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The Impact of Foreign Direct Investment on Sectoral Employment in Mexico: A Prospective Analysis

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Abstract

1. Importance of employment and its sectoral composition in the development process.
2. A structural macroeconometric model was estimated for 1970-2002 (3SLS).
3. Three prospective scenarios were forecasted to 2013 based on three different FDI behaviors.

I. Introduction

Since the late 60s difficulties were detected in employment (quantity and composition):

a) Since 1981:

sharp slowdown in economic growth

+

increase in its volatility

a) Rapid acceleration of the Economically Active Population.

b) Labor displacement due to an intensive use of labor-saving technology.

c) Expulsion of labor in traditional agriculture.

II. Sectoral Employment and Output Evolution

Since 1940 sectoral employment and output in developed countries have drastically changed showing the following trends:

- Sharp downfall in agriculture.
- Manufacturing:
 1. Increase (during initial phases of industrialization)
 2. Slight reduction
 3. Stabilization
- Persistent increase in the service sector.

Table 1
Sectoral Employment in 10 Developed Countries, 1970-2001
(Percentages)

Country/sector	Agriculture			Industry			Services		
	1970	1990	2001	1970	1990	2001	1970	1990	2001
United States	4.5	2.9	2.4	33.2	25.1	22.6	62.3	72.0	75.0
Canada	7.6	4.2	2.9	29.8	23.5	22.9	62.6	72.3	74.4
Australia	8.0	5.6	4.7	35.0	24.1	21.1	57.0	70.3	74.2
Japan	16.9	6.9	4.9	35.7	33.9	30.5	47.4	59.2	64.6
France	13.5	6.0	4.4*	38.5	29.0	23.1*	48.0	65.0	72.5*
Germany	8.5	3.5	2.6	48.7	39.0	32.4	42.8	57.5	65.0
Italy	20.1	8.9	5.2	39.8	32.5	31.8	40.1	58.6	63.2
Holland	6.4	4.7	3.3*	37.5	25.8	20.0*	56.1	69.5	76.7*
Sweden	8.1	3.8	2.3	38.0	28.3	23.8	53.9	67.9	74.0
United Kingdom	3.2	2.1	1.4	43.2	28.2	24.8	53.6	69.7	73.5

* Data for 2000.

Source: Godbout, 1993, European Commission, 2001; ILO, 2003.

III. Theoretical Framework

Reich (1993) → three main types of employment are conformed in contemporary capitalism :

- *Routine production and low-skilled employment*

Easily substituted by standardized processes and by re-location to lower-wage regions and countries.

- *Personal services*

Idem + higher qualifications and experience.

- *Symbolic-analytical services*

Connected to inter-mediation strategies, software, problem identification and resolutions.

Table 2
Mexico: Sectoral Employment and Output, 1940-2002
(Percentages)

Year	Agriculture		Mining		Manufacturing		Construction		Electric Energy		Services	
	L_i/L	Y_i/Y	L_i/L	Y_i/Y	L_i/L	Y_i/Y	L_i/L	Y_i/Y	L_i/L	Y_i/Y	L_i/L	Y_i/Y
1940	65.4	20.2	1.8	5.9	9.0	16.1	1.8	1.8	0.2	0.6	21.9	55.2
1950	58.3	19.6	1.2	4.5	11.8	18.3	2.7	1.8	0.3	0.5	25.8	55.4
1960	54.2	15.6	1.2	3.3	13.8	20.3	3.6	5.2	0.4	0.4	26.8	55.2
1970	36.3	11.2	1.0	2.6	12.6	23.0	6.7	6.2	0.3	0.8	43.1	57.1
1980	27.9	8.2	1.0	3.2	12.0	22.1	9.5	6.4	0.4	1.0	49.0	60.1
1990	25.4	7.7	1.2	3.6	11.1	22.8	10.7	5.1	0.5	1.5	51.0	60.7
2000	20.0	5.0	0.4	1.2	12.8	19.8	12.2	3.9	0.5	1.5	54.1	63.1
2002	20.2	5.1	0.4	1.2	12.6	18.8	12.5	3.8	0.5	1.6	53.8	64.4
Proportion of change 2002/1940	-3.24	-3.96	-4.42	-4.92	1.42	1.17	6.79	2.11	2.73	2.67	2.47	1.17

L_i = Sectoral employment; L = Total employment; Y_i = Sectoral output; Y = Total output.

Own calculations based on García, 1994; Trejo, 1978 and Loría, 2003.

Note: GDP's sum does not make up 100%, since neither imputed bank services nor output taxes are included.

Table 3
Mexico: Average Sectoral (Labor) Productivity, 1970-2002
(Index 1970 = 1.0)

Year	Agriculture	Mining	Manufacturing	Construction	Electric Energy	Services	Total
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1975	1.10	1.10	1.15	0.98	1.22	1.09	1.14
1980	1.25	1.51	1.31	0.95	1.44	1.21	1.30
1985	1.31	1.54	1.39	0.87	1.65	1.21	1.33
1990	1.30	1.55	1.50	0.70	1.76	1.20	1.33
1995	1.39	2.32	1.70	0.64	1.90	1.19	1.36
2000	1.46	2.58	1.85	0.59	1.98	1.32	1.51
2002	1.49	2.61	1.80	0.55	2.08	1.36	1.52
ARG	1.25	3.04	1.85	-1.83	2.32	0.97	1.31

ARG = Average (annual) Rate of Growth, 2002/1970.

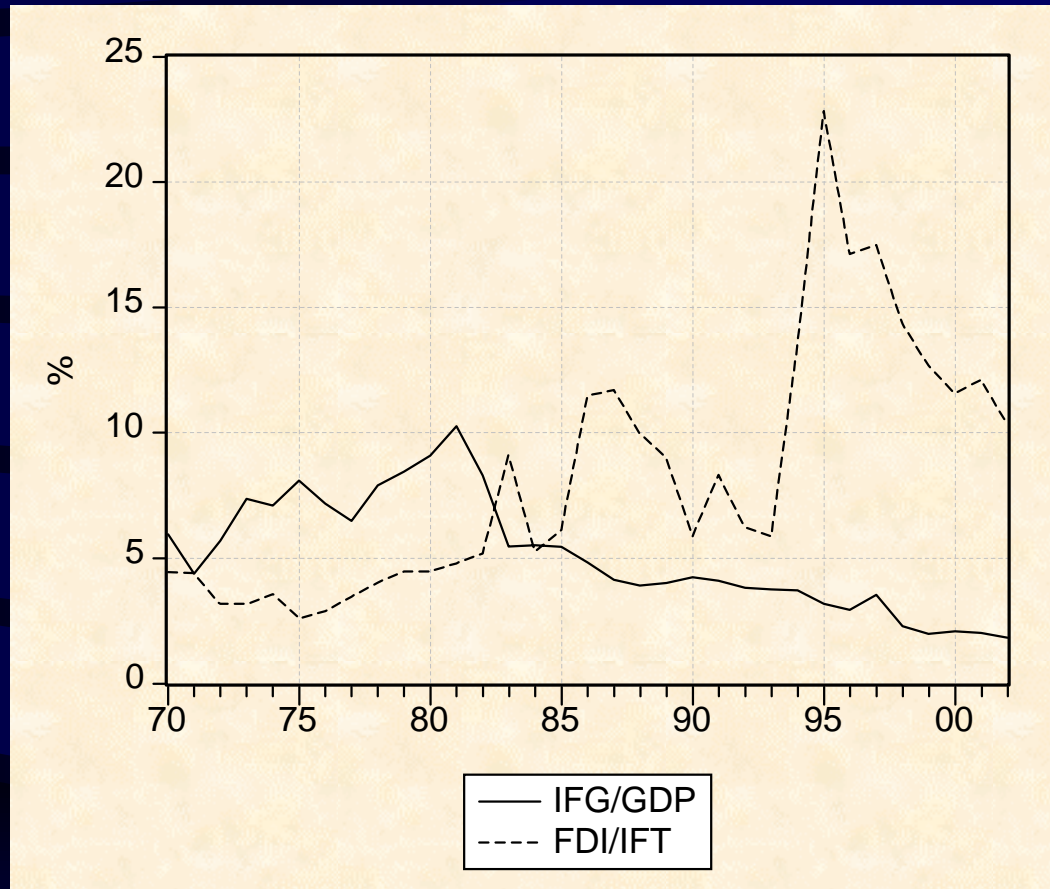
Source: Own calculations and Loría, 2003.

IV. Importance of FDI

- Main source of financing. In LA it grew from 243 billion dollars in 1990 to 830 billion dollars in 1999.
- FDI sectoral flows have been oriented mainly to activities with leading development/growth potentials and competitive advantages.
- In-bond plants generated 87% of new manufacturing employment and its contribution to total employment grew from 1.62% in 1988 to 4% in 2000.

Figure 1

Mexico: Public and Foreign Investment

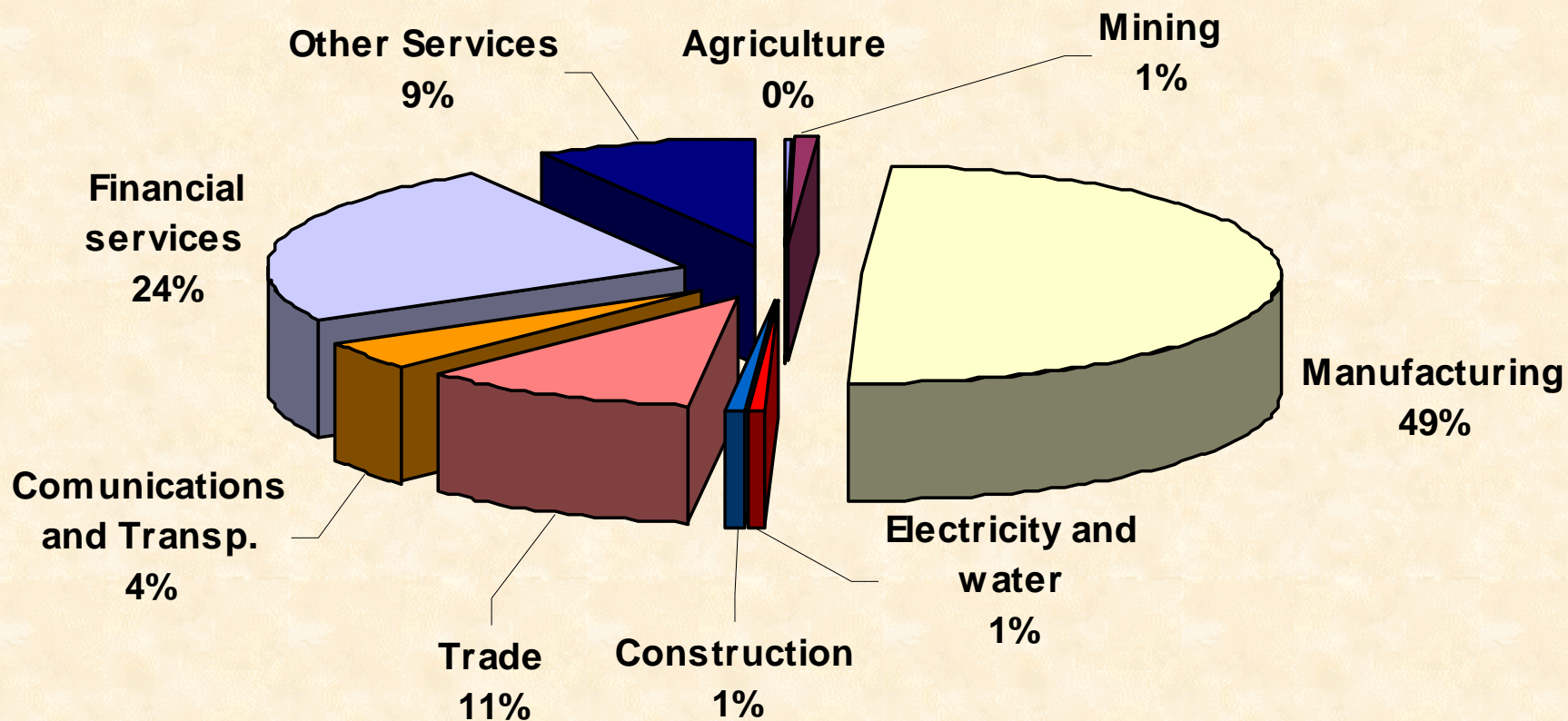


IFG = Public Investment
GDP = Gross Domestic Product
FDI = Foreign Direct Investment
IFT = Total Investment

All are expressed in real terms

Figure 2

Mexico: Sectoral Composition (Percentage) of FDI, 1994-2002



V. The Model

V.1. Methodology

- Estimation time span: 1970-2002
- Good balance between theoretical arguments and data as suggested in *modern structural econometrics*
- First, individual estimation (OLS) was tested for incorrect specification
- Unit root tests were performed for cointegration
- Weak exogeneity tests were applied to justify the use of a system.

V.2. Model Structure

- Six sectors: Agriculture, Mining, Manufacturing, Construction, Electric Energy and Services.
- Middle Real Wages and FDI.
- Structure:
 - a) 14 endogenous variables
 - b) 20 exogenous
 - c) 5 linear transformations
 - d) 5 accounting identities

V.3. Equation System (3SLS), 1970-2002

Agriculture

$$\text{LNE91} = -2.498 + 0.385 * \text{LXVG91} - 0.113 * \text{D(LWALDM1R)}$$

$$t \quad (-12.434) \quad (21.206) \quad (-2.686)$$

$$+ 0.109 * \text{LSCOS} - 0.027 * \text{D(LTCOMBN)}$$

$$(2.565) \quad (-3.484)$$

Mining

$$\text{LNE92} = 1.944 + 0.860 * \text{LMINSOLA} - 1.037 * \text{LZ92(-1)} + 0.266 * \text{TEGPV}$$

$$t \quad (2.833) \quad (8.446) \quad (-17.623) \quad (7.019)$$

$$+ 0.005 * \text{PTEGP1} + 0.334 * \text{LPRC}$$

$$(5.327) \quad (6.679)$$

Manufacturing

$$\begin{aligned} \text{LNE93} = & -2.892 + 0.250 * \text{LNE93}(-1) - 0.134 * \text{LCOSLAB} + 0.296 * \text{LIFT} \\ t & \quad (-11.747) \quad (4.433) \quad (-4.780) \quad (13.049) \\ & + 0.575 * \text{AR}(1) \\ & \quad (5.377) \end{aligned}$$

Construction

$$\begin{aligned} \text{LNE94} = & -9.068 + 0.873 * \text{LIFTC} + 0.849 * \text{LEAP} - 1.689 * \text{LNE91} - 0.177 * \text{LWALDM1R} \\ t & \quad (-18.357) \quad (13.577) \quad (7.253) \quad (-6.119) \quad (-3.954) \end{aligned}$$

Electric Energy

$$\begin{aligned} \text{LNE95} = & -3.702 + 0.685 * \text{LNE95}(-1) + 0.266 * \text{LGDP} - 0.065 * \text{LWBDNR} \\ t & \quad (-4.500) \quad (10.703) \quad (4.345) \quad (-2.506) \end{aligned}$$

Services

$$\text{LNE SERV} = 0.500 + 0.795 * \text{LNE SERV}(-1) + 0.193 * \text{D(LNE32)} + 0.033 * \text{LFDI}$$

t (6.615) (24.454) (7.552) (5.336)

$$+ 0.360 * \text{AR}(1)$$

(3.343)

Middle Real Wages

$$\text{LWBDNR} = -1.620 + 0.532 * \text{LWALDM1R} - 0.387 * \text{LPRC} + 0.017 * \text{FDI} + 1.032 * \text{LZ}$$

t (-0.743) (10.831) (-5.039) (3.410) (5.041)

Foreign Direct Investment

$$\text{LFDI} = -34.240 + 2.542 * \text{LGDP} + 0.878 * \text{LAPECOM} - 1.515 * \text{D(LCOSLAB)}$$

t (-11.287) (11.810) (6.512) (-2.563)

$$- 6.769 * \text{CCPIB} + 0.764 * \text{PRC}$$

(-3.372) (3.195)

Table 5
Residuals from the 3SLS Estimation. Unit Root
and Normal Distribution Test

	ADF(1)	DF GLS(1)	PP(3)	KPSS	J-B
NE91	-2.0899 ¹	-2.8170	-4.1777	0.1254	1.893(0.387)
NE92	-2.2739 ²	-3.3498 ²	-5.3053 ³	0.1490 ⁴	0.874(0.645)
NE93	-3.7061 ⁵	-3.7428 ⁴	-4.0970	0.2201 ³	4.597(0.100)
NE94	-2.1171 ⁴	-1.9154 ⁶	-3.4772 ⁷	0.1368	2.876(0.237)
NE95	-4.4265	-3.0127 ²	-4.7115	0.1173 ³	0.667(0.716)
NESERV	-2.7887	-2.8769	-2.6775	0.0773 ³	0.192(0.908)
WBDNR	-3.0752 ⁸	-2.3940 ⁸	-3.6932	0.0822 ³	0.911(0.633)
FDI	-3.2930	-3.1511	-6.0494	0.0812	1.164(0.558)

Tests at 99% of confidence. ADF, without trend and intercept; DF-GLS, with intercept; PP, without trend and intercept; KPSS, with intercept. PP and KPSS test were estimated by Bartlett-Kernel-Spectral method.

¹ With three lags; ² two lags; ³ with trend and intercept; ⁴ valid at 95% of confidence, with trend and intercept; ⁵ with intercept; ⁶ valid at 90% of confidence; ⁷ valid at 90%, with trend and intercept; ⁸ valid at 95% with intercept.

Lags and exogenous variables were selected following the reduction approach in order to obtain the best outcome regarding adjusted R², Akaike and Schwarz criterions, F test and serial correlation.

ADF and PP tests critical values are MacKinnon's (Eviews, 2002); DF-GLS test are Elliott-Rothenberg-Stock's (*ibid.*); KPSS test are Kwiatkowski-Phillips-Schmidt-Shin (*ibid.*).

Table 6

Weak Exogeneity Tests

Weak exogeneity of FDI and Z in the WBDNR function

	FDI	WBDNR	Z
F (2,22)	10.9603 (0.0)	4.2536 (0.028)	4.3354 (0.026)
χ^2 (2)	21.9207 (0.0)	8.5073 (0.014)	8.6709 (0.013)

Joint test χ^2 (2) = 23.9370 (0.001)

Weak exogeneity of GDP and COSLAB in the FDI function

	GDP	FDI	COSLAB
F (2,24)	12.4968 (0.0)	5.2115 (0.013)	4.5709 (0.042)
χ^2 (2)	24.9937 (0.0)	10.42312 (0.005)	4.5709 (0.032)

Joint test χ^2 (2) = 37.5757 (0.0)

V.3. Three Prospective Scenarios, 2003-2013

Table 7
Results, 2003-2013 (ARG)

Variable	<i>Basic</i>	<i>Optimistic</i>	<i>Pessimistic</i>
Total GDP	2.78	5.99	1.63
Agriculture	1.50	1.80	1.20
Industry	2.85	6.96	1.46
Services	2.78	5.66	1.69
FDI ¹	32.667	37.567	27.767
Total Employment	2.42	4.04	1.85
Agriculture	0.54	0.74	0.34
Industrial	4.26	5.78	3.77
Services	2.15	4.25	1.35
Middle Real Wages	1.13	3.67	-0.46

¹ Data in billions of US dollars to the year 2013.

Table 8
Employment and Output Sectoral Evolution,
1940-2013

Year	Agriculture		Industry		Services	
	L_i/L	Y_i/Y	L_i/L	Y_i/Y	L_i/L	Y_i/Y
1940	65.4	20.2	12.7	24.4	21.9	55.2
⋮	⋮	⋮	⋮	⋮	⋮	⋮
2002	20.20	5.15	26.0	25.33	53.80	64.42
Basic						
2013	16.55	4.56	30.1	26.13	53.35	63.84
Optimistic						
2013	13.68	3.07	29.9	30.0	56.39	60.61
Pessimistic						
2013	17.74	5.27	30.35	25.0	51.91	64.66

L_i = Sectoral employment; L = Total employment; Y_i = Sectoral output; Y = Total output


Note: The participations do not sum up 100% since the GDP accountable on the supply side includes imputed bank services and production taxes.

Sources: same of Table 1.

VI. Conclusions and Further Comments

- Since 1940 –in quantitative terms– Mexico has followed the same worldwide pathways in sectoral employment and output.
- But has not reached a suitable sectoral composition that endows economic development (permanent work force surplus in low-skilled activities).
- The *pessimistic scenario* warns that the current situation might be even more aggravated.

- Even in the *optimistic scenario*, Mexico depicts an undesirable economic profile: 13% of its labor force in agriculture, generating 3% of the GDP.
- The FDI's sole dynamics is insufficient to improve the Mexican outlook.
- Imperative to define additional policies to reduce overpopulation in the primary sector and enhance *symbolic-analytical* activities.
- Migration has always been an enhancing factor for development.

A geometric diagram on a dark blue background. It features a circle with a solid blue outline. The circle is divided into four quadrants by a vertical solid blue line and a horizontal solid blue line. Two dotted white lines represent diagonals of a square that circumscribes the circle. The word "EUDOXIO" is written in a white, serif, all-caps font across the center of the diagram, overlapping the horizontal line and the circle.

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