

POVERTY ALLEVIATION POTENTIAL OF SPECULATION CROPS AND REMITTANCE FLOWS IN MEXICO

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Recibido (03/10/2016)

Revisado (08/12/2016)

Aceptado (22/12/2016)

RESUMEN: El crecimiento agrícola y la reducción de la pobreza no están necesariamente interconectados. El aumento de la productividad puede ser impulsado por unas pocas organizaciones poderosas dejando de lado a un gran número de pequeños campesinos excluidos que no participan en los canales globales del mercado de producción. Estos pueden caracterizarse por economías de escala, acumulación de capital y diversificación del mercado globalizado. La elección de productos agrícolas que proporcionen la mejor combinación de nivel de ingresos y una estabilidad a largo plazo es una cuestión clave. Esto es especialmente importante para la población marginada, que carece de una cartera de productos geográficamente dispersa que pueda compensar volatilidades de precios potenciales y variación de la producción. El estudio analiza el impacto de cuatro productos agrícolas tradicionales (maíz, frijoles, chile y tomate) en la reducción de la pobreza en 32 estados mexicanos en el lapso de 10 años. En el trabajo se incluyen influencias macroeconómicas y se concluye que los cultivos comerciales con potencial especulativo, como el tomate, puede haber sido una mejor opción para los productores a pequeña escala que los cultivos de subsistencia. En cuanto a las otras variables estudiadas, las remesas, esenciales para los pequeños campesinos mexicanos debido a las interconexiones familiares con los mercados de trabajo de los Estados Unidos, son otro factor crucial para la reducción de la pobreza.

Palabras claves: remesas, chile verde, producción agrícola, reducción de la pobreza.

ABSTRACT: Agricultural growth and poverty reduction are not necessarily interconnected. Productivity increase can be fueled by few powerful organizations leaving aside large number of ostracized smallholders who do not participate in global production-market channels (characterized by economies of scale, capital accumulation and globalized market diversification). The choice of agricultural products that provide the best combination of income level and long term stability is a key decision. This is especially important for marginalized population that lack of a geographically spread product portfolio that could offset potential price volatilities as well as production variation. The study analyzes the impact on poverty reduction of four strategic traditional agricultural products produced in Mexico (corn, beans, chili pepper and tomato). Thirty two Mexican states have been included in the study within the span of 10 years. The work takes into account influences of macroeconomic character and concludes that commercial crops with a speculation potential, for instance tomato, may have been a better choice for the small scale producers than subsistence crops, as they seem to have a statistically important impact on poverty reduction. As to the other variables studied, remittances show to be another crucial factor for poverty reduction. These are essential for Mexican rural smallholders due to family interconnections with U.S. labour markets.

Keywords: Remittances, Green chili pepper, Agricultural output, Poverty reduction

1. Linkage between agricultural growth and poverty levels

Although agricultural growth is considered as one of the key factors for poverty reduction, the linkage is ambiguous and in certain cases is questionable. The paradigm of agricultural growth being the immediate cause of poverty reduction is being questioned. The data that can shed light on the relationship is only recent (Schneider, 2011). It suggests that the high correlation between poverty levels and agriculture is caused by the fact that most of the poor are active in agriculture rather than the low productivity being the cause for penury. The picture is furthermore obfuscated by the fact that the nexus between poverty and agriculture is influenced by the remoteness of areas, low human population density, inexistent choices for employment and insufficient development of basic infrastructures. All the previous factors contribute to generally low levels of development that not necessarily can be related to agricultural development. However, it is doubtful whether the higher productivity of agroindustry actually contributes to the trickle-down effect of increasing incomes of smallholders who constitute the bulk of the local societies.

The concentration of the agroindustry on export-oriented large capital-intensive farming systems leads to employment cuts giving rise to fewer workers higher-skilled with higher-wages. These systems translate a little poverty mitigation effect. The increase of savings and investments and the start of gradual industrialization can be rather decelerated through concentration of capital. Another factor contributing to this situation could be creeping ostracism of the poor smallholders who cannot compete with the multinational agroindustry that makes use of economies of scale and of opportune comparative advantages of selected production niches, destined for specific products with the highest added value along the commercialization chain. Such situation, as described by Kydd (2001) can be characterized by a lack of capitalization perspective and insulation of smallholders from globalized networks.

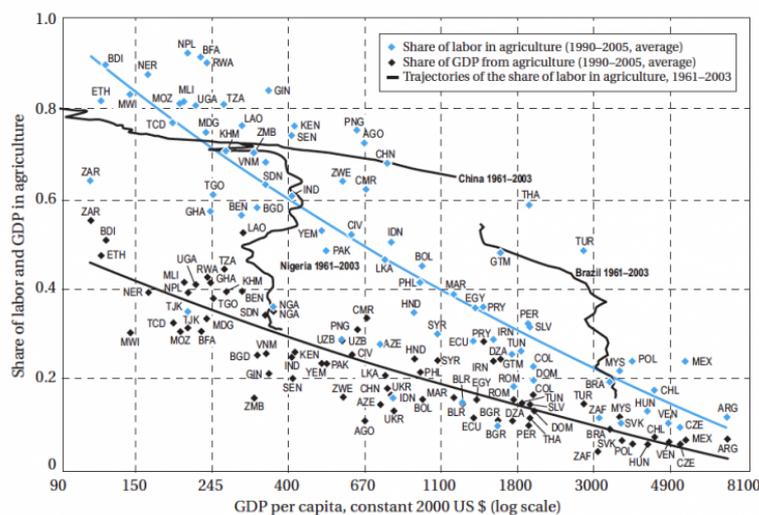


Fig. 1. Trajectories of a share of GDP and agriculture (Source: Todaro et al., 2001).

Even if it is possible to mitigate inequality and poverty by the growth of farm incomes, the complexity of the link between poverty and agriculture is too high to be considered a straightforward relationship. Sen quoted in 1999 that actually, the best escape from poverty implies not to work in agriculture (1999). Seemingly, such simplification is being proven by rural-urban migration pressures. These demographic movements are, among others, one of the reasons for Under-Participation Trap which is a process of exclusion of large groups of human from labour participation through unbalanced potentiation of segments of society, while excluding others. Furthermore, agriculture and poverty linkage can be also strengthened by the fact that poverty can be considered rather a rural phenomenon with agriculture being central to the subsistence of poverty stricken population strata as well as the main consumption expenditure. The estimates speak of almost than two-thirds of all the population of poor

humans living in rural regions, reaching 884 million people living in extreme poverty, while rural poverty rates reach 28% on average, which is much higher than urban poverty rates that reach 14% (IFAD, 2011).

Analysis of the link between economic growth, income, poverty and trade is therefore a research topic fueled by the fact that most of the poor living in rural regions depend on agriculture related activities. These activities are considered as the main livelihood source for 87 percent of the population of rural regions which can be translated into the population of 2.5 billion people and 1.2 billion smallholder jobs (FAO, 2004). Urban poverty can be viewed through the lens of deprivation of rural populations, who in consequence engage in rural–urban migration. Anriquez mentioned in 2007 that public policies have been mainly focused on public, industrial as well as on service sectors, paying less attention to agriculture. As a consequence, poverty mitigation have received little attention.

On the other hand, studies from India show that in the long run food prices will have essential impact on poverty alleviation (FAO, 2011). This is an important fact taking into account that the employment share of agriculture in developing countries accounts for 55 % of employment. Cross-country estimates illustrate that agriculture led-growth could have a benefit effect on the poorest double than other types of economic growth, such as seen on Fig. 1 (Ligon et al. 2007; World Bank, 2015). The Chinese household responsibility system coupled with technological advance and market liberalization was a cause of a steep decrease in rural poverty from 52% to mere 7% in between 1981 and 2002. Indian agriculture is widely considered as the reason behind poverty decline in the past 4 decades (Keralis, 2014). This is in line with findings from Ghana, showing 24% reduction in rural poverty during the past twenty years due to broad-based agriculture development (Xiao, 2010).

Despite these considerations, the continental example of Latin America shows that ongoing agricultural growth could not be considered as a reason for poverty reduction, as subsidies did not have the desired impact (Scott, 2011) and did not drive the agricultural growth. Graciano et al. (2009) confirm that the increased agriculture output in the recent decades did not have the desired effect on poverty levels on the continent as, between 1990 and 2006, the labor income was on decrease. It is rather a remittance flow that can be credited for poverty reduction, according to CEPAL (2009).

2. Nexus of Mexican agriculture and poverty

Mexico is not to be excluded from the previously described continental panorama. Mexico comprises of 196.5 million hectares of land (Ornelas, 2003), whith 27.3 million hectares (14.2 %) used for both crop and intensive animal husbandry. This percentage remains inferior than the relative percentages in developed large agroindustries from Germany, Spain, United Kingdom or USA, which exploit their agricultural land in 34.6%, 40.3%, 29.5% and 19.3% respectively. The sector is currently in stagnation of its production, as the agrarian reform is not complete and property is polarized. In general, there is lack of dynamism which contributes little to job creation, to heterogeneity of competition producers or to the finance of smallholders. As a consequence, the gradual increase of imports of basic subsistence nutrients is a fact (Hernandez et al., 2014).

Despite radical changes in the agricultural policy in the recent decades strong interventions in the agricultural activities through subsidies, state marketing of products and price support, have all ended (Saldaña et al., 2003). The neoliberal policies of late 80s and 90s led to disintegration of traditional agricultural services and such disruptions can explain the irregularities of agricultural growth especially in the late 80s and 90s. Due to unpreparedness of the sector, the changes slowed down the ongoing agricultural activity which can be characterized by low productivity of agricultural labor, while the population in rural areas remains high despites its low contribution to the national GDP. The powerful regional and structural marginalization thus characterizes the Mexican countryside as well as its agricultural sector, exposed to subsidized dumping competition by northern NAFTA members. Neoliberalism and new set of policies led to increase in Mexican exports of fruits and vegetables going

hand in hand with the volume of imports that can be attributed to the withdrawal of state from its agricultural sector (Saldaña et al., 2003). Additionally, Mexico now can be considered a country with a high alimentary dependency on imports, despite a long history of auto-sufficiency. The commercial agriculture was not necessarily related to the situation of the poor. During 80s and 90s, the agricultural sector registered a growth of 1.5 %, which was lower than the GDP growth and the population growth. Agricultural growth registered higher growth in northern states with agriculture being a considered a commercial activity in irrigated areas (World Bank, 2005).

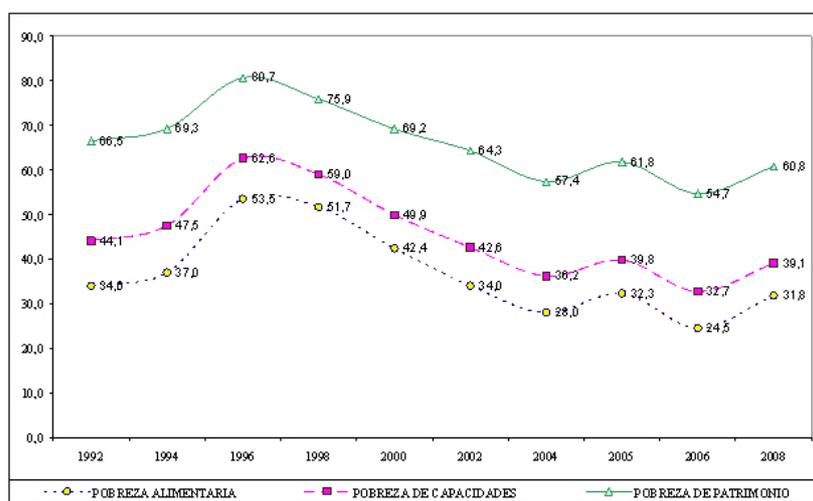


Fig. 2. Rural Poverty levels in Mexico between 1992 and 2008 in % (Source: Coneval, 2009)

Poverty in Mexico, is a rural phenomenon, which signals a powerful link with agriculture. Poverty levels were reduced significantly between 1950 and 1984, however remained constant until 1994 and increased sharply in 1996 as a result of public policies, elevated migration pressures and decrease of agricultural production. Opening of agricultural policies in the late 80s had benefited commercial agriculture, with little impact on the poverty levels also due to the lacking competitiveness of smallholder, inexistent long-term strategy for support (World Bank, 2005). In 2004 the downward trend continued (Székely 2005), while in 2010, 61% of the total rural population lived beneath the poverty level, translating into 15 million of people (IFAD, 2014), with 13 million people in rural areas in communities inferior to 2,500 inhabitants lived below the food poverty line. For these, agriculture related income, represented 42% of the total income (Sagarpa, 2006). According to Cepal (2014), 4.3 million Mexican households are dedicated to agriculture, with the average of 3.4 hectares per household unit, which contrasts to countries such as Brazil or Argentina that registered growth of 2% and 7% respectively, while agricultural output of Mexico registered a fall of 0.75% in the past 6 years (Cardenas, 2014)..

The abovementioned data demonstrates the need for development of Mexican agriculture as an instrument of poverty reduction, due rural character of poverty of Mexico, as well as the situation of the country related to decreasing auto-sufficiency and losing ground against international competition.

3. Agricultural crops focused by the study

The study targets classical Mexican strategic crops that can be attributed crucial role not only in Mexican agriculture but also in global markets. Four crops were selected and that due to their historical as well as economic importance for the subsistence of the local population, as described below.

- a) *Corn*. Corn belongs to crucial crops for Mexicans in realms of food, economy, culture as well as social relationships and is the most important crop nationwide. Mexico is currently the 4th largest corn producer, however also a major consumer. While Mexico manages to cover the national demand for

white maize through its own production, the country is not autonomous in terms of production of the yellow grain that has got many industrial uses such as the livestock consumption. For this reason Mexico imports more than 5 million tons per year, while in the period 1996-2006 only 51% of the total possible area was sown generating 7.4% of the total agricultural production volume that accounted for one third of the 30% of total production value. In 1996 the Mexican state established new rules for pricing policy, in which producers were allowed to sell their production for industrial-based international price levels and could be compensated for local prices differences. The federal government created ASERCA institution which was entitled to pay the difference of prices to the target producers and which identified approx. 2 million farmers with farming space of 5 or less hectares that grew corn (PROCAMPO Census 2004) and who were admitted to the national compensation system.

- b) *Beans*. Beans belong to traditional subsistence crops and are being produced in all states of Mexico. However temperate-semiarid regions with dry and warm winters are ideal for the bulk of production. The national production is led by states of Zacatecas, Durango Sinaloa and Nayarit. The production volume of beans on average showed a decline in 1985 and in the last decade, floating around the production volume of 1.2 million tons. This pattern could be explained by variations of guarantee prices related to different types of beans, especially in relation to consumer preferences in the 90s. Production volumes however remained high, rising from about 0.9 tons in 70s to 1.2 million tons on average in the last decade. This production volume placed Mexico at the 3rd rank on a global bean production scale (Sagarpa, 2014).
- c) *Tomatoes*. The production of tomatoes in Mexico is the 8th most important value crop production in the country. Historically, tomatoes (*Solanum lycopersicum*) stem from Central America, while the Aztec Nahuatl language provided the name of “tomatl” to this edible fruit. Currently the most common variety is “saladette” followed by “bola”, besides “cherry”. In 2012, the production of tomato reached 3.3% of the total value the agricultural sector and occupied 0.3% of the national area (more than 50 000 hectares), while declining at an average rate of 3.5% per year between 2007 and 2012 despite rising performance of production that increased from 37.5 t / ha to 51.3 t / ha in the production period. Mexico belongs the leading exporters of fresh tomatoes worldwide and produces almost 20% of global volume and 25% of the value of tomatoes traded, with primary market being the US. In total, Mexico exports about 1.5 million tons per year, which representing between %50 and 70% of total production volume. In 2014 the exports amounted to more than 1,100 million USD (Sagarpa, 2014).
- a) *Chili pepper*. The chili pepper (*Capsicum*) is a product belonging to family Solanaceae that was domesticated more than 8,000 years ago in Mexico. It is grown in almost all states during two agricultural cycles and belongs to the main exports of horticultural products, while the main customers are Mexican chilli production are United States, Canada, Japan, UK and Germany. However, almost 80% of national production is consumed in national markets. According to the Agri-food and Fisheries Information Service (SIAP) run the ministry of agriculture, Mexico is the most important exporter of green chili pepper in the world. As far as the production of chili pepper is concerned it is the 6th largest exporter of dry chili pepper (Gaytan et al., 2013), with the production reaching 2014 1,853 thousands of metric tons (Sagarpa, 2014).

4. Agricultural crops focused by the study

4.1. Data

The secondary data concerning 480 values on macroeconomic variables from 32 federal states of Mexico, stems from years 2010, 2012, 2014 (Fig. 3) and was collected principally from the National Council for Evaluation of Social Development Policy (CONEVAL) and the National Institute of Statistics and

Geography, (INEGI). The measurement of poverty according to the national methodology is done by the abovementioned institutions at least every two years for each state. Besides data related to poverty¹, lack of any formal education of people born before 1981, social insurance affiliates, employed without access to social insurance, crime levels per 100,000 inhabitants, remittances, employment and fiscal income were collected from CONEVAL.

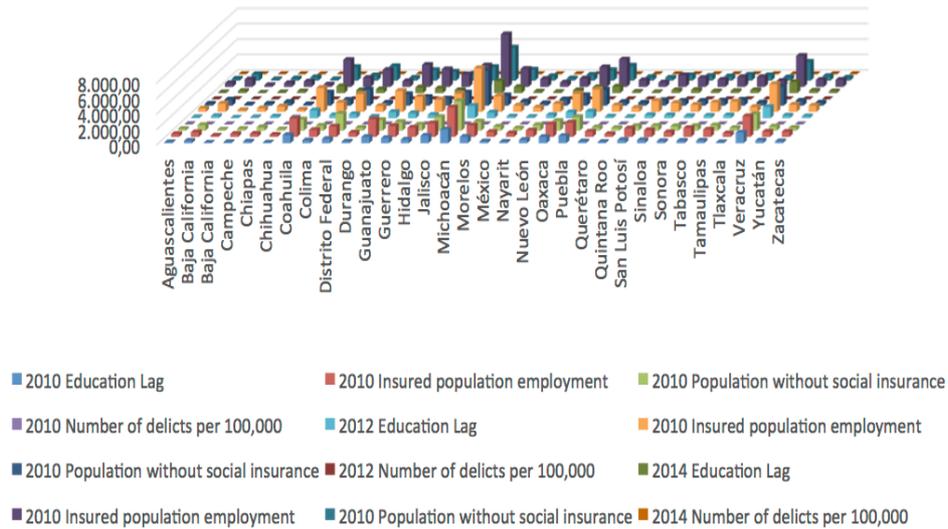


Fig 3. Education lag, employed population without access to social insurance, number of delicts, population with social insurance.

The secondary data with 384 values that corresponded to agricultural production of the chosen 4 products: chili pepper, beans, corn and tomato were collected in years 2010, 2012 and 2014 (Fig. 4) from SIAP, which has among its powers to coordinate several agencies of the Federal Government as well as local governments of federal states and municipalities in relation to statistical as well as geospatial information required by the food industry.

4.2. Applied estimation method

The authors compared the poverty level in Mexican federal states with chosen four agricultural crops as well as chosen nine macroeconomic indicators through cross sectional longitudinal panel data analysis applying fixed effects based on Ordinary Least Square (OLS) method, as described in (1). In the calculation, the statistical relationship between the poverty levels in the three year-sets were sought and the independent variables that could explain the dependent variable such as economically active populations, fiscal income and remittances, was calculated. Statistic fit and F-test were applied to both calculations in order to confirm the robustness.

$$y_t = \alpha_t + \sum_{i=1}^9 \beta_{it} x_{it} + \beta_{12,t} x_{12,t} + \beta_{13,t} x_{13,t} + \varepsilon_{it} \tag{1}$$

where, for a time t, the variables are:

- y_t : performance variable of poverty y
- x_{it} : independent variables: remittances (x_{1t}), crops of chili (x_{2t}), beans (x_{3t}), corn (x_{4t}), tomato (x_{5t}) education lag (x_{6t}), social insurance (x_{7t}), employment (x_{8t}), crime level (x_{9t}), economically active population ($x_{12,t}$), and fiscal income ($x_{13,t}$).
- β_{it} : coefficient associated to x_{it} .

¹ CONEVAL data based on MCS-ENIGH database

α_t : intercept of the regression line and the Y axis.
 ε_{it} : error term - residual value describing market i and time t.

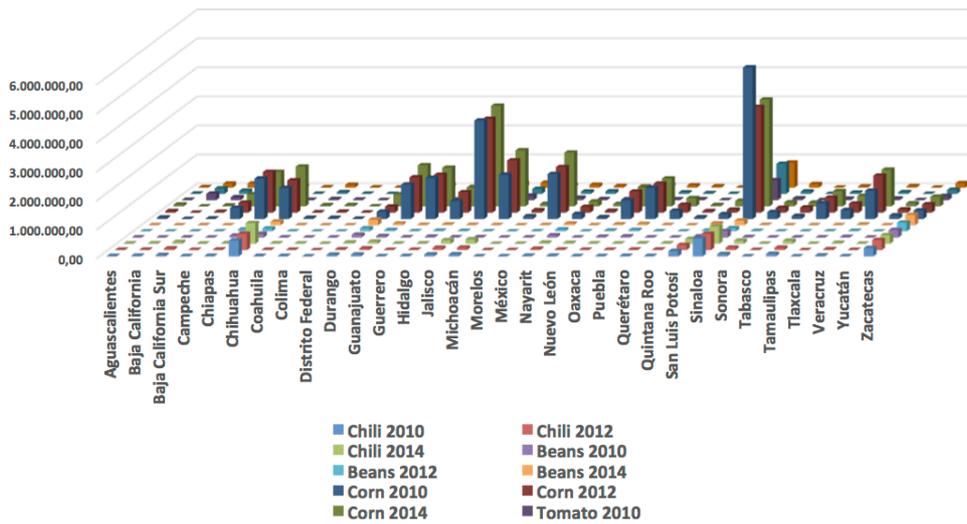


Fig 4. Production of chili pepper, beans, corn, tomato (thousands of tons): 2010, 2012, 2014.

4.3. Results and discussion

The examination of Table 1 reveals that speculative crop of tomato production shows to be significant in poverty reduction ($p=0.0040$) as well as the remittances flow ($p=0.0001$). Production of beans ($p=0.8357$), corn ($p=0.1053$) and chili ($p=0.0569$) seems not to impact poverty level in the analyzed period in the 32 states of Mexico even though chili is statistically significant on the level of confidence of 10%. Education lag (x_6), social insurance (x_7), employment (x_8), crime level (x_9) and fiscal income (x_{13}) do not provide any hint on poverty reduction potential. The variable of economically active population (x_{12}) is statistically significant, but does not bring any new information as it would be expected that increase in working population will reflect decrease in poverty levels.

Variable	DF	Estimate	Error	t Value	Pr > t	Label
Intercept	1	1217.031	585.6	2.08	0.0425	Intercept
x1	1	-0.80967	0.1884	-4.30	<.0001	
x2	1	0.0015	0.000771	1.95	0.0569	
x3	1	0.000216	0.00104	0.21	0.8357	
x4	1	-0.00023	0.000139	-1.65	0.1053	
x5	1	-0.00158	0.000526	-3.01	0.0040	
X6	1	-1.04626	0.5270	-1.99	0.0523	
X7	1	0.130349	0.1033	1.26	0.2124	
X8	1	-0.10024	0.2027	-0.49	0.6230	
X9	1	0.002179	0.00441	0.49	0.6232	
X12	1	0.000074	0.000024	3.10	0.0031	
X13	1	8.084E-6	0.000017	0.46	0.6453	

Table 1. Results of the time series testing for regression (1).

The goodness of fit and the F-test are provided in Table 2 and Table 3.

Fit Statistics				
SSE	544235.5137	DFE	53	
MSE	10268.5946	Root MSE	101.3341	
R-Square	0.9975			

Table 2. Goodness of fit of the statistical model.

F Test for No Fixed Effects

Num DF	Den DF	F Value	Pr > F
31	53	9.55	<.0001

Table 3. F-test

The results of the abovementioned regression confirm findings by Hes et al. published in 2016 (Hest et al. 2016) which consider the speculative crops as the crops with actual best poverty reduction potential out of the selected crops for Mexico. Chili pepper was considered in the abovementioned study as more promising than tomatoes, however the regression study still considers it as belonging as a statistically significant on 90% confidence level. In addition with remittances, this combination forms insight harboring an important poverty alleviation potential. The weight of remittances as a tool of poverty reduction is not surprising due to the importance of economic growth created by economically active population, including microenterprises and SME's, which are known to be often fueled by remittance flows, while population growth *ceteris paribus* is to imply expansion of all strata of the society, including the poor (McNicoll, 1999).

5. Conclusions

The agricultural sector is crucial to the advance of economic segment of societies and figures as a development priority of many economies, as agriculture serves not only as a basic subsistence tool, but is an instrument for the trickle-down effect with expected wealth distribution potential. The uncritical belief that agricultural output can be considered as a poverty reduction driver must however be subjected to detailed analysis related to regional and product considerations and should not be accepted without critical judgement, as agriculture is not necessarily an all-encompassing poverty mitigation tool. Furthermore, simple understanding of statistical output of agricultural sector is to be considered a potentially misleading to effects of poverty analysis as current agroindustry is not necessarily inclusive and leading to a higher participation of the population. Analysis of concrete agricultural mechanisms thus seems to be conditional for the understanding of the mechanics of the poverty reduction.

Studies confirm that present rural Mexico may have in crops of tomato and chili pepper, which are both tied to Mexico through ancient domestication, potentially important speculative crops that could harbor a higher poverty alleviation potential than other crops. The study especially considers as an important crop tomatoes, which showed to be statistically significant for poverty reduction in the studied period, with higher potential than beans or corn. The choice of crops that are to correspond to market needs seems to be crucial for smallholders to lift themselves from poverty stricken condition and evokes a set of questions on the causes of rural poverty. What if rural poverty is a phenomenon rather related to information barrier and to a slow reaction time of small scale producers who do not identify the market due to disconnectedness from market information and do not chose the right alignment to market demand applied on a mass scale? Mexican state policies, seen through the lens of adaptation to the interconnected markets, played a less successful role in the past 50 years, with public interventions that are considered as a cause for slowing competitiveness of this historical agricultural power. If the country is to continue to modernize, regional and societal structural imbalances are to be addressed from grass root level.

Departing from the Schultz industrial impact hypothesis, reformulated by the Fisher-Clark structural transformation model that considers the major provenance of economic development as coming from a specific predominantly industrial-urban location matrix and causing deep disparities in regional development, an agriculture of the 21st century may become a source of wealth especially if it reacts to market landscape employing analysis of the nexus between local poverty and global market needs and in combination with public support employing a clearly targeted system of subsidies that will support crops with highest actual poverty alleviation potential without leaving aside the diversification and long term need for strategical autonomy.

Taking into consideration the current impact of U.S. agricultural subsidies on Mexican poverty landscape, a dangerous potential of imports of genetically modified crops with ramified negative impacts, the double edged sword of remittances stemming from United States for Mexican economy creating

dependence and current course of U.S. foreign policy, representatives of Mexican public institutions should consider nascent extreme dangers within the realm of North American agricultural and economic ecosystem for inequality and rural poverty in Mexico. Furthermore, as Kydd said in 2001, globalized ideology is not likely to provide sources for private agricultural research regarding small stakeholder currently representing the bulk of the poor. For this reason, the role of government is to create new positive externalities institutionalizing public information systems targeting rural agricultural producers and providing them structured and localized production target recommendations derived from hard data gathered from regional markets ceaselessly involving a variety of socio-economic indicators also related to poverty, similar to regression of this study and forming joint national poverty alleviation and agricultural public policies, communicated to individual farmers as the final aim of public policies is to be happiness of many (Veenhoven, 2004) which ranks higher than economic progress of a few. Agriculture is thus not to be considered and GDP generator only, but also a rigorous poverty mitigation tool.

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