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Agricultural Growth and Poverty Reduction: The Case of Mexico

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AGRICULTURAL GROWTH AND POVERTY REDUCTION.

The case of Mexico.

There has been a lively debate on agriculture's poverty alleviation role in recent years. Research outcomes vary, depending largely on methodology and data used. For example, Ravallion and Datt (1996) found that agricultural growth has a significant effect in reducing not only rural but also urban poverty in India. Similar findings were reported for the Ivory Coast (Kakwani, 1993) and Indonesia (Thorbecke and Jung, 1996). Some other evidence for India, however, points to weak poverty alleviating effect of agricultural growth in areas with high inequality in land distribution. Thus, differences in initial conditions alter findings.

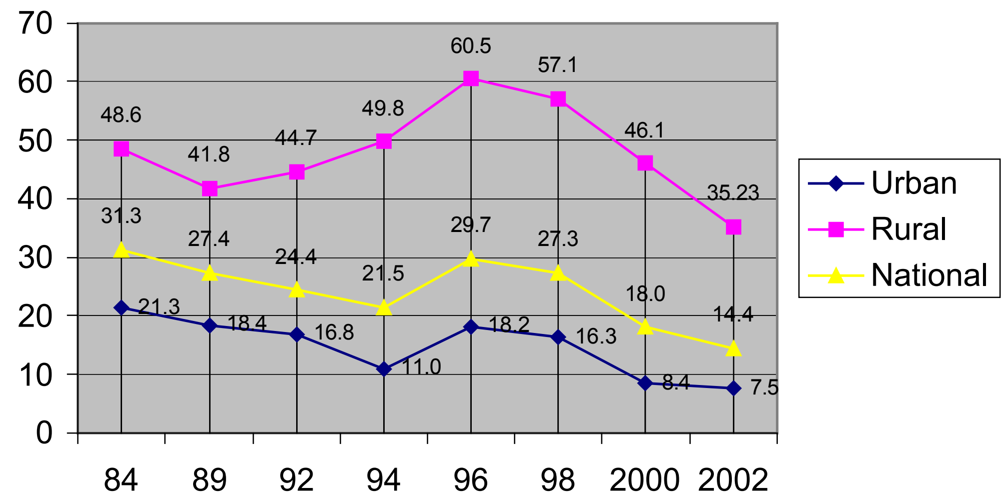
There is therefore a strong justification for a systematic investigation of the agricultural growth-poverty relationship.

In the first part of the paper, we illustrate the evolution of poverty in Mexico, emphasizing its rural and urban components. The second part will focus on modeling the main links through which agricultural growth translates into reduction of rural and urban poverty. We applied the Ravallion and Datt (1996) methodology to regional data, and conducted a sensitivity analysis to check for the robustness of our results. The third part of the paper explores what are the channels by which agricultural growth impacts on poverty levels. The fourth part of the paper is devoted to a discussion of the empirical results and their policy implications.

PART I: Evolution of Poverty

Poverty remains at high levels in Mexico. Although a clear negative trend was observed in the last 6 years, by the year 2000 about 18% of the population still falls below the food poverty line (see graph 1)

Graph 1: Poverty in Mexico: extreme (food) poverty lines



Source: Own, based on INEGI and World Bank

Poverty levels are not evenly distributed and rather vary a lot across the different regional areas of Mexico. Space limitations fobid us to show in detail the data. Here we just point that poverty levels are relatively low in the North, in the Pacific, and in Mexico City--between 10% and 14% on average since 1994--and high--between 29% and 45% on average since 1994--in the other four regions (Golfo, Centro, Centro-norte and Sur). Moreover, there are also huge variations within each region. On average for all years in the sample and for all regions, rural poverty is about 3 times higher than urban poverty.

We follow here the approach presented in Ravallion and Datt (1996). They utilized a reduced-form econometric approach where agricultural and non-agricultural growth are used as explanatory variables of a poverty equation. Using series of consistent, consumption-based poverty measures spanning forty years, they assess how much India's poor shared in the country's economic growth, taking into account its urban-rural and output composition. An important feature of their methodology is that the estimated growth-poverty elasticities incorporate *all* direct and indirect effects of growth on poverty, including the income distribution and general equilibrium effects.

Their main findinds are: i) rural consumption growth reduced poverty in both rural and urban areas; ii)urban growth brought some benefits to the urban poor, but had no impact on rural poverty; iii) rural-to-urban population shifts had no significant impact on poverty. Decomposing growth by output sectors, they found that ouput growth in the primary and terciary sectors reduced poverty in both urban and rural areas but that secondary sector growth did not reduced poverty in either.

Ravallion and Datt's methodology uses Foster, Greer and Thorbecke (FTG) decomposable measures for poverty and considers two sectors, urban and rural. We extent their model to capture the regional dimension of the data set we will use here.

Ravallion and Datt tested whether the composition of growth matters for poverty reduction. Their final equation is given by

$$\begin{aligned} \Delta \ln P_{it} &= \pi_u s^{\mu}_{uit-1} \Delta \ln \mu_{uit} + \pi_r s^{\mu}_{rit-1} \Delta \ln \mu_{rit} \\ &+ \pi_n (s^{\mu}_{rit-1} - s^{\mu}_{uit-1} n_{rit-1} / n_{uit-1}) \Delta \ln n_{rit} + \Delta \varepsilon_{it} \end{aligned} \quad (1)$$

(t = 2,..,T)

where the π's are parameters to be estimated, Δ is the discrete time difference operator, and ε is the error term that accounts for other --not controlled for factors-- that influence measured poverty. Notice that by using first differences time-invariant region-specific effects are being eliminated.

π_u y π_r coefficients can be interpreted as the impact of (share weighted) growth in the urban and rural sectors respectively, while π_n shows the impact of the population shift from rural to urban areas.[1]

[1] If what only matters is overall growth, then π_u=π_r=π_n=π and equation (17) reduces to :

What we would like to test is whether economic growth in one sector affects distribution in other sectors. We can use equation 3 to decompose the rate of growth in average poverty, and estimate the following system of equations:

$$(2)\quad s^{P}_{uit}\Delta \ln P^{u}_{it} = \pi_{u1it} s^{\mu}_{uit}\Delta \ln \mu^{u}_{it} + \pi_{u2it} s^{\mu}_{rit}\Delta \ln \mu^{r}_{it} + \pi_{u3it}(s^{\mu}_{rit} - s^{\mu}_{uit} n^{r}_{it}/n^{u}_{it})\Delta \ln n^{r}_{it} + \Delta\varepsilon_{uit}$$

$$(3)\quad s^{P}_{rit}\Delta \ln P^{r}_{it} = \pi_{r1it} s^{\mu}_{uit}\Delta \ln \mu^{u}_{it} + \pi_{r2it} s^{\mu}_{rit}\Delta \ln \mu^{r}_{it} + \pi_{r3it}(s^{\mu}_{rit} - s^{\mu}_{uit} n^{r}_{it}/n^{u}_{it})\Delta \ln n^{r}_{it} + \Delta\varepsilon_{rit}$$

$$(4)\quad \begin{aligned} &(s^{P}_{rit} - s^{P}_{uit} n^{r}_{it}/n^{u}_{it})\Delta \ln n^{r}_{it} = \pi_{n1it} s^{\mu}_{uit}\Delta \ln \mu^{u}_{it} + \pi_{n2it} s^{\mu}_{rit}\Delta \ln \mu^{r}_{it} \\ &+ \pi_{n3it}(s^{\mu}_{rit} - s^{\mu}_{uit} n^{r}_{it}/n^{u}_{it})\Delta \ln n^{r}_{it} + \Delta\varepsilon_{nit} \end{aligned}$$

where $\pi_j=\pi_{uj}+\pi_{rj}+\pi_{nj}$, j=1, 2, 3. If we sum equations 6, 7 and 8 we obtain equation 4. Equation 6 shows how the composition of growth and population shifts affect urban poverty. In turn, equation 7 shows how rural poverty is being affected, and equation 8 shows the impact on the population shift component of $\Delta \ln P$. From the last three equations only two of them needed to be estimated, the third coming from using the additive restriction $\pi_{nj}= \pi_j - \pi_{rj} - \pi_{uj}$, j = 1, 2, 3.

The elasticities of the poverty measures to the sector means can be readily obtained by multiplying the regression coefficients by the relevant consumption or income shares.

In this paper we apply Ravallion and Datt's approach to Mexican data. Lacking a long panel of poverty measures, we estimate equations (1) ,(2) and (3) using combined regional and time series household data. That is, we estimate total rural and urban poverty changes *by region* instead of for the whole country. This allows us to sufficiently increase the number of observations to perform econometric analysis[2].

Our dependent variable is the FTG index of poverty (1, 2, and 3). For our sensitivity analysis we have taken three indicators: i)"food-consumption poverty", where the poverty line

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$$\Delta \ln P_{it} = \pi\Delta \ln \mu_{it} + \Delta\varepsilon_{it}$$

[2] Lack of data forbid us to take into account migration flows, although below we discuss its likely impact on our results.

is equivalent to the income needed to satisfy a specific minimum caloric intake per capita; ii) "moderate poverty", where the poverty line is equivalent to the previous one *plus* the income needed to develop certain activities (food poverty line times 2 in urban areas, food poverty line times 1.75 in rural areas); and iii) poverty levels of people situated between the "food consumption" poverty and the "moderate poverty".

By its nature, FTG(i) indexes cannot capture non-income measures of well being and we say nothing here about how responsive these dimensions may be to growth. Regarding the choice of consumption versus income, there are indications that current consumption is a better indicator of current level of living than current income (Ravallion, 1994), and this is the metric we use for our measures.

DATA

We use comparable official household data coming from the National Institute for Statistics, Geography and Informatic for years 1984, 1989, 1992, 1994, 1996, 1998, 2000 and 2002. As mentioned above, to get enough degrees of freedom we use the regional estimates of poverty.

Econometric results

For each poverty measure we have estimated two sets of regressions in first differences, one by OLS and the other by instrumental variables (IV). The IV approach was needed because the dependent and the independent variables are estimated from the same survey data. This can produce a bias because measurement errors in the survey can be passed on both variables; if the mean is underestimated, poverty will tend to be overestimated. Most of the cases the Durbin-Wu-Hauman (DWH) tests of exogeneity of independent variables indicated that the OLS approach would bring consistent estimates. Nonetheless, we report here both set of results.

Table1 resumes our estimations for FTG(0) poverty measures. The upper panel shows the impact of urban and rural growth on total poverty (columns 3 and 4), on urban poverty (columns 5 and 6) and on rural poverty (columns 7 and 8). The first line in each panel indicates the value of the coefficient, the second its *t* statistic and the third the elasticity computed at mean value levels. To help reading the table, the gray shading indicates statistically significance.

Following column 4 (IV estimation is indicated by the DWH test. Also, the Sargan test for exogeneity of instrument indicates that they are appropriated. Full set of results are not presented here to save space and are available from the authors upon request) , we find that growth in both sectors, urban and rural, impacted negatively on total poverty levels, although growth in rural areas seems to have a stronger impact. Following column 5 and 7 (the DWH test indicates this is appropriated) shows that, contrary to Ravallion and Datt findings for India, there are no inter-sectoral effects: urban growth impacts only urban poverty (elasticity 1.35) and rural growth impacts only rural poverty (elasticity 0.82).

When considering the poverty level of people between the food poverty line and the moderate poverty line, we find that , while urban or rural growth had no impact on overall poverty, urban and rural growth impacted negatively on urban poverty (elasticities of 0.25 and 0.28 respectively), and had no impact on rural poverty. Un rural areas, only migration from the countryside to urban areas reduced poverty.

Finally, when considering moderate poverty, we find that urban and rural growth reduced total poverty with about equal power (similar elasticities), and, again, that there are no inter-sectoral effects: urban growth only reduces urban poverty (elasticity of 0.58) and rural growth only reduces rural poverty (elasticity of 0.53). Population shifts from rural to urban areas do reduced poverty in rural areas.

When considering other measures of poverty, the rural growth impact on poverty is stronger. For instance, for food poverty, the impact of rural growth on FTG(1) doubles that of urban growth (see table 2) . Clearly, rural growth has more power than urban growth in impacting the poorest among the poor people

This set of estimates suggests that there is an important role for rural growth when considering the goal of poverty reduction. Urban and rural growth have about equal power in reducing total food and moderated poverty at the country level. Importantly for policy implications, rural growth has inter-sectoral impact on that part of the population that is situated between the food poverty line and the moderate poverty line, reducing the proportion of poor people not only in rural areas but also in urban areas. Also, judging for the elasticities of the Poverty Gap and of the Squared Poverty Gap indexes of poverty, rural growth seems to be more powerful than urban growth in impacting the poorest among the poor people

Table 1. Condensated results from estimations. Dependent variables: First panel Food poverty FTG(0), second Panel: FTG(0) between food poverty and moderate poverty lines. Third panel: Moderate FTG(0)

		total poverty (3)	**total poverty(4)**	**urban poverty(5)**	**urban poverty(6)**	**rural poverty(7)**	**rural poverty(8)**
Food poverty		OLS	IV	OLS	IV	OLS	IV
Urban growth	coeff	**-0.95**	**-1.09**	**-0.77**	**-0.88**	-0.14	-0.15
π_1	t-statistic	**(-4.21)**	**(-2.89)**	**(-4.53)**	**(-3.31)**	(-1.16)	(-1.01)
	elasticity	**-0.76**	**-0.88**	**-1.35**	**-1.55**	-0.21	-0.22
Rural growth π_2	coeff	**-2.80**	**-6.78**	-0.59	-2.11	**-2.43**	**-4.24**
(*)	t-statistic	**(-2.61)**	**(-2.50)**	(-0.68)	(-1.11)	**(-2.91)**	**(-2.74)**
	elasticity	**-0.55**	**-1.32**	-0.25	-0.90	**-0.87**	**-1.52**
Population Shift	coeff	0.04	-0.46	-0.33	-0.17	**0.42**	**0.36**
π_3	t-statistic	-0.05	(-0.36)	(-0.59)	(-0.19)	**-2.71**	-0.84
		total poverty	total poverty	urban poverty	urban poverty	rural poverty	rural poverty

Population between food poverty and moderate poverty		OLS	IV	OLS	IV	OLS	IV
Urban growth π_1	coeff	-0.14	-0.21	**-0.22**	**-0.30**	0.07	0.08
	t-statistic	-1.18	-1.16	**-2.34**	**-2.14**	1.56	0.97
	elasticity	-0.11	-0.17	**-0.25**	**-0.34**	0.20	0.23
Rural growth $\pi_{2(*)}$	coeff	-0.73	-0.16	**-1.00**	-1.07	0.29	0.86
	t-statistic	-1.20	-0.12	**-2.08**	-1.05	0.63	1.21
	elasticity	-0.14	-0.03	**-0.27**	-0.29	0.20	0.59
Population Shift π_3	coeff	0.08	0.54	0.24	0.45	**-0.36**	-0.19
	t-statistic	0.21	0.86	0.77	0.92	**-1.74**	-0.76
		total poverty	total poverty	urban poverty	urban poverty	rural poverty	rural poverty
Moderate poverty		OLS	IV	OLS	IV	OLS	IV
Urban growth π_1	coeff	**-0.47**	**-0.60**	**-0.44**	**-0.55**	-0.03	-0.04
	t-statistic	**(-4.21)**	**(-2.89)**	**(-4.53)**	**(-3.31)**	(-1.16)	(-1.01)
	elasticity	**-0.38**	**-0.48**	**-0.58**	**-0.73**	-0.06	-0.08
Rural growth $\pi_{2(*)}$	coeff	**-2.02**	**-2.88**	-0.89	-1.30	**-1.06**	**-1.52**
	t-statistic	**(-2.61)**	**(-2.50)**	(-0.68)	(-1.11)	**(-2.91)**	**(-2.74)**
	elasticity	**-0.39**	**-0.56**	-0.29	-0.42	**-0.53**	**-0.75**
Population Shift π_3	coeff	0.10	0.20	-0.32	0.26	**-0.08**	0.14
	t-statistic	-0.05	(-0.36)	(-0.59)	(-0.19)	**-2.71**	-0.84

Source: Own estimates

(*)The elasticity of regional rural consumption growth to regional agricultural GDP growth is high. Depending on model specifications it varies from 0.75 to 0.87.

Table 2. Impact of growth on Poverty. Estimates, t statistics and elasticities.

Poverty Index	Impact on Total Poverty		Impact on Urban poverty		Impact on Rural Poverty	
	OLS(1)	IV(2)	OLS(3)	IV(4)	OLS(5)	IV(6)
Impact of Urban Growth						
FTG(0)	-0.95	-1.09	-0.77	-0.88	-0.141	-0.151.11
	(-4.21)	(-2.89)	(-4.53)	(-3.31)	(-1.16)	(-1.01)
	-0.76	-0.88	-1.35	-1.55	-0.21	-0.22
FTG(1)	-1.18	-1.26	-0.84	-0.92	0.18	-1.49
	(-4.02)	(-2.48)	(-4.69)	(-3.27)	(-0.2)	(-0.74)
	-0.95	-1.01	-1.72	-1.89	0.23	-1.97
FTG(2)	-1.29	-1.29	-0.34	-0.39	0.15	-0.35
	(-3.55)	(-2.06)	(-4.16)	(-3.25)	(-0.38)	(-0.41)
	-1.03	-1.04	-0.78	-0.91	0.19	-0.43
Impact of Rural Growth						
FTG(0)	-2.80	-6.78	-0.59	-2.11	-2.43	-4.24
	(-2.61)	(-2.50)	(-0.66)	(-1.11)	(-2.91)	(-2.74)
	-0.55	-1.32	-0.25	-0.90	-0.87	-1.52
FTG(1)	-3.19	-8.63	-0.29	-0.27	-3.73	-6.50
	(-2.13)	(-2.38)	(-1.52)	(-1.11)	(-3.32)	(-2.95)
	-0.62	-1.68	-0.14	-0.13	-1.20	-2.09
FTG(2)	-4.14	-10.93	-0.17	-0.19	-2.24	-3.62
	(-2.25)	(-2.44)	(-1.68)	(-1.42)	(-3.56)	(-3.02)
	-0.81	-2.13	-0.10	-0.11	-0.67	-1.08

Note: first line for each FTG index shows coefficients from regressions from Annex II

Second line shows the t statistics. Third line shows elasticities at mean points. The upper panel shows the impact of Urban growth on total, urban and rural poverty, the lower panel the impact of rural growth on total, urban and rural poverty.

The Durbin-Wu-Hausman (DWH) test for endogeneity for IV estimates showed that for Total poverty (first two columns) IV is indicated. For Urban poverty (third and fourth columns) OLS give consistent estimates, whereas for Rural Poverty (fith and sixth columns) OLS's consistency is not rejected at 95% confidence level, but is rejected at 90% confidence level (p value of the WDH test was .092). The main difference in results for these last two columns is the impact of urban growth on rural poverty (it is not statistically significant in OLS estimates but it is significant unde IV estimates). Full set of results and tests are presented in Annex II

The gray shading indicates by column, which one is the appropriated model (IV or OLS), and byline, which parameters are statistically significant in the appropriated model. See table __ for mean values of consumption andpoverty used to construct the elasticities. At mean values, urban consumption is 85.6% of total consumption, urban share of total poverty (FTG(0) is 41.8%, 34.3% of FTG(1), and 0.297 of FTG(2).

Source: Own estimates.

Table 3 shows results by region for FTG(0). While the impact of urban growth on total poverty is within a relatively small range (lowest elasticity of 0.74 in Sur region, and highest elasticity of 1.06 in Capital region), the impact of rural growth showed more variation. Not surprisingly, the impact follows the share of rural population in each region (see table 1 above for population and consumption shares by region): higher elasticity in the three poor and relatively more rural regions of Sur, Golfo , Centro, and Centro-Norte—between 1.58 and 2.17—and lower elasticities in the other less poor and more urbanized Norte, Capital and Pacifico regions—elasticites between 0.24 and 1.38. As mentioned above, regression results did not show inter-sectoral effects (i.e. urban growth only affected urban poverty and rural growth only affected rural poverty). Interestingly, both, urban and rural growth had a bigger impact on urban and rural poverty respectively, in those areas where the share of urban population is relatively smaller (Sur, Golfo , Centro, and Centro-Norte).

Tabla 3. Impact of urban-rural growth on Poverty:1984-2002. Elasticities by region

	Poverty-region total		Poverty-region urban		Poverty-region rural	
	OLS(1)	IV(2)	OLS(3)	IV(4)	OLS(5)	IV(6)
Urban Growth						
Total effect	-0.76	-0.88	-1.35	-1.55	-0.87	-3.13
Norte	-0.86	-1.00	-1.18	-1.34	-0.02	-0.02
Capital	-0.91	-1.06	-1.13	-1.29	-0.01	-0.01
Golfo	-0.72	-0.84	-1.67	-1.91	-0.10	-0.10
Pacífico	-0.75	-0.87	-1.18	-1.35	-0.06	-0.06
Sur	-0.64	-0.74	-1.68	-1.92	-0.15	-0.16
Centro-Norte	-0.72	-0.84	-1.58	-1.80	-0.09	-0.09

Centro	-0.71	-0.82	-1.46	-1.67	-0.09	-0.10
Rural Growth						
Total effect (*)	-0.55	-1.32	-0.06	-0.06	-0.87	-1.52
Norte	-0.25	-0.60	-1.32	-4.76	-0.54	-0.93
Capital	-0.10	-0.24	-1.66	-5.95	-0.25	-0.43
Golfo	-0.66	-1.60	-0.69	-2.49	-0.89	-1.54
Pacífico	-0.57	-1.38	-0.97	-3.50	-1.03	-1.79
Sur	-0.90	-2.17	-0.58	-2.08	-1.13	-1.97
Centro-norte	-0.65	-1.58	-0.72	-2.59	-0.90	-1.58
Centro	-0.70	-1.69	-0.73	-2.61	-1.00	-1.75

Source: Own estimates based on table 9. (*) First line from Table 9

The gray shading indicates by column, which one is the appropriated model (IV or OLS), and byline, which parameters are statistically significant in the appropriated model. For the impact of rural growth on rural poverty (fith and sixth columns) OLS's consistency is not rejected at 95% confidence level, but is rejected at 90% confidence level (p value of the WDH test was .092). See full set of results and test in Annex __.

Part III. Exploring the channels

a) Income distribution

To explore plausible channels for the effects found in our regressions, we regress the change between surveys in the logs of Gini index on the growth rates in both urban and rural means. Results suggest that growth in rural areas decreases the Gini coefficient at the *national and urban* levels Interestingly, it has no effect on the Gini in *rural areas* (i.e., rural growth is distribution neutral in rural areas)

$$\Delta Gini_{total} = 0.25\Delta \ln mean(urban) - 0.22\Delta \ln mean(rural) \quad (9)$$

$$\Delta Gini_{urban} = 0.23\Delta \ln mean(urban) - 0.21\Delta \ln mean(rural) \quad (10)$$

In both regressions, coefficients are statistically significant at 1% with Rsquared of 0.37 and 0.24, respectively.

Rural consumption growth has been decreasing inequality in urban areas, while urban growth has been worsening it. This suggest that rural growth has a general equilibrium effect on urban areas, derived perhaps from a Harris-Todaro like effect by deterring migration.

b) Relative wages effect

We postulate that producers minimize the cost of production. There are two outputs being produced, agriculture(Qa) and non-agriculture products (Qn). These outputs are being produced in competitive markets using three variable factors of production, unskilled labor (Lu), skilled labor (Ls), and Capital (K). The three factors of production are supposed to be mobile across the two productive sectors and are allocated efficiently.

Elasticities: Effects of Changes in Agricultural Output Level

Table 4 shows the elasticities of demand for unskilled and skilled labor implicit in the estimated coefficients and evaluated at sample means. It also presents the standard errors of these elasticities (note that elasticities are functions of several coefficients) and their degree of statistical significance. The two labor demand equations are downward sloping, with unskilled labor demand being relatively more elastic (-1.3) to its own price than the skilled labor demand equation (-0.55). Unskilled and skilled labor are substitutes (cross elasticities are both positive: 0.28 and 0.42 respectively). Almost all demand elasticities are statistically significant at least at 10%. Only the response of skilled labor to agricultural output turned out to be not statistically significant. Both types of labor appear to be substitute with capital.

We have run this model to see what the impact of agricultural/non agricultural growth is on the demand of skilled/unskilled workers. Results show that growth in the agricultural output impacts the demand for unskilled workers, whereas growth in the non-agricultural sector increases demand for both types of labor with a higher elasticity for the demand of skilled workers (0.88 *versus* 0.57, the differences being statistically significant)[3].

Table 4.**Estimated Labor Demand Elasticities (evaluated at sample means)**

	prices			growth	
	Unskilled labor	Skilled Labor	Capital	Agricultural Output	Non-Agricultural Output
Unskilled Labor demand	-1.30*** (0.1253)	0.28*** (0.0024)	1.05*** (0.1246)	0.22* (0.1130)	0.57*** (0.0086)
Skilled Labor demand	0.42*** (0.0242)	-0.55*** (0.1309)	0.27** (0.1265)	0.06 (0.1349)	0.88*** (0.0072)

Note: Standard errors in parentheses. Level of significance: *** at the 1% ** at 5% and * at 10%

In this section we examine the hypothesis that agricultural growth helps reducing the real price of food products. To determine the marginal effect of agricultural growth on food prices we explain the path of the real food price index (RFP, measure as the Food, Beverage and Tobacco CPI index divided by the GDP implicit price index) as a function of external factors, real exchange rate (RER, measure as the current exchange rate inflated by US WPI and deflated by Mexican GDP implicit price index) and average nominal tariffs, and internal

[3] This issue may explain the positive impact of urban growth on the Gini coefficient: urban growth has a greater impact on skilled labor demand than on unskilled labor.

factors, agricultural output (Qa, from Mexican National Accounts) and non agricultural output (Qn, from Mexican National Accounts)

$$RFP_t = \alpha + \delta t + \beta_1 RER_t + \beta_2 \ln Q_a + \beta_3 \ln Q_n + \mu_t \qquad (13)$$

Several econometric issues arise in estimating this equation. Some or all the variables in equation (13) are expected to be non-stationary and could lead to spurious correlation results. Thus, we run a battery of unit root tests to detect the presence of integrated time series. It turned out that all variables in (13) are integrated of order 1—I(1). We then run then the Phillips and Oularis single equation procedure to explain variation in RFP. The DF test for cointegration gives a value of –3.26 is below the asymptotic critical value at 5%---2.986— (the critical value at 1% is –3.716). Therefore we conclude that the residual of (13) is stationary, and equivalently the time series cointegrate, with [1 *B*] as a cointegrating vector. This means that in the long run the four variables move together.

For the case of Mexico, the RER seems to have the most important role in determining relative food prices. See table 5 for long run effects.

Table 5. Estimated long run effects. Dependent variable Real Food Prices. 1970-2001

Variable	Coefficient	Std Error	Statistical significance
RER	0.146	0.038	***
lnQa	-0.021	0.399	Non Significant
lnQna	0.047	0.206	Non Significant

Statistical significance: *** 1%, ** 5%, * 10* . R_squared 0.45. Nuber of obs. 32.

Source: Own estimates.

For this and other specifications we tried, results strongly suggest that what only matters for the Real Food Prices behavior is the Real Exchange Rate movements[4]. The coefficient for agricultural growth although has the expected negative sign, turned out to be statistically not different from zero. We have also estimated the short run relationships by way of an error

[4] In other formulations tried, results were consistent: what only matters is the Real Exchange Rate.

correction representation, with the same outcome: no impact of agricultural growth on Real Food Prices.

In summary, we conclude this section by stating that all the price-growth relationships investigated showed that it is not through lowering food prices that agricultural growth impact on poverty levels.

PART IV: Conclusions

Poverty levels have been diminishing in Mexico since the late 90's, although several regions still show high levels of poverty, and they are extremely high in some rural areas. This paper have addressed the issue of the linkages between sectoral growth (urban/rural) and poverty levels. It was found that although both types of growth impacted negatively on poverty levels in Mexico, rural growth seems to have a higher power in improving consumption per capita of the poorest among the poor people. Moreover, the only inter-sector linkage found was the one that connects rural growth with urban poverty for those people above the food-poverty line but below the moderate poverty line.

Exploring plausible channels, we have found that rural growth enhances equality of income distribution at total and urban levels, while urban growth does exactly the opposit. But this is still a general equilibrium effect. Thus, we further explored labor market issues. We found that rural growth impacted positively on labor demand for unskilled worker: on this base, *ceteris paribus* it is better for poverty alleviation to have rural growth . We have also explored the issue of relative prices, although no impact of rural/urban growth was found here. Everything seems to be driven by the real exchange rate behavior. The share of agriculture in total income is relatively more important for poor people in rural areas, and most of the food poor people live in rural areas. This may be at the root of our findings.

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