker, Rubalcava, Teruel, & Behrman, 2007; Walton & Lopez-Acevedo, 2005; World Bank, 2005). All of these factors have implications for workforce composition. Education enhances entrepreneurial skills, while also providing qualifications for formal sector work (Levy, 2008; Mandelman & Montes-Rojas, 2009; Tornarolli et al., 2014). Poverty reduction and local infrastructure increase local purchasing power and create conditions more conducive to small in-home enterprises (González de la Rocha, 1994; Jütting, Parlevliet, & Xenogiani, 2008; Wassink & Hagan, 2018). Thus, social development

¹Throughout, I refer to self-employed workers with no employees as “own-account” and self-employed workers with one or more employees as “employers.” Scholars generally view own-account work as indicative of labor market marginalization, potentially a sign of masked unemployment (Gindling & Newhouse, 2014; Grimm, Knorringa, & Lay, 2012).

may encourage the emergence of stable salaried jobs and more selective entry into entrepreneurship.

Social development is not a monolithic process, rather, LMICs are generally characterized by significant regional inequalities (Portes & Roberts, 2005; Sassen, 1988), which result in local development patterns that vary across time and space. A growing number of LMICs, including Mexico, have invested in large-scale multipronged programs over the last half-century, intended to reduce poverty, educate their populations, and increase access to power and water (World Bank, 2013). These programs generally target under-developed areas to improve opportunities among more marginalized residents.

An additional advantage of analyzing changes in workforce composition at the subnational level is that it enables attention to the impact of social development on more and less developed communities. Cross-national research suggests that countries go through multiple transitions as they develop, first experiencing the substitution of marginal non-agricultural self-employment for subsistence agriculture, but gradually observing a rise in selective and prosperous entrepreneurship among more developed countries (Gindling & Newhouse, 2014; Grimm, Knorringa, & Lay, 2012). It is possible that local communities experience a similarly nonlinear change in self-employment patterns in response to social development. Moreover, cross-national studies have not considered whether the association between development and formal sector employment varies between more and less developed regions (Tornarolli et al., 2014). Variations in the relationship between social development and workforce composition at the local level are critical to policymakers intending to reduce marginal self-employment and promote formal sector job creation and prosperous self-employment.

Recognizing heterogeneous process of social development within countries, I conduct a meso-level examination of the association between social development and subsequent changes in workforce composition using municipal-level data from four waves of the Mexican Census: 1990, 2000, 2010, and 2015. Mexico is characterized by a high degree of regional inequality in terms of infrastructure, educational attainment, and poverty, which has motivated concerted investments in social development over the last three decades (Arias, Azuara, Bernal, Heckman, & Villarreal, 2010; CONAPO, 2010; Parker et al., 2007; World Bank, 2005). Substantial improvements in social development provide an opportunity to assess the relationship between social development and changes in workforce composition at the local level.

Three questions guide the analysis. (1) Does social development predict reduced marginal own-account work and agricultural wage labor? (2) As community-level social development increases, what types of non-agricultural wage jobs and businesses emerge? (3) Does the within-country relationship between local social development and workforce composition vary among communities with different levels of social development?

This analysis offers the first longitudinal and within-country examination (to my knowledge) of the relationship between local social development and workforce composition. Relatively little is known about the extent to which improvements in social development are associated

with reduced marginal self-employment and agricultural work and increased formal sector jobs and more prosperous self-employment. Results can inform development strategies as policymakers aim to modernize economic activity and reduce subsistence self-employment in less developed areas.

BACKGROUND

SOCIAL DEVELOPMENT AND WORKFORCE COMPOSITION

Descriptive research at the macro-level suggests that economic development, most commonly measured as GDP per capita, reduces marginal self-employment and encourages prosperous entrepreneurship (Gindling & Newhouse, 2014; Grimm et al., 2012; Margolis, 2014). In the poorest countries, as many as 50% of workers are independent farmers, indicative of a high rate of marginal self-employment and few non-agricultural wage options (Fajnzlber, Maloney, & Rojas, 2006; Gindling & Newhouse, 2014). But, higher country level development is associated with lower agricultural own-account work and more non-agricultural wage jobs, increasingly opportunistic entry into entrepreneurship, and successful business formation.² However, less is known about the mechanisms that link development to workforce composition, and how these mechanisms operate at the microlevel (Tybout, 2000). One possibility is that social development, which frequently accompanies economic growth, contributes to the transition from poor agrarian economies toward more dynamic and industrial economic settings.

Indeed, cross-sectional research suggests that social development affects entrepreneurial opportunities in several ways. Access to clean water and power are sparse in the least developed areas where most residents live in unfinished homes with dirt floors (Moreno-Brid & Ros, 2009; Tybout, 2000). In LMICs, such as Mexico, inefficient credit markets and limited access to startup capital motivate many entrepreneurs to initiate small businesses in the home (González de la Rocha, 1994; Maloney, 2004). Owners of in-home businesses in less developed areas must devote considerable resources to compensate for their lack of utilities and adequate workspace (Tybout, 2000). Thus, improvements in housing quality and access to utilities could encourage subsistence farmers and poor informal sector workers to initiate more productive ventures in manufacturing or commerce (Margolis, 2014).

Poverty reduction can also promote prosperous self-employment. Extreme poverty at the community level limits entrepreneurialism owing to an absence of potential clients (Margolis, 2014). As community-level poverty falls, a growing proportion of workers may opt out of agriculture or non-agricultural informal sector wage work and even some low-skill formal sector jobs to form new businesses, in response to growth in potential consumers in their local communities (Maloney, 2004; Perry et al., 2007).

Investments in education also provide important human capital skills for potential business owners. When scholars distinguish between employers and own-account workers, they

²In their analysis of seven African capitals, Grimm et al. (2012) identified own-account workers who demonstrated a high potential for growth based on their age, sex, educational attainment, and industrial profile. They found that the proportion of high potential own-account workers increased in more developed areas. Gindling and Newhouse (2014), emulating Grimm et al.'s (2012) approach, found that the proportion of high potential own-account workers increases significantly in more developed countries.

consistently find that higher education predicts lower odds of own-account work and higher odds of employer self-employment (Fajnzlber et al., 2006; Gindling & Newhouse, 2014; Grimm et al., 2012; Mandelman & Montes-Rojas, 2009). Thus, as community-level education increases, a growing proportion of workers may opt out of wage labor, preferring to invest their formal human capital skills in non-agricultural businesses.

However, in high income countries, the majority of agricultural workers hold non-agricultural wage jobs (Gindling & Newhouse, 2014). Throughout Latin America, the majority of workers – including two thirds of the Mexican workforce – are located in the informal sector of the economy (INEGI, 2011; Tornarolli et al., 2014). A vast literature explores the causes and consequences of informal sector jobs at the individual and national levels (e.g., Arias et al., 2010; Levy, 2008; Maloney, 2004). One recent analysis of Latin American countries found that the size of the informal economy is inversely correlated with GDP (Tornarolli et al., 2014). Yet, although formal employment tends to emerge first in urban areas (Jütting et al., 2008; Tornarolli et al., 2014), little is known about how changes in social development at the local level are associated with the rate of formal sector work.

There are multiple reasons to suspect that improvements in social development could motivate formal sector employment. For one, formal sector firms such as large multinational factories rely on stable infrastructure to power their operations and transport raw materials and finished products (Durand, Kandel, Parrado, & Massey, 1996; Margolis, 2014; Tybout, 2000). Moreover, formal sector firms generally require that their workers have at least a secondary education (nine years of school) or in many cases a preparatory degree (12 years of school comparable to U.S. high school) (Heredia, 1996; Rodriguez, 2016). Thus, social development could encourage growth in formal sector employment as well as entrepreneurship.³

SOCIAL DEVELOPMENT IN MEXICO

In Mexico, there are large and persistent regional disparities in social development. In an assessment of regional development between 1940 and 2000, Garcia-Verdu (2005) found significant convergence in literacy, but stable inter-state disparities in terms of GDP per capita. For example, in 1960, the Federal District had the highest GDP per capita, equaling about six times that of Oaxaca, which had the lowest GDP per capita. Despite substantial aggregate growth over the next four decades, GDP per capita in the Federal District remained about six times higher than in Oaxaca (Garcia-Verdu, 2005). Numerous studies have found similarly entrenched regional disparities in Mexican development, with several highlighting increasing regional inequality during the 1980s and early 1990s, just prior to the period of observation (for a review, see Rey & Sastré-Gutiérrez, 2010). Mexico's historic regional inequality, which prompted a multifaceted development agenda and significant

³It is important to note that the limited mobility inherent to some low-skill formal sector jobs contributes to higher rates of self-employment among workers dissatisfied with their mobility prospects in wage labor. Studies of the Mexican labor market find that self-employment is widely preferred to informal sector wage work and that 30 to 50 percent of workers view self-employment more favorably than formal sector work (Maloney, 2004; Perry et al., 2007). Moreover, recent studies show that Mexican workers often relocate or change jobs when they are overeducated relative to average workers in their same occupations (Villarreal, 2016). Thus, growth in entrepreneurship associated with rising educational attainment could partially reflect frustration with limited occupational mobility opportunities, not just the effect of rising human capital skills on entrepreneurial tendencies.

attenuation of inter-state and -municipality inequality in social development during the 1990s and 2000s, provides a unique opportunity to assess the relationship between social development and workforce composition.

In 1990, Mexico's National Population Council (CONAPO) constructed an index of marginalization (IM) to track variations in social development at the state and municipal levels.⁴ The IM is a multi-dimensional indicator that reflects educational attainment (literacy and primary school completion), housing quality and access to utilities (electricity, piped water, overcrowding, and dirt floors), poverty, and rurality (See Table A1 in Appendix A for a list of the primary items).⁵ At the national level, these different dimensions of marginalization all correspond closely to a country's income bracket and Gross National Income per capita, which are commonly used indicators of development (Fajnzlber et al., 2006; e.g., Gindling & Newhouse, 2014). Table 1 reports five of the eight indicators included in Mexico's IM as well as GNI per capita and the poverty headcount ratio at \$1.90/day.⁶ Between 1990 and 2015, Mexico achieved improvement across all of the measures of development, while also experiencing significant economic growth. In terms of economic productivity, literacy, access to utilities, and rurality, Mexico established itself firmly within the ranks of upper-middle-income-countries.

Mexico's sustained improvement was fueled in large part by an ambitious development program that targeted education, poverty, and infrastructure, with an emphasis on poor and underdeveloped communities (CONAPO, 2010; Moreno-Brid & Ros, 2009; OECD, 2012; Parker et al., 2007; Walton & Lopez-Acevedo, 2005). Macro-level reforms targeted education and infrastructure to improve the opportunities available to Mexican households, regardless of region or social class. In the late 1980s, Mexico reformed its education system to reduce regional disparities. Subsequently, the government enacted the National Agreement to Modernize Basic Education in 1992, which required that all students remain in school through the completion of ninth grade.

A variety of meso-level programs targeted access to power and clean water at the household and community levels, achieving major improvement in recent decades (World Bank, 2005), which are reflected in Table 1. At the micro-level, Mexican policies targeted poverty through cash transfer programs. In 1997, the Mexican government implemented *Progresa* (now, *Oportunidades*), which provides cash grants to participating low-income families, conditional on the enrollment of children in school. *Oportunidades* has an enrollment of over four million households, with more than 2.5 million of them in less developed communities. Table 1 points to the aggregate success of Mexico's multipronged development agenda, which has encouraged human capital formation, enhanced access to utilities, and reduced the

⁴Municipal analyses conducted by CONAPO (2010) demonstrate that the IM is highly correlated with Mexico's human development index, which captures life expectancy, infant mortality, and GDP per capita at the local level. Thus, the index not only captures poverty, infrastructure, and education, it is also an excellent proxy for economic indicators most often used to assess economic and human development cross-nationally (e.g., Brady, Kaya, & Beckfield, 2007; Firebaugh & Beck, 1994).

⁵See CONAPO (2010) for a thorough discussion of the indicator as well as an analysis of trends in state- and municipal-level marginalization in Mexico.

⁶I report the poverty headcount ratio at \$1.90/day because it provides an easily comparable unit for cross-national comparisons. The proportion of the population earning less than two minimum wages, which CONAPO uses to measure poverty, fell from 63% to 35% between 1990 and 2015.

rate of abject poverty nationally. Moreover, CONAPO's (2013) assessment of municipal development reveals declining inter-municipality disparities in terms of social development.

In my analysis, I assess how Mexico's rapid social development has impacted workforce composition at the municipal level. Although this study does not explicitly link changes in social development to policy interventions, by assessing the impact of social development on the workforce, it can inform policies intended to reduce marginal own-account work and promote formal sector jobs and prosperous self-employment.

DATA AND METHODS

DATA

I used data from Mexico's decennial Censo de Poblacion y Vivienda (Census of Population and Housing, henceforth CPV) from 1990, 2000, and 2010, as well from Mexico's 2015 population count. The CPV is based on a stratified random sample of about 2.9 million households, which was collected by the Instituto Nacional de Estadística y Geografía (National Institute of Statistics and Geography, INEGI), Mexico's equivalent of the U.S. Census Bureau. The CPV oversampled rural communities to provide precise population estimates by community size and level of development. Importantly for this analysis, the CPV is representative at the municipal level and includes all Mexican municipalities. Municipalities are second-level administrative districts akin to U.S. counties. Although localities within municipalities vary considerably, often characterized by an urban municipal center surrounded by small rural communities, there exist sizable inter-municipality disparities in terms of social development (CONAPO, 2010).

To create the analytic sample, I generated variables of interest—age, internal migration, and workforce status—at the individual level and then collapsed the data by year and municipality.⁷ I applied sample weights to adjust for the CPV's complex design. When creating the workforce composition variables, I restricted the sample to economically active respondents of working-age (15-55). Thus, the results highlight changes in workforce composition among economically active working-age Mexicans. The dataset contains 2,329 municipalities using IPUMS's continuous municipal boundaries for the period 1990-2015. I dropped three municipalities with missing information on social development, leaving an analytic sample of 2,326 municipalities and 9,304 municipality-years.⁸

SOCIAL DEVELOPMENT

I measured social development using CONAPO's IM. I used principal component analysis (PCA) to capture variance across seven of the eight items; I excluded rurality from the measure of development so that it would reflect community characteristics that can be targeted by government interventions. Table A2 in Appendix A presents the correlation matrix for the seven indicators that I used to construct the IM. PCA weights multiple measures to capture the greatest proportion of variance (Duntelman, 1989). The composite

⁷These variables were drawn from the Integrated Public Use Microdata Series, International (Minnesota Population Center, 2015).

⁸The number of observations in the analyses is smaller because data are lagged so observations from the 1990 census are not included in the analysis.

indicator had an eigenvalue of 4.89 and captured 70% of the variance across the seven distinct items. All of the components were weighted in the same direction, confirming that they reflect distinct aspects of a common outcome. To capture local development, I reverse coded the index so that higher scores reflect improvement in terms of community educational attainment and literacy, housing quality, access to piped water and electricity, and lower poverty. To account for variations by community size, I also adjusted for the natural logarithm of total population at the municipal level as a control variable. All of the variables used to calculate the IM and the measure of municipal population were drawn from CONAPO's online database.⁹

Figure 1 plots the density of municipal development for each of the four study years. The shifting distributions reveal a robust decline in regional inequality across the 25-year period. In 1990, social development was widely dispersed across Mexican communities, with a long tail to the left indicating a large number of significantly less developed communities. With each subsequent period, the curve shifted to the right, indicating higher aggregate development consistent with Table 1. Over time, the distribution also became increasingly pinched, with the left tail moving closer and closer to the mean. The tightening of the distribution indicates declining regional inequality and concentrated social development in the least developed areas, likely due to Mexico's targeted social development policies.

WORKFORCE COMPOSITION

The CPV records working-age respondents' job statuses and industries. Using job status, I separated economically active respondents into own-account workers, paid workers, and employers.¹⁰ Then, using industrial classifications, I organized workers into six categories: own-account agricultural, own-account non-agricultural, paid agricultural, paid non-agricultural, employer agricultural, employer non-agricultural. After collapsing the data at the municipal level, each variable captures the proportion of municipal workers in a job/industry category.

Non-agricultural own-account work combines marginalized workers unable to find paid jobs with ambitious entrepreneurs at early stages of business formation (Grimm et al., 2012). To distinguish between these different selection mechanisms, I created two additional measures that classify non-agricultural own-account workers as low and high potential. Following Gindling and Newhouse (2014) and Margolis (2014), I estimated a logistic regression of the odds of being an employer on age, sex, educational attainment, and industry. Then, I identified the average probability of being an employer among employers. I coded non-agricultural own-account workers with at least as high a probability of being an employer as employers as high-potential and all other own-account workers as low potential. This categorization distinguishes more selective and growth-minded entrepreneurs from more marginalized own-account workers unable to find paid jobs.

⁹http://www.conapo.gob.mx/es/CONAPO/Datos_Abiertos_del_Indice_de_Marginacion.

¹⁰The Mexican Census includes a question titled "*posición en el trabajo*" (position in the work). The options include "*patrón(a) o empleador(a)*" (employer) and "*trabajador(a) por cuenta propia (No contrata Trabajadores)*" (worker for your own-account (not contract workers)).

To distinguish between formal and informal sector non-agricultural wage work, I created an additional indicator that identifies labor market formality based on the receipt of employer-sponsored social security coverage. Extensive scholarship considers alternative measures of formal sector employment (Portes & Haller, 2005; Tornarolli et al., 2014). The two preferred indicators of formal employment are receipt of job-based benefits and employment in a large firm with more than four workers (Tornarolli et al., 2014). Private sector employers in Mexico are required to make contributions to *Seguro Social*, which then provides their employees with access to health services, pensions, retirement funds, and other benefits. Thus, wage workers who do not receive *Seguro Social* and own-account workers are commonly classified as illegal or informal workers.¹¹ Because the CPV does not record firm size, I identified labor market formality using receipt of benefits through Mexico's employment based social security program, *Seguro Social*.¹² Because affiliation with *Seguro Social* was not measured in the 1990 CPV, I restricted analyses of formal and informal sector employment to the 2000, 2010, and 2015 data.

INTERNAL MIGRATION, AGE STRUCTURE, AND POPULATION

I adjusted all of the regression models for internal migration, average age, and population size. Internal migration is strongly related to both human capital formation and regional disparities in labor market opportunities (Harris & Todaro, 1970). In particular, workers migrate to communities where they can maximize returns to their education (Lindstrom & Lauster, 2001; Villarreal, 2016). Because educationally motivated labor migration could affect both the average education in sending and receiving communities, as well as the workforce composition, I adjusted for the municipal migration rate using retrospective reports of internal migration occurring within the previous five years. I also adjusted regression analyses for municipal average age. Over the last several decades, Mexico's fertility rate has dropped, life expectancy has increased, and average age has risen as a result (Romo Viramontes & Sánchez Castillo, 2009). The fertility decline has been particularly acute in more developed areas with greater access to contraception. Age affects work; younger workers tend toward wage labor in manufacturing (González de la Rocha, 1994), while older workers are more likely to be self-employed due in some cases to age discrimination and limited education and in other instances to resource and skill accumulation (Bargain & Kwenda, 2011; Cunningham & Maloney, 2001; Fajnzlber et al., 2006; Wassink & Hagan, 2018). Finally, I included the natural log of municipal population to adjust for changes in the size of the local workforce across the study period. Results from models without adjustment for population size, internal migration, or age structure were almost identical to the adjusted results reported below (available upon request).

METHODS OF ANALYSIS

I conducted the analysis in three stages. In the first stage, I examined descriptive plots of municipal workforce composition by social development within Mexico that mirror previous cross-national assessments. In the second stage, I measured the association between change

¹¹See Tornarolli et al. (2014) for a discussion and comparison of alternative measures of informal sector employment in Latin America.

¹²Recent analyses of Mexican workers find that both measures yield similar results and that *Seguro Social* is a strong predictor of stable employment (Villarreal & Blanchard, 2013; Wassink, 2018).

in social development and subsequent change in workforce composition using the six different labor market categories: own-account agricultural, own-account non-agricultural, paid agricultural, paid non-agricultural, employer agricultural, and employer non-agricultural. In the third stage, I assessed the relationship between social development and high and low potential non-agricultural own-account work and formal and informal sector non-agricultural wage work.

To identify the association between local development on workforce composition, I estimated ordinary-least-squares (OLS) regression models with fixed effects (Allison, 2009; Wooldridge, 2015). The basic regression model can be represented by combining Eq. 1 and Eq. 2:

$$Y_{it} = \beta_n x_{it} + a_i + u_{it}, \quad t = 1, 2, \dots, T \quad (1)$$

$$\bar{Y}_i = \beta_n \bar{x}_i + a_i + \bar{u}_i, \quad (2)$$

Equation 1 is the individual regression for each municipality i at each time t , and Eq. 2 is the average regression for each municipality i across all of the time points. Within each equation, the β s reflect the associations between a vector of independent variables (x s) on the value of the dependent variable Y . a_i captures the effect of time-invariant characteristics at the municipal level. Because a_i is a time-invariant intercept, it is the same in the time-specific equation (Eq. 1) and the municipal average equation (Eq. 2). u_{it} is a time-varying error term that captures unexplained variance across municipalities and time. When Eq. 1 and Eq. 2 are combined in the fixed effects model shown in Eq. 3, a_i drops out of the equation because it is subtracted from itself:

$$Y_{it} - \bar{Y}_i = \beta_n (x_{it} - \bar{x}_i) + u_{it} - \bar{u}_i \quad (3)$$

By “demeaning” the coefficients, Eq. 3 removes the effects of time invariant municipal characteristics (Allison, 2009). However, several issues persist. First, changes in workforce composition at the municipal level occur gradually over time in response to previous demographic and contextual changes (Gindling & Newhouse, 2014; Portes & Roberts, 2005). Hence, changes in workforce composition should be assessed relative to prior rather than contemporary changes in social development. Second, the fixed effects do not account for secular trends in workforce composition that could be related to macroeconomic restructuring, globalization, or other factors likely captured by the time-varying error term. Equation 4 incorporates time ordering and adjusts for secular workforce trends:

$$Y_{it+1} - \bar{Y}_i = \beta_n (x_{it} - \bar{x}_i) + \beta_k (Y_{it} - \bar{Y}_i) + u_{it} - \bar{u}_i \quad (4)$$

To incorporate temporal ordering, Eq. 4 lags the dependent variable such that it regresses changes in Y at time $t+1$ on changes in x at time t . In other words, changes in the independent variables are ordered temporally prior to changes in the dependent variables. Equation 4 also includes change in Y at time t as a control variable to adjust for secular trends in workforce composition that could be related to trends in social development and predict subsequent changes in the workforce.¹³ The results presented below were estimated using the model specified in Eq. 4. It is important to emphasize that these analyses are not causal. They identify the predicted change in workforce composition based on an observed change in social development. But, the models cannot rule out the possibility that an unobserved time-varying third variable caused a previous change in social development and a future change in workforce composition. To adjust for potential non-linearity in the relationship between social development and workforce composition, I estimated models with linear, quadratic, and cubic measures of social development. I delineated between alternate specifications using likelihood ratio tests.

RESULTS

STAGE I: DESCRIPTIVE PATTERNS

Figure 2 graphs municipal workforce composition by social development, mirroring cross-national assessment of workforce composition by country-level development (e.g., Gindling & Newhouse, 2014; Margolis, 2014). Because the proportions of agricultural and non-agricultural employers were far lower than the other categories, I scaled them on the secondary axis to the right of the figure.

Figure 2 reveals a pattern largely consistent with previous cross-national studies. As community development increases, the proportion of the workforce who are own-account agricultural workers, likely working as subsistence farmers, drops steeply, and is largely replaced by non-agricultural wage work. There is also a significantly higher prevalence of non-agricultural business ownership in more developed communities. Consistent with the multiple stages of development identified by Gindling and Newhouse (2014), the rate of non-agricultural own-account work increases as communities move from low to moderate development, but then stabilizes and begins to decline gradually in the most developed areas. This trend may reflect the emergence of large factories and consolidation among small businesses, signaled by the steep increase in non-agricultural employers, which in turn provide employment opportunities for non-agricultural own-account workers on the margins of the informal economy.

Figure 3, which plots the rates of informal and formal sector wage jobs and low and high potential own-account work by social development, elucidates the patterns that emerged from Figure 2. As social development moves from low to moderate, there is a steep increase in the rate of informal sector work outside of agriculture and modest growth in low potential own-account work. These patterns are mirrored by marginal growth in formal sector paid jobs and high potential own-account work. But, as communities move from moderate to high

¹³The results from models without lagged dependent variables and without controls for the dependent variables at time t revealed a pattern that was substantively consistent with the results presented below (available upon request).

levels of social development, informal sector wage work and low potential own-account work both peak and then begin to decline, while the rates of high potential own-account work and formal sector wage work begin to increase more steeply. In particular, the rate of formal sector paid work surges to close to 50% of the workforce in the most developed communities. Thus, there is a strong crosssectional relationship between municipal social development and formal sector employment, non-agricultural business formation, and more selective entry into own-account work in Mexico, which mirrors cross-national trends in both labor market formality and self-employment (Gindling & Newhouse, 2014; Margolis, 2014; Tornarolli et al., 2014). To assess the robustness of these patterns, I turn to the results from the time ordered regression models with fixed effects.

STAGE II: SOCIAL DEVELOPMENT AND WORKFORCE COMPOSITION

Table 2 presents the results from likelihood ratio tests comparing the fit of the fixed effects models with local development measured using linear, quadratic, and cubic functions. Consistent with the observations from the descriptive analysis, the likelihood ratio tests provide strong support for the non-linear cubic model. In every model, the linear specification was rejected and in five of the six, the model with the cubic and quadratic terms was preferred to the model with only the quadratic term. Thus, I present results from models that include both squared and cubic terms to capture the non-linear relationship between social development and workforce composition. Results from the linear and quadratic models are available upon request.

Because non-linear relationships are difficult to interpret from raw coefficients, I plotted the marginal effects of local development on the measures of workforce composition to show how the effect of a change in social development varies across communities at different levels of social development. Figure 4 plots the marginal effects of change in social development at the municipal level on the lagged measures of workforce composition for each of the six workforce categories. The raw regression results are presented in Table B1 in Appendix B. The marginal effects of development on agricultural and non-agricultural employers are plotted on the secondary axis to the right of Figure 4. Because of the time lag, these results can be interpreted as the predicted future change in workforce composition based on an observed change in social development. The figure reveals a two-stage development process. In the least developed communities, social development is associated with a sharp reduction in the rate of own-account agricultural work, with the change largely accounted for by growth in non-agricultural wage jobs and non-agricultural own-account work. This transition likely signals the shift away from subsistence farming toward construction, manufacturing, and small scale services that has been observed in macro-studies of development and micro-analyses of particular communities (Gindling & Newhouse, 2014; Long, 2003; Long, Long, & Roberts, 1984; Portes & Roberts, 2005).

As communities develop, emerging factories also create demand for wage workers in manufacturing, and jobs emerge in construction and services in response to industrialization and growth in international commerce. These parallel processes likely contribute to the growth in non-agricultural paid jobs shown in Figure 4. Growth in non-agricultural own-account work, which likely reflects a combination of displaced agricultural workers avoiding

unemployment through marginal activities and opportunistic self-employment as individuals opt out of low-wage manufacturing jobs in favor of entrepreneurship (Bargain & Kwenda, 2011; Jütting et al., 2008; Perry et al., 2007).

In the second-half of Figure 4, several changes occur. Non-agricultural wage work continues to replace subsistence farming, although the substitution process begins to tail off at the upper end.¹⁴ Meanwhile, growth in non-agricultural own-account work tails off, while growth in non-agricultural entrepreneurship begins to accelerate. During the second stage communities appear to cross a threshold after which there are sufficient jobs to limit marginal own-account work. In turn, the rise in wage workers enables communities to sustain a growing class of small businesses – restaurants, stores, and service providers, as well as the many small manufacturing and construction firms that compose much of Mexico's informal economy. Such a transition is consistent with Grimm et al.'s (2012) finding that productive small business formation increases in more developed areas where stable infrastructure and increased education provide the necessary context and skills for business formation and a large paid workforce creates a ready consumer base. The results from Stage II are consistent with the descriptive pattern documented in Stage I and previous cross-national studies, revealing a pattern by which agricultural own-account work is initially replaced by a mix of non-agricultural employment and own-account work. But, over time non-agricultural paid jobs gradually emerge as the dominant source of work, while entrepreneurship begins to flourish in the most developed areas. To further interrogate the composition of non-agricultural wage jobs and own account work I turn to Stage 3 of the analysis.

STAGE III: SOCIAL DEVELOPMENT AND NON-AGRICULTURAL WORK

Here, I report the results from models that distinguished between formal and informal sector paid work and high and low potential own-account work. First, I assessed the fit of linear, quadratic, and cubic forms of social development. As shown in Table 3, the cubic form was the preferred specification for each of the four outcomes, indicating that the municipal level relationship between social development and subsequent changes in non-agricultural wage and own-account work differs as communities develop.

Figure 5 reports the marginal effects of changes in local development on subsequent changes in formal and informal non-agricultural wage work and high and low potential non-agricultural own-account work – the estimation results are reported in Table B2 in Appendix B. As shown in Figure 5, initial social development is associated with rapid growth in informal sector paid work and modest growth in low potential own-account work. But, communities appear to cross a threshold, beyond which growth in informal sector wage work stabilizes and low potential own-account work begins to decline. Meanwhile, as communities continue to develop, there is increasingly rapid growth in formal sector paid work and modest, albeit increasing, growth in high potential own-account work.

¹⁴The positive effect of social development on agricultural own-account in more developed communities is likely an artifact of earlier changes in the rate of subsistence farming, given the very low rate of agricultural work in the most socially developed communities (see Figure 2).

These patterns yield several conclusions. First, the majority of Mexican workers who leave agriculture as communities' social development increases initially enter informal sector wage work or marginal own-account work, a trend that is consistent with the emergence of small factories and jobs in informal construction or service oriented work (Maloney, 2004; Tornarolli et al., 2014). However, as social development continues to progress toward the upper end of the spectrum, it is succeeded by increasingly rapid growth in formal sector employment. The relationship between social development and formal sector employment suggests that as communities develop and the proportion of skilled workers increases, the benefits of expanding and registering enterprises increasingly outweigh the costs.

The modest growth in high potential own-account work and increasing decline in low-potential own-account work have two implications. First, growth in low-potential own-account work in communities around the middle of the social development index likely reflects marginal own-account work among formerly agricultural workers unable to find work in the informal sector. Ethnographic studies suggest a particularly high rate of marginal own-account work among women, older workers, and migrants who often resort to self-employment in response to discrimination in the labor market, perhaps as one part of larger household strategies (Cunningham & Maloney, 2001; González de la Rocha, 1994; Wassink & Hagan, 2018). But, the decline in low-potential own account work and modest growth in high potential own-account work as communities continue to develop signals a transition as saturated labor markets provide employment opportunities even for those at the margins, while more robust infrastructure and declining poverty encourage more skilled workers, perhaps those who benefitted from increased educational opportunities, to select out of low-wage informal sector jobs and even less-skilled formal sector occupations in manufacturing and services in favor of entrepreneurship (Jütting et al., 2008; Maloney, 2004; Perry et al., 2007). The much larger marginal effect on formal sector employment relative to high potential own-account work is consistent with the perspective that more selective entrants into self-employment voluntarily opt out of the formal labor market, suggesting that a subset of highly skilled workers attempt to maximize their human capital returns through entrepreneurship.¹⁵ These trends suggest that as community-level social development improves entry into non-agricultural self-employment undergoes a transition from one characterized primarily by exclusion similar to that theorized by those who adopt a more negative view of the informal sector labor market (Hirschman, 1970; Lewis, 2005), toward a more voluntary exit pattern as workers seek to maximize returns to their skills (e.g., de Soto, 1989; Maloney, 2004; Perry et al., 2007).

CONCLUSION

This study investigated within-country changes in workforce composition following local (municipal) social development. I examined patterns of social development and workforce composition in Mexico between 1990 and 2015, a period that included a sizable attenuation of municipal inequalities in educational attainment, housing quality and access to utilities, and poverty. Although recent cross-sectional studies document an association between

¹⁵For further discussion and analysis of voluntary and involuntary movement between formal sector employment and self-employment in Mexico and other Latin American countries, see Maloney et al. (2004). and Perry et al. (2007).

country-level economic indicators such as GDP per capita and workforce composition (Gindling & Newhouse, 2014; Margolis, 2014), little is known about how such relationships evolve within countries, particularly as more marginalized communities progress through multiple stages of development. Because development progresses unevenly and policy interventions in countries like Mexico generally target specific and disadvantaged communities (Parker et al., 2007; Walton & Lopez-Acevedo, 2005; World Bank, 2005), it is essential to understand how the association between social development and workforce composition varies across time and levels of development.

In this study, I estimated fixed effects regression models of lagged workforce composition on social development. This approach improved upon previous cross-sectional studies in several ways. First, by controlling for time invariant characteristics unique to municipalities and incorporating a temporal structure in which workforce composition responds to prior changes in social development, I removed concerns that variation in workforce composition can be attributed to time invariant characteristics of particular communities and assumed a theoretically appropriate temporal structure in which changes in social development predict future changes in workforce composition. Second, I adjusted for secular trends in workforce composition within communities to more precisely identify the effect of changes in social development. Third, I integrated research on economic development and workforce composition with the extant literature on informal sector employment to assess the composition of non-agricultural wage jobs that emerge as communities develop.

My results demonstrate that social development is a significant predictor of decline in subsistence agriculture and growth in non-agricultural wage work and entrepreneurship. The municipal-level association between social development and changing workforce composition is nonlinear. Initially, agriculture is largely replaced by informal sector paid jobs and low-potential own-account work. Yet, as mid- to well-developed communities continue to experience gains in terms of education, housing quality, and poverty, they experience increasingly rapid growth in formal sector employment and more selective entry into non-agricultural self-employment, while the rate of marginal own-account work begins to decline.

Although the analysis does not directly identify the impact of social policy on the workforce, the results suggest that targeted social development programs may have the potential to transform largely agrarian communities and reduce the rate of subsistence self-employment, an outcome in line with the UN's 2015 Sustainable Development Goals (Fields, 2013). At the same time, the fact that agricultural self-employment is not immediately replaced by formal sector employment has implications for Mexico's labor and development policy, particularly given that its informal sector, which significantly outpaces that of other Latin American countries with similar income levels (Tornarolli et al., 2014), actually increased in size between 2000 and 2010, despite the sustained economic growth and social development documented in Table 1. My findings indicate that as local social development improves, communities may cross a threshold after which growth in non-agricultural informal sector work is increasingly replaced by formal sector employment and more selective business formation. Thus, sustained investment in terms of educational attainment, housing quality and access to utilities, and poverty reduction may have the potential to spur long-run growth

in formal sector employment. However, the most marginalized communities likely require significant improvements before significant gains in formal sector employment and more selective entrepreneurship are observed. Future research might consider whether a causal relationship exists between social development policy and workforce composition

This study suggests several productive directions for future research. First, although Mexican communities span much of the development spectrum, they do not reflect the development process of all other countries. For example, many less developed countries lack the resources and political stability to implement their own development programs on the same scale as Mexico. Even among those that do, varying labor market regulatory contexts differently affect workforce transitions. Future studies might build on this analysis by comparing countries at varying levels of development and with diverse policy frameworks. Additionally, while this study focused on a multidimensional indicator of social development, other factors such as investment in transportation infrastructure, crime reduction, technological innovation and mechanization, or global economic integration could all affect workforce composition. Future studies might examine different facets of development simultaneously to disentangle how alternative mechanisms impact the transition from agrarian and largely subsistence-based economies toward formal labor markets and more selective entry into self-employment.

Finally, while this study modeled the evolution of workforce composition in relation to improvements in social development, it did not directly measure the quality of emerging non-agricultural jobs and businesses in terms of earnings, job satisfaction, or tenure. Macro-level research documents stagnant wages in Mexico during the 1990s and 2000s (Passell, Cohn, & Gonzalez-Barrera, 2012), while much of the growth in formal sector employment has resulted from the proliferation of large factories that provide formal sector health and retirement benefits, but relatively limited wages and mobility opportunities (Rodriguez, 2016). Indeed, the increase in high potential own-account work in more developed areas suggests that many qualified workers voluntarily exit or opt not to enter formal sector jobs (Maloney, 2004; Perry et al., 2007), preferring the opportunity to maximize the returns to their skills through entrepreneurship. Future studies could invest the impact of changes in workforce composition on the wages associated with various industries, occupations, and skill levels. Studies could also consider global measures of wages or income inequality to assess.

APPENDIX A

Table A1.

Primary components of Conap's index of marginalization

Educational marginalization	
Illiteracy	Proportion of residents older than 15 who cannot read/write
<Primary	Proportion of residents older than 15 with less than a primary education (6 years)
Housing marginalization	
Electricity	Proportion of residents in homes without electricity
Water	Proportion of residents in homes without water

Overcrowding	Proportion of residents in homes with some level of overcrowding
Floors	Proportion of residents in homes with dirt floors
Poverty	Proportion of employed population earning less than twice the minimum wage
Rurality	Proportion of municipal residents in communities with fewer than 5,000 residents

Table A2.

Marginalization index weighting and covariance matrix

	Component weighting	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Illiteracy	0.43	1.000						
(2) <Primary	0.42	0.851	1.000					
(3) Electricity	0.26	0.575	0.629	1.000				
(4) Water	0.30	0.547	0.574	0.626	1.000			
(5) Overcrowding	0.36	0.680	0.749	0.562	0.559	1.000		
(6) Floors	0.34	0.745	0.764	0.690	0.609	0.725	1.000	
(7) Poverty	0.41	0.660	0.767	0.421	0.450	0.694	0.642	1.000

Table B1.

Fixed effects regressions of workforce composition on social development with lagged dependent variables

	Own-account		Employer		Paid	
	Ag	Nonag	Ag	Nonag	Ag	Nonag
Development	0.0056 (0.0095)	-0.0019 (0.0054)	0.0040 *** (0.0011)	0.0040 ** (0.0012)	-0.0016 (0.0066)	-0.0104 (0.0078)
Development-squared	-0.0061 *** (0.0014)	0.0019 * (0.0008)	-0.0005 *** (0.0002)	-0.0006 *** (0.0002)	-0.0001 (0.0009)	0.0055 *** (0.0011)
Development-cubed	0.0004 *** (0.0001)	-0.0001 ** (0.0000)	0.0000 ** (0.0000)	0.0000 *** (0.0000)	0.0000 (0.0000)	-0.0003 *** (0.0001)
Age	-0.0126 *** (0.0007)	-0.0035 *** (0.0004)	0.0006 *** (0.0001)	0.0011 *** (0.0001)	0.0036 *** (0.0005)	0.0111 *** (0.0006)
Internal migration	-0.2851 *** (0.0821)	0.0837 (0.0465)	-0.0001 (0.0092)	0.0067 (0.0107)	0.0131 (0.0564)	0.2026 ** (0.0675)
Ln(population)	0.0031 (0.0082)	-0.0036 (0.0047)	-0.0021 * (0.0009)	-0.0010 (0.0011)	-0.0240 *** (0.0056)	0.0278 *** (0.0067)
Own-account, Ag	-0.1256 *** (0.0131)					
Own-account, Nonag		-0.1524 *** (0.0123)				
Employer, Ag			-0.2866 *** (0.0192)			
Employer, Nonag				-0.3263 ***		

	Own-account		Employer		Paid	
	Ag	Nonag	Ag	Nonag	Ag	Nonag
				(0.0167)		
Paid, Ag					−0.1106 ***	
					(0.0116)	
Paid, Nonag						−0.1391 ***
						(0.0139)
Constant	0.7132 ***	0.2520 ***	0.0033	−0.0127	0.3442 ***	−0.1781 **
	(0.0771)	(0.0439)	(0.0087)	(0.0100)	(0.0532)	(0.0631)
R-squared	0.3270	0.0640	0.0700	0.2040	0.0370	0.3680
Observations	6974	6974	6974	6974	6974	6974

Standard errors in parentheses

Source: Author Calculations from the Mexican Census, 1990-2015

Ag = Agricultural

Nonag = Non-agricultural

Table B2.

Fixed effects regressions of wage work formality and own-account work potential on social development with lagged dependent variables

	Nonag wage work		Nonag own-account work	
	Informal	Formal	LP	HP
Development	−0.074	0.054 *	−0.004	0.002 *
	(0.044)	(0.022)	(0.005)	(0.001)
Development-squared	0.016 **	−0.008 **	0.002 **	0.000
	(0.005)	(0.003)	(0.001)	(0.000)
Development-cubed	−0.001 **	0.000 ***	0.000 ***	0.000 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Age	0.010 ***	0.001	−0.004 ***	0.000 ***
	(0.001)	(0.000)	(0.000)	(0.000)
Internal migration	0.020	0.063	0.092 *	−0.006
	(0.087)	(0.045)	(0.045)	(0.007)
Ln(population)	−0.004	0.022 ***	−0.007	0.002 *
	(0.011)	(0.005)	(0.005)	(0.001)
Nonag wage work, informal	−(0.346) ***			
	(0.020)			
Nonag wage work, formal		−0.271 ***		
		(0.016)		
Nonag own-account work, LP			−0.144 ***	
			(0.012)	
Nonag own-account work, HP				0.028
				(0.015)
Constant	−0.047	−0.154 *	0.295 ***	−0.025 ***

	<u>Nonag wage work</u>		<u>Nonag own-account work</u>	
	<u>Informal</u>	<u>Formal</u>	<u>LP</u>	<u>HP</u>
	(0.134)	(0.068)	(0.043)	(0.007)
R-squared	0.437	0.176	0.082	0.407
Observations	4,647	4,647	6974	6974

Standard errors in parentheses

Source: Author Calculations from the Mexican Census, 2000-2015

Nonag = Non-agricultural

LP = low potential

HP = high potential

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Fig 1.
Distribution of local development by year for all Mexican municipalities. Source, CPV
1990-2015

Fig 2.

Descriptive association between local development and workforce composition. The proportions of agricultural and non-agricultural employers are graphed relative to the secondary y-axis to the right of the figure.

Source: Author calculations from the Mexican CPV 1990-2015

Fig 3.

Descriptive association between local development and non-agricultural wage work by sector and non-agricultural own-account work by growth potential.

Source: Author calculations from the Mexican Census CPV 1990-2015

Fig 4.

Marginal effects of local development on workforce composition by level of development. The marginal effects of social development on agricultural and non-agricultural employers are graphed relative to the secondary y-axis to the right of the figure.

Source: Author calculations from the Mexican Census CPV 1990-2015

Fig 5.

Marginal effects of local development on the quality of non-agricultural paid and own-account work.

Source: Author calculations from the Mexican Census CPV 1990-2015

Table 1.

Development indicators by country income level (2015)

	Low-income	Lower-middle-income	Middle-income	Upper-middle-income	High-income	MX(1990)	MX(2000)	MX(2010)	MX(2015)
GNI per capita, Atlas method (current US\$)	500	1,510	3,617		39,749	5,840	10,200	14,910	17,120
Primary completion rate, total (% of relevant age group)	65%	89%	94%	100%	98%	71%	72%	80%	84%
Adult literacy rate, population 15+ years, both sexes (%)	57%	74%	84%	94%	N/A	88%	91%	93%	94%
Access to electricity (% of population)	23%	75%	86%	98%	100%	87%	91%	98%	99%
Improved water source (% of population with access)	61%	86%	89%	92%	99%	79%	89%	91%	95%
Rural population (% of total population)	71%	63%	52%	40%	20%	34%	31%	29%	29%
Poverty headcount ratio at \$1.90 a day (2011 PPP) (% of population)	52%	24%	16%	8%	1%	10%	11%	4%	3%

Source: World Development Indicators, World Bank & Mexico's National population Council

Table 2.

Likelihood ratio tests comparing the models of workforce composition with alternative measures of local development

	Own-account				Employer				Paid			
	Ag		Nonag		Ag		Nonag		Ag		Nonag	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
Linear vs. squared	73.70	0.000	1.72	0.190	6.18	0.013	72.78	0.000	20.38	0.000	37.00	0.000
Linear vs. cubic	123.20	0.000	12.81	0.002	21.14	0.000	108.70	0.000	20.85	0.000	88.56	0.000
Squared vs. cubic	49.50	0.000	11.10	0.001	14.95	0.000	35.92	0.000	0.47	0.493	51.56	0.000
Observations	6974		6974		6974		6974		6974		6974	

Standard errors in parentheses Source: Author Calculations from the Mexican Census, 1990-2015 Ag = Agricultural Nonag = Non-agricultural

Table 3.

Likelihood ratio tests comparing the models of workforce composition with alternative measures of local development predicting the quality of non-agricultural work

	Own-account				Paid			
	Low		High		Informal		Formal	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Linear vs. squared	0.89	0.345	63.33	0.000	299.61	0.000	24.18	0.000
Linear vs. cubic	17.57	0.000	92.94	0.000	325.82	0.000	45.45	0.000
Squared vs. cubic	16.68	0.000	29.60	0.000	26.20	0.001	21.27	0.001
Observations	6,974		6,974		4,647		4,647	

Source: Author Calculations from the Mexican Census, 1990-2015