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Apéndice B. Desarrollo asintótico

Se detalla la metodología empleada para obtener los resultados asintóticos: Sea la especificación 4, misma que se estima suponiendo que las variables se generan con base en el **PGD A**. La estimación de los parámetros $\hat{\alpha}$, $\hat{\beta}$ y $\hat{\delta}$ se hizo mediante la formulación matricial de MCO:¹

$$Y = X\beta + U$$

donde:

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ y_T \end{bmatrix} \quad X = \begin{bmatrix} 1 & x_1 & y_0 \\ 1 & x_2 & y_1 \\ 1 & x_3 & y_2 \\ \vdots & \vdots & \vdots \\ 1 & x_T & y_{T-1} \end{bmatrix} \quad \beta = \begin{bmatrix} \hat{\alpha} \\ \hat{\beta} \\ \hat{\delta} \end{bmatrix} \quad U = \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \\ \vdots \\ \epsilon_T \end{bmatrix}$$

Se calculan los estimadores de MCO mediante la fórmula clásica $\hat{\beta} = (X'X)^{-1}X'Y$. Si desarrollamos la matriz cuadrada $X'X$ obtenemos:

$$X'X = \begin{bmatrix} T & \sum x_t & \sum y_{t-1} \\ \sum x_t & \sum x_t^2 & \sum x_t y_{t-1} \\ \sum y_{t-1} & \sum x_t y_{t-1} & \sum y_{t-1}^2 \end{bmatrix}$$

Por otra parte, al desarrollar $X'Y$ obtenemos:

$$X'Y = \begin{bmatrix} \sum y_t \\ \sum x_t y_t \\ \sum y_t y_{t-1} \end{bmatrix}$$

¹ Todas las sumas son hasta T .

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Desarrollamos posteriormente cada una de las sumatorias que aparecen en estas matrices (se coloca bajo cada componente de la sumatoria el orden de divergencia que le corresponde). Dado que x_t y y_t tienen el mismo PGD, las sumatorias (i) $\sum y_t, \sum x_t$; (ii) $\sum y_t^2, \sum x_t^2$ (iii) $\sum y_{t-1}^2 \sum x_{t-1}^2$; (iv) $\sum y_t y_{t-1}, \sum x_t x_{t-1}$ son esencialmente iguales (sólo cambia el subíndice de los parámetros), las desarrollamos usando la notación $z = x, y$. Todos los órdenes de convergencia pueden encontrarse en Phillips (1986), o en Hamilton (1994):

$$\begin{aligned}
\sum z_t &= \mu_z T + \underbrace{\beta_z \sum t}_{O_p(T^2)} + \underbrace{\sum u_{zt}}_{O_p(T^{1/2})} \\
\sum z_{t-1} &= \mu_z T + \beta_z \sum t - \beta_z T + \underbrace{\sum u_{zt-1}}_{O_p(T^{1/2})} \\
\sum z_t^2 &= \mu_z^2 T + \underbrace{\beta_z^2 \sum t^2}_{O_p(T^3)} + \underbrace{\sum u_{zt}^2}_{O_p(T)} + 2\mu_z \beta_z \sum t + 2\mu_z \sum u_{zt} + \underbrace{2\beta_z \sum u_{zt} t}_{O_p(T^{3/2})} \\
\sum z_t z_{t-1} &= \mu_z^2 T + 2\mu_z \beta_z \sum t - \mu_z \beta_z T + \mu_z \sum u_{zt} + \mu_z \sum u_{zt-1} \\
&+ \beta_z^2 \sum t^2 - \beta_z^2 \sum t + \beta_z \sum u_{zt} t + \beta_z \sum u_{zt-1} t \\
&- \beta_z \sum u_{zt} + \underbrace{\sum u_{zt} u_{zt-1}}_{O_p(T^{1/2})}
\end{aligned}$$

En los restantes desarrollos es necesario distinguir x de y :

$$\begin{aligned}
 \sum x_t y_t &= \mu_y \mu_x T + \mu_y \beta_x \sum t + \mu_y \sum u_{xt} + \mu_x \beta_y \sum t \\
 &\quad + \beta_x \beta_y \sum t^2 + \beta_y \sum u_{xt} t + \mu_x \sum u_{yt} \\
 &\quad + \beta_x \sum u_{yt} t + \underbrace{\sum u_{yt} u_{xt}}_{Op(T^{1/2})} \\
 \sum x_t y_{t-1} &= \mu_y \mu_x T + \mu_x \beta_y \sum t - \mu_x \beta_y T + \mu_x \sum u_{yt-1} + \mu_y \beta_x \sum t \\
 &\quad + \beta_x \beta_y \sum t^2 - \beta_x \beta_y \sum t + \beta_x \sum u_{yt-1} t + \mu_y \sum u_{xt} \\
 &\quad + \beta_y \sum u_{xt} t - \beta_y \sum u_{xt} + \underbrace{\sum u_{yt-1} u_{xt}}_{Op(T^{1/2})}
 \end{aligned}$$

Finalmente, sólo resta precisar las sumas deterministas:

$$\begin{aligned}
 \sum t &= \frac{1}{2} (T^2 + T) \\
 \sum t^2 &= \frac{1}{6} (2T^3 + 3T^2 + T)
 \end{aligned}$$

Apéndice C. Cálculo asintótico en *Mathematica*TM

Las expresiones anteriormente desarrolladas se capturan en un programa que realiza todo el cálculo asintótico necesario. En este apartado, se presenta el código realizado en *Mathematica* 4.1 para obtener el valor asintótico de los estimadores $\hat{\alpha}$, $\hat{\beta}$ y $\hat{\delta}$, así como de $\hat{\sigma}^2$ y de la R^2 .² Para poder leer dicho código es necesario conocer el glosario; éste se divide en dos. El primer glosario [ver cuadro (3)] es el que permite leer los programas relativos a la estimación de los parámetros, la varianza y la bondad de ajuste. El segundo glosario [ver cuadro (4)] permite leer los programas relativos al cálculo del estadístico *DW*:

² El estadístico *F* puede derivarse fácilmente con base en su relación con la R^2 .

C.1. Glosarios

Letra(s)	Representa	Letra(s)	Representa
Mz	μ_z	St	$\sum t$
Bz	β_z	$St2$	$\sum t^2$
Uz	$\sum u_{zt}$	Uzt	$\sum u_{zt}t$
$Uy1$	$\sum u_{yt-1}$	$Uy1t$	$\sum u_{yt-1}t$
Uzc	$\sum u_{zt}^2$	C	$\sum u_{yt}u_{yt-1}$
$Uy1c$	$\sum u_{yt-1}^2$	D	$\sum u_{xt}u_{yt}$
F	$\sum u_{xt}u_{yt-1}$	Sz	$\sum z_t$
$Sy1$	$\sum y_{t-1}$	$Sz2$	$\sum z_t^2$
$Sy12$	$\sum y_{t-1}^2$	$Syy1$	$\sum y_t y_{t-1}$
Sxy	$\sum y_t x_t$	$Sxy1$	$\sum x_t y_{t-1}$

Cuadro 3: Glosario para demostración de resultados asintóticos relativos a $\hat{\alpha}, \hat{\beta}$ y $\hat{\delta}, \hat{\sigma}^2$ y R^2 . $z = x, y$. Note que $\sum u_{yt}u_{yt-1} = O_p(T^{1/2})$ en ausencia de autocorrelación y $O_p(T)$ en presencia de ésta.

Letra(s)	Representa	Letra(s)	Representa
Sz	σ_z^2	$Sz1$	σ_z^2
$Sdz2$	$\sum \Delta^2 z_t$	$Sdy12$	$\sum \Delta^2 y_{t-1}$
$Sdydx$	$\sum \Delta y_t \Delta x_t$	$Sdydy1$	$\sum \Delta y_t \Delta y_{t-1}$
$Sdy1dx$	$\sum \Delta y_{t-1} \Delta x_t$	Be	$plim(\hat{\beta})$
De	$plim(\hat{\delta})$	Pru	Num. de DW

Cuadro 4: Glosario para demostración de resultados asintóticos relativos al numerador del estadístico DW (el denominador es asintóticamente $\hat{\sigma}^2 T$ $z = x, y$).

C.2. Demostración del teorema 1

C.2.1. Estimación de los parámetros, la varianza y la bondad de ajuste

$$\text{ClearAll}; St = \frac{1}{2} * (T^2 + T); St2 = \frac{1}{6} * (2 * T^3 + 3 * T^2 + T);$$

$$Sy = My * T + By * St + Uy * T^{\frac{1}{2}};$$

$$Sx = Mx * T + Bx * St + Ux * T^{\frac{1}{2}};$$

$$Sy1 = My * T + By * St - By * T + Uy1 * T^{\frac{1}{2}};$$

$$Sy2 = My^2 * T + By^2 * St2 + Uyc * T + 2 * My * By * St + 2 * My * Uy * T^{\frac{1}{2}} + 2 * By * Uyt * T^{\frac{3}{2}};$$

$$Sx2 = Mx^2 * T + Bx^2 * St2 + Uxc * T + 2 * Mx * Bx * St + 2 * Mx * Ux * T^{\frac{1}{2}} + 2 * Bx * Uxt * T^{\frac{3}{2}};$$

$$Sy12 = My^2 * T + By^2 * St2 + By^2 * T + Uy1c * T + 2 * My * By * St - 2 * My * By * T + 2 * My * Uy1 * T^{\frac{1}{2}} - 2 * By^2 * St + 2 * By * Uy1t * T^{\frac{3}{2}} - 2 * By * Uy1 * T^{\frac{1}{2}};$$

$$Syy1 = My^2 * T + 2 * My * By * St - My * By * T + My * Uy1 * T^{\frac{1}{2}} + By^2 * St2 - By^2 * St + By * Uy1t * T^{\frac{3}{2}} + My * Uy * T^{\frac{1}{2}} + By * Uyt * T^{\frac{3}{2}} - By * Uy * T^{\frac{1}{2}} + C * T^{\frac{1}{2}};$$

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$$\begin{aligned}
 S_{xy} &= M_x * My * T + M_x * By * St + M_x * Uy * T^{\frac{1}{2}} + My * Bx * St \\
 &+ Bx * By * St2 + Bx * Uyt * T^{\frac{3}{2}} + My * Ux * T^{\frac{1}{2}} + By * Uxt * T^{\frac{3}{2}} \\
 &+ D * T^{\frac{1}{2}}; \\
 S_{xy1} &= M_x * My * T + M_x * By * St - M_x * By * T + M_x * Uy1 * T^{\frac{1}{2}} \\
 &+ My * Bx * St + Bx * By * St2 - Bx * By * St + Bx * Uy1 * T^{\frac{3}{2}} \\
 &+ My * Ux * T^{\frac{1}{2}} + By * Uxt * T^{\frac{3}{2}} - By * Ux * T^{\frac{1}{2}} + F * T^{\frac{1}{2}};
 \end{aligned}$$

$$\begin{aligned}
 M_{xNR} &= \begin{pmatrix} T & S_x & S_{y1} \\ S_x & S_{x2} & S_{xy1} \\ S_{y1} & S_{xy1} & S_{y12} \end{pmatrix}; XTY = \begin{pmatrix} S_y \\ S_{xy} \\ S_{yy1} \end{pmatrix}; \\
 iM_{xNR} &= \text{Inverse}[M_{xNR}];
 \end{aligned}$$

$$\begin{aligned}
 R1 &= \text{Extract}[iM_{xNR}, \{1, 1\}]; \\
 R10 &= \text{Factor}[R1]; \\
 R1num &= \text{Numerator}[R10]; \\
 R1den &= \text{Denominator}[R10]; \\
 J5 &= \text{Exponent}[R1num, T]; \\
 J6 &= \text{Exponent}[R1den, T]; \\
 R1num2 &= \text{Limit}[\text{Expand}[R1num/T^{J5}], T \rightarrow \infty]; \\
 R1den2 &= \text{Limit}[\text{Expand}[R1den/T^{J6}], T \rightarrow \infty]; \\
 R12 &= \text{Factor}[\text{Expand}[(R1num2/R1den2) * \frac{T^{J5}}{T^{J6}}]]; \\
 R2 &= \text{Extract}[iM_{xNR}, \{1, 2\}]; R3 = \text{Extract}[iM_{xNR}, \{1, 3\}]; \\
 R4 &= \text{Extract}[iM_{xNR}, \{2, 1\}]; R5 = \text{Extract}[iM_{xNR}, \{2, 2\}]; \\
 R50 &= \text{Factor}[R5];
 \end{aligned}$$

```

R5num = Numerator[R50];
R5den = Denominator[R50];
J1 = Exponent[R5num, T];
J2 = Exponent[R5den, T];
R5num2 = Limit[Expand[R5num/TJ1], T → ∞];
R5den2 = Limit[Expand[R5den/TJ2], T → ∞];
R52 = Factor[Expand[(R5num2/R5den2) *  $\frac{T^{J1}}{T^{J2}}$ ]]
R6 = Extract[iMxNR, {2, 3}]; R7 = Extract[iMxNR, {3, 1}];
R8 = Extract[iMxNR, {3, 2}]; R9 = Extract[iMxNR, {3, 3}];

R90 = Factor[R9];
R9num = Numerator[R90];
R9den = Denominator[R90];
J3 = Exponent[R9num, T];
J4 = Exponent[R9den, T];
R9num2 = Limit[Expand[R9num/TJ3], T → ∞];
R9den2 = Limit[Expand[R9den/TJ4], T → ∞];
R92 = Factor[Expand[(R9num2/R9den2) *  $\frac{T^{J3}}{T^{J4}}$ ]]

Param1 = iMxNR.XTY;

P10 = Factor[Expand[Extract[Param1, {1, 1}]]];
P11num = Numerator[P10];
K1 = Exponent[P11num, T];
Anum = Limit[Expand[P11num/TK1], T → ∞];
P12den = Denominator[P10];
K2 = Exponent[P12den, T];
Aden = Limit[Expand[P12den/TK2], T → ∞];

```

```

Apar = Factor[Expand[(Anum/Aden) *  $\frac{T^{K1}}{T^{K2}}$ ]]

P20 = Factor[Expand[Extract[Param1, {2, 1}]]];
P21num = Numerator[P20];
K3 = Exponent[P21num, T];
Bnum = Limit[Expand[P21num/ $T^{K3}$ ],  $T \rightarrow \infty$ ];
P22den = Denominator[P20];
K4 = Exponent[P22den, T];
Bden = Limit[Expand[P22den/ $T^{K4}$ ],  $T \rightarrow \infty$ ];
Bpar = Factor[Expand[(Bnum/Bden) *  $\frac{T^{K3}}{T^{K4}}$ ]]

P30 = Factor[Expand[Extract[Param1, {3, 1}]]];
P31num = Numerator[P30];
K5 = Exponent[P31num, T];
Dnum = Limit[Expand[P31num/ $T^{K5}$ ],  $T \rightarrow \infty$ ];
P32den = Denominator[P30];
K6 = Exponent[P32den, T];

Dden = Limit[Expand[P32den/ $T^{K6}$ ],  $T \rightarrow \infty$ ];
Dpar = Factor[Expand[(Dnum/Dden) *  $\frac{T^{K5}}{T^{K6}}$ ]]

P40 =
Factor[Expand[ $Sy2 + Apar^2 * T + Bpar^2 * Sx2 + Dpar^2 * Sy12 - 2 * Apar * Sy -$ 
 $2 * Bpar * Sxy - 2 * Dpar * Sy1 + 2 * Apar * Bpar * Sx + 2 * Apar * Dpar * Sy1 +$ 
 $2 * Bpar * Dpar * Sxy1$ ]];
P41num = Numerator[P40];
K7 = Exponent[P41num, T];
Wnum = Factor[Limit[Expand[P41num/ $T^{K7}$ ],  $T \rightarrow \infty$ ]];
P42den = Denominator[P40];
K8 = Exponent[P42den, T];
Wden = Factor[Limit[Expand[P42den/ $T^{K8}$ ],  $T \rightarrow \infty$ ]];
Wpar = Factor[Expand[ $T^{-1} * (Wnum/Wden) * \frac{T^{K7}}{T^{K8}}$ ]]

P50 = Factor[Expand[P40/( $Sy2 - (\frac{Sy * Sy}{T})$ )]];
P51num = Numerator[P50];

```

```

P50 = Factor[Expand[P40/(Sy2 - (Sy*Sy)/T)]];
P51num = Numerator[P50];
K9 = Exponent[P51num, T];
Rcnum = Factor[Limit[Expand[P51num/T^K9], T -> ∞]];
P52den = Denominator[P50];
K10 = Exponent[P52den, T];
Rcden = Factor[Limit[Expand[P52den/T^K10], T -> ∞]];
Rc = FullSimplify[Factor[Expand[(Rcnum/Rcden) * T^K9/T^K10]]]

```

C.2.2. Estimación del estadístico Durbin-Watson

ClearAll;

$$Sdy2 = (By^2 + 2 * Sy) * T ;$$

```

Sdx2 = (Bx^2 + 2 * Sx) * T;
Sdy12 = (By^2 + 2 * Sy) * T;
Sdydx = Bx * By * T;
Sdydy1 = (By^2 - Sy) * T;
Sdy1dx = Bx * By * T;
Be = BxBySy / (By^2Sx + Bx^2Sy);
De = By^2Sx / (By^2Sx + Bx^2Sy);
Pru = Sdy2 + Be^2 * Sdx2 + De^2 * Sdy12 - 2 * Be * Sdydx - 2 * De * Sdydy1 +
2 * Be * De * Sdy1dx;
R10 = Factor[Pru];
R1num = Numerator[R10];
R1den = Denominator[R10];
J5 = Exponent[R1num, T];
J6 = Exponent[R1den, T];
R1num2 = Limit[Expand[R1num/T^J5], T -> ∞];
R1den2 = Limit[Expand[R1den/T^J6], T -> ∞];
Pru2 = FullSimplify[Factor[Expand[(R1num2/R1den2) * T^J5/T^J6]]]

```

C.3. Demostración del teorema 2

C.3.1. Estimación de los parámetros, la varianza y la bondad de ajuste

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El código es idéntico al anterior; basta con reemplazar, en la expresión de “Syy1”, “ $C \cdot T^{1/2}$ ” por “ $C \cdot T$ ”.

C.3.2. Estimación del estadístico Durbin-Watson

ClearAll;

$$Sdy2 = (By^2 + 2 * Sy - 2 * Sy1) * T ;$$

$$Sdx2 = (Bx^2 + 2 * Sx - 2 * Sx1) * T ;$$

$$Sdy12 = (By^2 + 2 * Sy - 2 * Sy1) * T ;$$

$$Sdydx = Bx * By * T ;$$

$$Sdydy1 = (By^2 + 2 * Sy1 - Sy2 - Sy) * T ;$$

$$Sdyldx = Bx * By * T ;$$

$$Be = -\frac{BxBy(Sy1-Sy)}{By^2Sx+Bx^2Sy} ;$$

$$De = \frac{Bx^2Sy1+By^2Sx}{By^2Sx+Bx^2Sy} ;$$

$$Pru = Sdy2 + Be^2 * Sdx2 + De^2 * Sdy12 - 2 * Be * Sdydx - 2 * De * Sdydy1 + 2 * Be * De * Sdyldx ;$$

$$R10 = \text{Factor}[Pru] ;$$

$$R1num = \text{Numerator}[R10] ;$$

$$R1den = \text{Denominator}[R10] ;$$

$$J5 = \text{Exponent}[R1num, T] ;$$

$$J6 = \text{Exponent}[R1den, T] ;$$

$$R1num2 = \text{Limit}[\text{Expand}[R1num/T^{J5}], T \rightarrow \infty] ;$$

$$R1den2 = \text{Limit}[\text{Expand}[R1den/T^{J6}], T \rightarrow \infty] ;$$

$$Pru2 = \text{FullSimplify}[\text{Factor}[\text{Expand}[(R1num2/R1den2) * \frac{T^{J5}}{T^{J6}}]]]$$

Labor Market Integration between Northern Mexico and Southern United States: an empirical investigation*

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Abstract

In this paper, the analysis of co-dependence between the US and Mexico labor markets is carried out by estimating the cyclical component of California's and Texas' manufacturing employment and four US Border Mexican cities through the Hodrick-Prescott filter. We estimated the smoothing parameter following a calibration technique proposed by Guerrero et al (2001) which allows us to obtain the best linear unbiased estimator of the trend component. Our analysis suggests that after 1994 there has been greater labor market integration between Mexico's northern region and US' southern region. This greater integration has implied a change in the nature of the short term relationship of manufacturing employment between Mexico and the US. The change is also significant on the relationship between Mexican real wages and US employment.

Keywords: Vertical FDI, Labor market integration, Hodrick-Prescott filter, Latin America, US-Mexico border.

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Resumen

En este trabajo, el análisis de la codependencia entre los mercados laborales de Estados Unidos y México se realiza mediante la estimación del componente cíclico del empleo manufacturero en California y Texas y cuatro ciudades en el norte de México, a través del filtro de Hodrick-Prescott. Se estima el parámetro de suavizamiento siguiendo la metodología propuesta por Guerrero et al. (2001), la cual nos permite obtener el mejor estimador lineal insesgado del componente tendencial. Nuestros resultados sugieren que, después de 1994, la integración de los mercados laborales entre el norte de México y la región sur de Estados Unidos ha sido mayor. Esta mayor integración ha implicado un cambio en la naturaleza de la relación de corto plazo del empleo manufacturero entre México y los Estados Unidos. También se observa un cambio significativo en la relación entre el salario real Mexicano y el empleo en Estados Unidos.

Palabras Clave: IED vertical, integración del mercado laboral, filtro Hodrick-Prescott, frontera Estados Unidos-México.

Clasificación JEL: E3, J3, O1.

Introduction

Since the mid 80s Mexico's economy has been undergoing major structural reforms. Both trade and direct investment liberalizations have induced an industrial restructuring which has implied the relative growth of some regions and the decline of others.³ These adjustments have also brought changes in regional labor markets. For example, it has been argued that economic liberalization has had differentiated impact on regional labor markets; in particular, it has accentuated, and even increased, existing wage differentials across regions (Hanson, 2003). Moreover, regions most exposed to trade and overseas direct investment seems to have obtained wage gains (Meza, 2002).

It has also been argued that trade and investment liberalization have induced further economic integration between Mexico and the United States. The great majority of these studies have focused on measuring the degree to which Mexico's production is linked to the US industrial production (Garcés, 2003; Cuevas et al, 2003; Torres and Vela, 2002). There are few studies however about the extent to which both economies' labor markets are integrated.

³ See for instance, Katz (1998) and Aguayo and Salas (2002).

One of the earliest analyses about labor market integration between Mexico and the United States is Robertson (2000). In Robertson's study, market integration is measured by the responsiveness of Mexico's wages when there is a shock in the United States' wages. He concludes that shocks on wage differential are temporary and that in the long run the latter remains constant. By the same token, Fragoso, et al (2008) analyze whether there are common movements between both countries' manufacturing sectors. They find that Mexico's employment in the manufacturing non-maquiladora sector exhibits higher degree of synchronization with the manufacturing employment of the US economy that does the maquiladora sector.

A key element in Robertson's argument is the assumption that an increase in the relative wage⁴ induces Mexican labor to migrate north, which, in turn, causes relative wage to return to its initial level. As discussed later on, there are few problems with this view of labor market integration. Instead, we propose an alternative approach based on the analysis of the cross-correlation of the cyclical components of these economies' manufacturing employment and the analysis of the relation between changes in the US manufacturing employment and Mexican wage rates. We depart from previous studies in two important respects. First, to the extent that Mexico's northern border region hosts a large number of US subsidiaries, whose production levels depend on both US demand as well as international demand for these products, we argue that labor demand in this region is closely tied to the US business cycles. Second, recent advancements in the theory of Multinational Corporations (MNCs) include the development of models of vertical Foreign Direct Investment (FDI), which explain not only the emergence of foreign subsidiaries but also the growing importance in the international economy of both intra-firms trade flows and intermediate goods trade. We relate the growing importance of vertical FDI to higher labor market integration of the economies involved.

Due to data availability (or rather restrictions) this study focuses on labor market integration between the four largest Northern Mexican cities and the US economy. Overall, these cities concentrate more than 70% of maquiladora plants in Mexico. We consider the employment and wage rates as time series, which after adjusting for seasonality and outliers exhibit trend and cyclical components.

Further, in order to examine if there have been changes in the relationship between both economies since the beginning of NAFTA we divided the whole sample period into two sub-periods: the first goes from 1987:01 until 1993:04 and the second includes the years 1994:01 -2003:01.

⁴ US relative to Mexico.

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It is argued that 1995 represents a turning point in the Mexican economy because of several developments: (i) it is the year in which a major financial crisis took place with negative effects on the real sector of the economy; (ii) the government adopted a flexible exchange rate system which has had some effects on the in bond industry; (iii) the North American Free Trade Agreement was in its first year of being implemented. This trade agreement changed the strategic behavior of many multinational enterprises (MNCs) with strong repercussions on the nature of its relationship with their subsidiaries.

The empirical analysis is carried out by means of the Hodrick-Prescott Filter (Hodrick and Prescott, 1997). Unlike studies that use the Hodrick-Prescott filter however, the smoothing parameter is estimated through a calibration technique that allows us to obtain the best linear unbiased estimator of the trend component (Guerrero, et al, 2001). Our analysis suggests that after 1994 there has been greater labor market integration between Mexico's northern region and US' southern region. This greater integration has implied a change in the nature of the short term relationship of manufacturing employment between Mexico and the US. The change is also significant on the relationship between Mexican real wages and US employment.

The paper is organized as follows. Section 1, reviews some basic models of vertical FDI and builds the case for expecting greater labor market integration between Mexico's northern border region and the US economy. In particular, we stress the role played by the in bond industry in accelerating such a process. It also presents our definition of labor market integration. Section 2 provides some stylized facts about the FDI in Northern Mexico and gives an assessment of the relative importance of the cities considered within their respective States' manufacturing sector. Section 3 discusses all methodological issues. In particular, it submits the basic ideas of the Hodrick-Prescott (HP) filter (Section 3.1), it discusses the data used in the empirical analysis (Section 3.2) and presents the main results for the short run fluctuations and the long run behavior of employment in both economies, Section 3.3 and Section 3.4, respectively. The last section summarizes our main results.

1. Foreign Direct Investment and Economic Integration

For the last two decades, less developed economies and emerging economies have shown a renewed interest to attract Foreign Direct Investment (FDI) as a means to sustain, -even accelerate-, their economic growth.⁵ It is argued that FDI will bring more resources, new technology and management, including novel marketing and distribution techniques. In addition, and to the extent that the new firms have some spillover effects upon the domestic firms, overall efficiency will further accelerate. However, FDI has some collateral effects that not all governments are aware of, but that need to be evaluated to obtain a complete assessment of the likely impacts of FDI on the host country. Higher co-dependence of the business cycles between the home and the host economy is one example. Another example is the higher integration of the home and host countries' labor markets.

In what follows we present the basic ideas behind the different models of vertical FDI. It shows why we shall expect greater labor market integration when vertical FDI emerges.

1.1. Models of Vertical Foreign Direct Investment

A formal model of labor market integration is yet to be developed. However, we can infer the nature of the integration from the strategic behavior of the MNCs. Therefore, the purpose of this section is to draw some sketches about the factors that explain the emergence and evolution of the in bond industry. We begin with the early propositions made by Vernon (1966) and continue with models proposed by Markusen (1984), Helpman (1984), Markusen et al (1996) and Yi (2003).

Historically, US firms were the first ones to establish foreign subsidiaries worldwide so that Vernon's (1966) explanation was based on US firms' practices during the 1950s and 1960s. Vernon's theory, known as the product cycle hypothesis, argues that to the extent that both high-income levels and abundance of skilled labor characterized the US market, the latter provided a fertile ground for constant innovations.⁶ He also argued that over time, firms would convert new technologies or innovations into common knowledge. Once this occurred, firms would transfer the production of such goods to a different location. In his view, the emergence of FDI was a US

⁵ Moran (2000) shows that during 1990-1998 the flow of FDI directed to less developed economies went from US 24 Billion to US 120 Billion.

⁶ A strong domestic market was a source of stimulus for the innovating firm, while the abundance of skilled labor and the technological capabilities allowed US firms to improve new products to the point in which the technology becomes standardized.

firm's response to a real or perceived monopolistic advantage. When such an advantage was absent, the firm would not be willing to take the costs and uncertainties associated with the operation of a foreign subsidiary.

Changes in the international economy made Vernon (1979) re-evaluate his early ideas. In particular, the emergence of Europe and Japan as world economies meant that there were new markets that could sustain innovations and the emergence of large firms capable of FDI. Hence, US firms were not longer the only Multinationals (MNC's) capable of FDI. They now had to compete against European and Japanese firms that were establishing foreign subsidiaries even in the US as a means to gain market share in the international economy. The flow of direct investment across industrialized countries became the leading type of FDI, as opposed to FDI going from the latter to less industrialized economies.

Early analyses on MNCs took Vernon's ideas as a starting point. These studies analyzed different aspects of MNCs operations such as their impacts on the patterns of trade, home and host countries' welfare, transfer of technology in a rather descriptive manner. At that time, formal models of trade were incapable of explaining the existence of foreign subsidiaries. By the mid 1980s, however, Markusen (1984) and Helpman (1984) analyzed the existence of foreign direct investment under the presence of increasing returns to scale (IRS). In effect, while Markusen (1984) relied on multi-plant economies, Helpman's model (1984) was based on differentiated inputs; in particular, he considered a general-purpose input that played a special role in a differentiated product industry. In both cases, IRS emerged as the leading cause of trade (intra-firm trade) and in both cases the firm was able to separate geographically different internal activities.⁷

In Markusen's model, the multi-plant economies are found in firm-specific activities such as R&D, advertising, marketing, and distribution and management services, the so-called "corporate headquarters", C . Furthermore, these firm-specific activities, C , tend to be centralized in a particular location, while production activities, F , are geographically dispersed. A "national" firm becomes multinational when the sector in which it is located exhibits IRS; that is, when the production involves the product of two activities: corporate headquarters, C , and factory, F . If increasing returns in the sector are weaker than the effects of factor intensity,

⁷ Both models have some similarities with regards to the assumptions: they are 2x2x2 models, e i, two-countries (home and host), two-goods (one exhibits CRS and the other one presents IRS), two-factors of production. In Markusen these are capital, K , and labor, L ; although in Helpman these are labor, L ; and a general-purpose input, H . In both models firms maximize profits. In both cases, labor is homogeneous and immobile across countries.

then the “national” firm would maintain plants in both countries i.e., would become MNC’s. A major drawback of the model however is that it cannot predict the direction of trade; that is, it cannot predict which country ends up with the corporate activities, C , and which one with the production activities, F .⁸

Helpman (1984), on the other hand, describes the conditions under which firms find it desirable to establish foreign subsidiaries so that trade patterns can be induced from such a decision. Firms produce a single-good and because they maximize profits their location choices are cost minimizing. Contrary to Markusen’s model, here MNC’s emerge as a result of the tendency of factor price to differ across countries.⁹ The IRS sector produces differentiated products, while the CRS sector produces a homogenous product.

For a while, models about FDI explained either horizontal FDI or vertical FDI but not both of them at the same time (Markusen, et al 1996). Horizontal MNCs are those multi-plant firms that produce the same product in several countries; substituting international trade for international production. The main purpose of the MNCs in this case is to penetrate a foreign market protected by high tariffs or high transport costs. Vertical MNCs, on the other hand, separate their productive process geographically, taking advantage of differences in relative factor price across countries. In this case, the objective is not to penetrate the host’s market but rather use it to reduce overall costs of production. The first type of models were relevant to explain FDI taking place in advanced industrialized economies, whereas the second type was more relevant to less developed economies.

Recent studies about MNCs have provided new insights about the relative importance of vertical FDI with respect to horizontal FDI and its role in the impressive growth of trade flows that cannot be explained by trade liberalization alone (Hanson et al, 2001; Hanson et al, 2003; Braconier, et al, 2002; Yi, 2003). For example, Hanson et al (2003) show that throughout the nineties US MNCs sent a growing part of their production to their subsidiaries through intermediate exports that need further processing. They also show that employment in subsidiaries located in non-OECD countries - i.e., Asia and Latin America- grew faster than in subsidiaries located in OECD countries, indicating differences in the expansion strategy followed by the MNCs in both groups of countries.

⁸ This result is in part due to the assumption that both countries have the same factors endowments, market size, and tastes and preferences.

⁹ The model assumes away transport costs, tariffs and tax advantages.

In the light of the mounting evidence about FDI, Markusen et al (1996) modified some assumptions present in Markusen (1984) to provide a comprehensive explanation of FDI. In particular, differences in labor's skills and relative factors endowments. In this model, the firm would choose between horizontal and vertical FDI depending on differences in: relative factor endowments across countries, trade restrictions in the form of higher costs, and market size of the countries involved. The firm's decision would maximize its overall profits.

Given a set of assumptions, the model predicts that when countries' differences in factor endowments are moderate, then the country that has relative abundance in skilled labor exports X . However, if the differences in factors endowments across countries are large, then vertical MNCs emerge. Multinational firms would fragment X , and the country with the relative abundance of skilled labor will concentrate headquarters activities and the production would be located in the country with relative abundance in unskilled labor. This decision changes trade direction because now the country with abundant skilled labor would import the good that is intensive in skilled labor.

It should be noted that in this model, vertical multinational dominates production when trade costs are low and the countries differ significantly in relative factor endowments but are of similar size. Horizontal multinational, on the other hand, emerge when countries are of similar size and relative factor endowments and when the trade costs are from moderate to large. National firms dominate when the trade costs are low and the relative endowments are similar, or when trade costs are moderate, relative endowments are similar and the countries differ significantly in size.

The new evidence about the magnitude of vertical FDI helped reconsider two key issues in the discussion: the definition of vertical FDI and whether differences in relative factor costs are more important than differences in relative factor endowments in explaining vertical FDI (Braconier et al, 2002). In effect, early models considered vertical FDI as the practice where foreign subsidiary exports goods only to headquarters, while the evidence suggested that the concept of vertical FDI needed to be extended to include sales from subsidiaries to third countries and sales to the host country. Thus, the picture of trade flows explained by vertical FDI is more complex than initially thought.

The debate about whether differences in relative factors endowments are more important than differences in relative factors prices to explain the impressive growth of trade and the increasing relative importance of vertical FDI has also reached a turning point. Recent empirical studies give more

evidence in favor of the relative factors prices argument (Hanson, 2003; Braconier et al, 2002). Yi (2003), for instance, builds a model that can explain the emergence of vertical and horizontal FDI as a function of labor productivity. The goods consumed and invested by the two countries are produced in sequential stages of production. One of the conclusions of the model is that one country can produce goods of a particular stage, while the other would produce the remaining stage goods. Given the two countries' productivity and their relation with respect to their relative wages, each one of them would produce the stage good for which is better prepared, giving rise to some kind of specialization, but on a particular stage of production.

1.2. Why should we expect increased labor market integration?

As shown in the previous section, a priori we cannot determine the nature of the labor market integration because the latter depends on the role that subsidiary plants play on the overall strategy of the MNCs. Whether we observe a positive (negative) correlation between both countries' employments depends on whether goods produced by subsidiary plants located in the host country are complements (substitutes) of the goods produced by plants located in the home country.

From an international trade theory perspective, more integration can be expected to lead to more trade; and more international trade will result in more highly correlated employment's cycles. But this view, particularly the second part is not universally accepted. For instance, Eichengreen (1992) and Krugman (1993) have pointed out that as trade becomes highly integrated, countries specialize more in production. By this logic, increasing specialization will *reduce* the business cycle correlation *not increase* it. Increased specialization might also result from adopting a flexible exchange rate system since it dampens the effects of industry specific shocks (Ricci, 1996).¹⁰

From an international trade theory's point of view, a trade agreement between two countries may change the nature of the relationship between both labor markets. If the resulting trade flows were more intra-industry than inter-industry, then one would expect that employment fluctuations in both countries to become positively correlated. On the other hand, if the resulting trade flows were inter-industry, then employment fluctuations in both countries go in opposite directions.

¹⁰ In the case of Mexico, it is worth recalling that at the same time that Mexico signed NAFTA, -which increased significantly trade between Mexico and US-, the Mexican government adopted a flexible exchange rate. Thus, it is expected that Mexico has become more specialized in the production of specific goods.

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Short run fluctuations of employment can be expressed in terms of its deviations from its long run trend. Thus, the correlation between short run fluctuations of home country (A) and host country (M), v , over time span τ and de-trended with method a , can be denoted by

$$\text{Corr}(v, a)_{A, M, \tau}$$

Labor market integration can also be seen through the impact of changes in home country's employment on host country's wage rates. The relationship between changes in home country's employment and fluctuations in host country's real wage rates is less clear, however. For one thing, wage rates result not only from the interplay of labor supply and demand but also from the institutional settings that regulate wage determination; in particular, the bargaining power of labor to link their wages to domestic inflation rate and to productivity growth. The association between employment in country A and real wages in country M would provide a direct indicator about whether trade agreement between countries A and M have meant an improvement on the latter's living conditions.

Our definition of labor market integration is different from other views. Robertson (2000), for example, defines labor market integration between Mexico and US as the responsiveness of Mexican wages to US wage shocks. In Robetson's view the adjustment mechanism of relative wages is based on the assumption that Mexican labor migrates north as a result of changes in relative wages.

This explanation however runs into several problems. First, there is the question about the extent to which labor migration to the US affects overall wage rates in Mexico. Not only the size of labor migration is not large enough to affect overall wage rates but also wages in Mexico is more likely to depend on some institutional settings. Second, several studies show that the decision to migrate to the US depends not only on economic considerations but also on other factors as well. A study carried out by The Mexico/United States Bi-national Study on Migration in 1997¹¹ identifies two types of factors that drive migration: pull and push factors. Among the pull factors the report identifies: the emergence of new employers, labor brokers, cross-border social networks of relatives and friends. The main push factor, on the other hand, is the lack of employment opportunities in Mexico. Third, relative wages between Mexico and US seem to respond more to variations of the exchange rate rather than to changes in labor mobility

¹¹ The Binational Study Group on Migration (1998).

between both countries.¹² Finally, the hypothesis not only implies that Mexican workers have access to information about US labor market conditions but also that although there are restrictions to labor migration, these are not impediments to massive labor mobility so that relative wages ultimately respond to it. For all these reasons, we think the measure of labor market integration based on the analysis of the cyclical components is better suited.

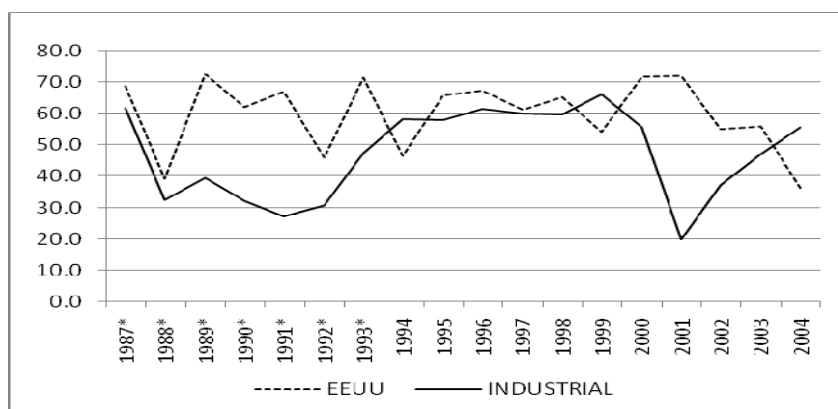
2. Foreign Direct Investment in Northern Mexico

In a study about FDI in Mexico, Máttar et al (2002) note some of its distinguishing features. In particular, they note that a large part of FDI comes from US multinationals concentrated in manufactures. To the extent that these multinational firms have subsidiaries in Mexico, the main recipients are the maquiladoras plants. Figure 1 shows the percentage of FDI coming from the United States and the percentage of FDI directed to industrial sector during 1987-2004.¹³ It shows that on average more than 60% comes from US firms. Beginning 2001 however the participation shows a steady decline.

¹² In effect, during 1980-2003 fluctuations in relative wages have been associated to periods of high depreciation of Mexico's currency. Relative wages defined as $\omega = \ln(w^{US}) - \ln(w^{MX})$ where w^{US} is the hourly wage rate of electronics sector and w^{MX} is the average hourly rate of Mexico's maquiladora sector (both are in US dollar).

¹³ It should be noted that in 1994 there was a change in the methodology used to estimate FDI. Beginning in that year, FDI includes reports given to the National Registry of Foreign Investment by 2008 and were actually implemented in the year plus imports from maquiladora plants. Since 1999 FDI also includes new investments outside social capital. As a result of these changes, between 1993 and 1994 the amount of FDI went from US \$3361 to US \$7112.2 (in real terms, deflated by US CPI base year 1982-4).

Figure 1
FDI in Mexico, Country of Origin and Sector



Source: Secretaría de Economía, Dirección General de Inversión Extranjera.

The graph also shows that the industrial sector has been one of the main recipients of FDI. In effect, after 1988-1993, when the amount of FDI going to the sector was below 40%, it increased to 60% during 1994-2000. The year 2001 shows a steep decline in the percentage, explained by the purchase of the largest Mexican bank, but it recovered the following years so that by 2004 it was again above 50%.

Throughout the nineties and early part of the 2000s, FDI as a percentage of Mexico's GDP shows an upward trend. It went from about 2 percent during the second half of the 80s to about 4.7 percent during the second half of the nineties to about 8.9 percent during the first four years of the 2000s.

Analyzing the geographical distribution of FDI in Mexico we find that during 1994-2004 about 26.7 % of total FDI was directed to all US-Border states¹⁴. To the extent that Tijuana, Ciudad Juarez, Nuevo Laredo and Matamoros are located in Baja California, Chihuahua and Tamaulipas respectively, we focus on the amount of FDI that was directed to them. The amount of FDI going to these three Border States increased from 8.4% in 1994 to about 20.2% in 1998. Since then the percentage distribution shows a declining trend so that by 2004 it was only about 7.9% of total FDI. Moreover, the FDI pattern among these three states differs significantly, i.e., while the amount of FDI going to Baja California and Chihuahua grew at an

¹⁴ There are six Mexican States that share limits with the US: Baja California, Coahuila, Chihuahua, Nuevo Leon, Sonora and Tamaulipas.

annual rate of 12.7% and 5.9% respectively, the amount going to Tamaulipas declined by 6.6% annually.

Despite the fact that since the mid eighties the in bond industry has grown faster in non-border regions, a distinctive aspect is that the US border region hosts, on average, more than 70 % of total plants and around 77 % of total maquiladora employment.¹⁵ This is the reason why Mexican researchers believe that this region's economic performance depends upon the behavior of the maquiladora plants.

Due to the lack of information about the distribution of FDI by cities, and in order to assess their relative importance within the flow of FDI going to these States, we measure their relative importance within their respective States' manufacturing sector. In general, the selected cities concentrate most of the manufacturing activities within their respective States. Table 1 shows the participation of these cities' manufacturing sector within their respective States in 1999.¹⁶ Tijuana, for example, concentrated 37.9% of the manufacturing sector's Fixed Assets in Baja California. The city's strong position can also be seen in terms of Gross Capital Formation, Gross Production and Employment.¹⁷

¹⁵ It should be noted however that during 1990 and 2003, the annual rate of decline of the region's share in the number of establishment and employment in the maquiladora sector were 1.04 and 0.98 percent respectively (source: INEGI, <http://dgcnesyp.inegi.gob.mx/bdine/bancos.htm>).

¹⁶ That is, with respect to the state's manufacturing sector.

¹⁷ The second most important city in the manufacturing sector in Baja California is Mexicali. These two cities concentrate more than 90% of manufacturing activity within the State.

Table 1
City's Relative Importance in their States' Manufactures, 1999
(Percentage)

City	Fixed assets	Gross capital formation	Gross production	Employment
Tijuana, BC	37.9	48.1	43.8	61.8
Ciudad Juarez, CHIH	37.2	49.6	51.2	68.3
Nuevo Laredo, TAMS	5.6	2.4	7.7	13.1
Matamoros, TAMS	9.9	10.5	23.3	31.6

Source: Own estimates using data from the 1999 Economic Census, (INEGI, 1999).

The importance of Ciudad Juarez within the State of Chihuahua's manufacturing sector is also similar to that of Tijuana. More than half of the manufacturing activity (in terms of production, capital formation and fixed assets) occurs in this city. The importance of the city is even higher if we consider the employment in the manufacturing sector since it captures more than 68% of the State's employment in the manufacturing sector.

The relative importance of Nuevo Laredo and Matamoros within the manufacturing sector in the State of Tamaulipas is not as strong as that of Tijuana and Ciudad Juarez. This is explained by the fact that in Tamaulipas there are two other cities that are just as important: Ciudad Madero and Reynosa. In terms of production and employment Matamoros and Nuevo Laredo concentrate 31% and 44.7% of the state manufactures, respectively. In terms of Gross Capital Formation and Fixed Assets their participation is lower however: 12.9% and 15.5%, respectively.

It has been shown the relative importance of these cities in the region's manufacturing sector. While Tijuana and Ciudad Juarez concentrate more than half of the manufacturing within their respective states, Nuevo Laredo and Matamoros are less important in the performance of Tamaulipas' manufacturing sector. Their importance in the region's manufacturing employment however cannot be underestimated.

3. Methodology

In this section we describe the method followed to obtain the trend and cyclical components of the series. We then discuss the data source and carry out the empirical analysis.

3.1 The Hodrick-Prescott Filter

In what follows we treat the employment (E_t) and wage series (w_t) as time series, which exhibit two components: a trend component (unobserved), g_t , and a cyclical component (unobserved), c_t ; thus, $w_t = g_t + c_t$. We will assume that the time series E_t and w_t are integrated of order 1, $I(1)$, in such a way that its trend will also be $I(1)$ and the cyclical component will be stationary.¹⁸ The data have been adjusted for seasonality. To the extent that growth accounting gives estimates of the permanent component with errors that are small relative to the cyclical component, the cyclical component is computed as the difference between the observed value and the trend component ($w_t - g_t = c_t$). The aim is to estimate and extract the components g_t and c_t . The approach developed by Hodrick and Prescott (1997) minimize the following expression:

$$\sum_{t=1}^T (w_t - g_t)^2 + \lambda \sum_{t=1}^T ((g_{t+1} - g_t) - (g_t - g_{t-1}))^2$$

where the penalty parameter λ controls the smoothness of the series, σ . The larger the λ , the smoother σ is. As $\lambda \rightarrow \infty$, g_t approaches a linear trend. In recent years several authors have criticized the mechanical use of the HP filter because it can generate spurious cycles.¹⁹ To avoid such a problem, it has been suggested that when investigating economic fluctuations an important first step is the analysis of their variance to quantitatively assess their relative volatility and contribution to the

¹⁸ We present unit root tests for the series in the Appendix. Tables A1 and A2 report unit root tests based on Dickey and Fuller (1979) and Perron (1997). Both tests conclude that the series are $I(1)$ so that their trend components are also $I(1)$ and their cyclical components are stationary.

¹⁹ See, for instance, Harvey and Jaeger (1993); Cogley and Nason (1995); Baxter and King (1995), Süßmuth, (2003), among others.

constitution of some aggregate series. A second step is to investigate their cyclical properties in the frequency domain by means of spectral analysis.²⁰

The popularity of the HP filter is based on some of its desirable properties, -it is a symmetric filter so that no phase shift is introduced, and it has trend reduction properties, furthermore, it places zero weight at the zero frequency. In fact, compared to a band-pass filter proposed by Baxter and King (1995), the HP filter gives essentially the same results for quarterly data.²¹ Guay and St-Amant (1997), on the other hand, argue that the HP filter performs well in terms of extracting business cycle frequencies of time series whose spectra have a peak at those frequencies. That is, if the series is dominated by high frequency cycles then the HP filter might provide a good approximation of the unobserved cycle frequencies.²²

The HP filter requires previous specifications of the parameter λ . This parameter defines the smoothness of the trend. It depends on the periodicity of the data and on the main period of the cycle that is of interest to the analyst. The parameter does not have an intuitive interpretation for the user, and its choice is considered perhaps the main weakness of the HP filter. For quarterly data, there is an implicit consensus in employing the value of $\lambda = 1600$, originally proposed by Hodrick and Prescott. However, the consensus disappears when other frequencies of observation are used. For example, for annual data, Baxter and King (1995) recommend the value $\lambda = 10$ because it approximates a band pass filter that removes from the cycle periodicities larger than 8 years, while Backus and Kehoe (1992), Giorno et al (1995) or European Central Bank (2000) use the value $\lambda = 100$. For monthly data, Dolado et al (1993) propose $\lambda = 4800$, while the popular econometrics program E-viewsTM uses the default value 14400.

²⁰ Süssmuth (2003) argues that spectral analysis in economics has not been used more often for several reasons. First, it can be applied only to stationary times series. To the extent that most of economic variables contain a trend component, the failure to effectively remove it would lead to the “typical spectral shape” reported by Granger (1966). Second, many economic series are so short that classical nonparametric methods of spectral analysis cannot be successfully used. Third, it emphasizes description rather than testing. Fourth, methods from the time domain, like cointegration analysis still play a predominant role in applied business cycle analysis.

²¹ This is untrue however for data with other frequencies (Baxter and King, 1995).

²² A preliminary spectral analysis of our employment and wage series suggests that a significant variability of the series occur at the business cycle frequencies and thus the use of the HP filter is warranted.

We follow a method proposed by Guerrero et al (2001) to find the appropriate value of λ that yield consistent and more objective results. These authors suggest an alternative interpretation of Whittaker graduation that yields the graduated series as the best linear unbiased estimator of the true series. Through an index called the “index of precision share” attributable to the time series model, they developed a criteria to help reducing subjectivity when graduating a time series.²³

3.2 Data Sources

The Mexican cities’ employment and wage data come from the National Urban Employment Survey (ENEU). We focus on four cities, -Tijuana, Ciudad Juarez, Nuevo Laredo, and Matamoros-, mainly because data for other border cities are not as complete as for these cities.

Our analysis is based on workers who received an income for their job. The analysis does not include workers who worked less than 16 hours and more than 68 hours during the reference week. We also excluded males and females younger than 12 and older than 75 years. We only consider workers employed in the manufacturing sector. The data are in natural-logarithms so that changes in the long-term component, $g_t - g_{t-1}$, correspond to the series’ long-term growth rate. The wage rate refers to hourly wage rate and is computed by dividing the monthly labor income by the total number of hours worked in a month. We used the (quarterly) National Consumer Price Index (NCPI) to deflate nominal quantities, using 1994 as the base year. In the case the worker had more than one job, we considered the labor earnings of the primary job to estimate wage rates.

We obtained quarterly data for manufacturing employment in California, Texas and overall US manufacturing employment from the US Bureau of Labor Statistics.²⁴ The strategy of analysis is to evaluate if employment on the Mexican side is integrated to their neighboring US States (Tijuana with California, Ciudad Juarez, Matamoros and Nuevo Laredo with Texas) on the assumption that production in the maquiladora plants depends on manufacturing output (and hence employment) of these neighboring

²³ Due to space restrictions the details are available from the authors.

²⁴ An analysis of the distribution of the manufacturing employment across cities indicates that in the State of California, it is concentrated in the cities of Los Angeles, San Jose, Santa Ana and San Francisco. These cities concentrate about 78 percent of the State’s manufacturing employment. Whereas in the case of Texas, manufacturing employment is concentrated in the cities of Dallas and Houston, which on average concentrate about 78.1 percent of the State’s (Source: Bureau of Labor Statistics, <http://www.bls.gov>, the period considered is 1999-2004). In both cases, US cities near the Mexican border have small participation in terms of US manufacturing employment.

States. An alternative assumption is that production on the Mexican side depends more on overall US manufacturing production rather than just the southern region's output. As shall be argued later on, Mexican manufacturing employment seem more integrated to the regional manufacturing employment rather than to the national manufacturing employment.

Table 2 shows the average employment distribution by main economic sectors for the four largest cities in the Mexican northern border region; namely, Tijuana, Ciudad Juarez, Matamoros and Nuevo Laredo during the period 1987-2000 (figures are percentages of each city's total employment). As can be observed, the four largest cities as a whole, about a third of employed labor is occupied in the manufacturing sector (mainly operated through maquiladora plants).²⁵ In Ciudad Juarez and Matamoros the importance of the maquiladora plants as a source of employment is even greater since they occupy about 41.3% and 38.8% of these cities' labor, respectively. In contrast, its importance in Tijuana and Nuevo Laredo is much lower than the other sectors: 27% and 23%, respectively.

Table 2
Average Employment Distribution, 1987-2000

	Ciudad Juarez	Tijuana	Matamoros	Nuevo Laredo	Border Region
Manufacturing	0.413	0.271	0.388	0.236	0.329
Commerce	0.197	0.259	0.182	0.208	0.212
Service	0.257	0.270	0.262	0.306	0.273
Construction	0.046	0.067	0.079	0.082	0.068
Transport	0.033	0.050	0.042	0.106	0.057

Note: the figures do not add up to one because the table omits workers employed in Mining, Agriculture and other sectors.

Source: National Survey of Urban Employment (ENEU), 1987:01-2000:04.

²⁵ It should be noted that there is a debate among Mexican researchers about whether these maquiladora plants are merely assembly plants or not. Some argue that maquiladora plants in Mexico have evolved into plants with research and development facilities (see for instance, Barajas et al, 2004). Other researchers note that although there are one or two plants with R&D capabilities, there is still very little evidence that the entire maquiladora sector is moving towards such a situation (Bendesky et al 2003). In fact, the large majority of maquiladora plants are still assembly plants. What seems to be technological upgrading in the maquiladora productive process is in reality a reflection of the technological advancement that the different industries are going through.

The Service sector comes second since it generates more than 27% of the region's total employment. Commerce comes third because it occupies about 21% of total regional employment. It should be noted that Construction and Transport in Nuevo Laredo occupy a fairly significant percentage of employed workers (about 10%).²⁶ In summary, maquiladora plants constitute a significant portion of these cities' labor demand.

3.3 The Empirical Analysis: the cyclical component

We start with a discussion of employment cyclical components of the Mexican cities and their respective neighboring US states; thus we obtain the following pairs: Tijuana-California, Ciudad Juarez-Texas, Nuevo Laredo-Texas and Matamoros-Texas.

The variability of a series is measured by the sample standard deviations, while the co-variability between the employment cyclical components is measured by their cross-correlations. We divide the sample period into two sample sub-periods: the pre-NAFTA period (1987:01-1993:04) and the post NAFTA period (1994:01-2003:01) to examine whether there have been changes in the relationship between both economies' labor markets.

The first two columns of Table 3 and Table 4 present the variability of manufacturing employment's cyclical component before 1994 and after that year. Few results are worth mentioning. First, California's manufacturing employment became more volatile after 1994 compared to the previous one. Texas, on the other hand, became less volatile. On the Mexican side, volatility increased in Tijuana and Matamoros, while decreased in Ciudad Juarez and Nuevo Laredo. Both effects induced that the relative volatility of Mexican employment with respect to their respective neighboring US State increased significantly during the second period in Ciudad Juarez, Matamoros and Nuevo Laredo (2nd column in Table 3 and Table 4).

²⁶ Nuevo Laredo is the main port of entry/ exit of goods transported by trucks.

Table 3
SD and CC between US Border Mexican cities and California and Texas: 1987-1993

	Standard deviation (%)	Standard deviation relative to CA & TX ME	Cross Correlation								
			r_{t-4}	r_{t-3}	r_{t-2}	r_{t-1}	r_t	r_{t+1}	r_{t+2}	r_{t+3}	r_{t+4}
CA ME	1.57										
Tijuana	5.74	3.65	0.028	0.027	0.185	0.123	0.027	0.069	-0.009	-0.089	-0.174
TX ME	2.24										
C. Juárez	8.26	3.68	-0.336*	-0.326*	-0.350*	-0.308*	-0.248	-0.090	0.055	0.137	0.174
Matamoros	8.20	3.66	0.050	-0.112	-0.347*	-0.500*	-0.631*	-0.618*	-0.585*	-0.520*	-0.422*
N. Laredo	11.68	5.21	0.175	0.160	0.055	-0.012	-0.110	-0.189	-0.184	-0.137	-0.107

* Coefficient different from zero at 95%

Source: Own estimates.

Table 3 and Table 4 also show the cross correlation between employment's cyclical component of California - Tijuana, Texas - C. Juárez, Texas - Matamoros, and Texas - N. Laredo, before NAFTA and afterwards, respectively. It can be observed that before NAFTA (Table 3) Tijuana and Nuevo Laredo show no evidence of correlation with the manufacturing employment in California and Texas, respectively. During the same period, short run fluctuations in employment between Ciudad Juárez and Texas and between Matamoros and Texas were strong but negative (-0.350 and -0.631 respectively); that is, employment fluctuations in these Mexican cities were counter-cyclical to employment in Texas; moreover, they were felt first in Ciudad Juárez by almost a year earlier whereas in Matamoros was contemporaneous.

Table 4
SD and CC between US Border Mexican cities and California and Texas: 1994-2003

	Standard deviation (%)	Standard deviation relative to CA & TX ME	Cross Correlations								
			r_{t-4}	r_{t-3}	r_{t-2}	r_{t-1}	r_t	r_{t+1}	r_{t+2}	r_{t+3}	r_{t+4}
CA ME	1.93		-0.016	0.125	0.196	0.296*	0.335*	0.364*	0.351*	0.324*	0.320*
Tijuana	6.51	3.37									
TX ME	1.27										
C. Juárez	7.87	6.19	0.064	0.165	0.346*	0.474*	0.528*	0.595*	0.568*	0.546*	0.547*
Matamoros	10.06	7.92	0.070	0.177	0.283*	0.422*	0.525*	0.621*	0.645*	0.617*	0.578*
N. Laredo	7.65	6.02	0.126	0.225	0.351*	0.431*	0.438*	0.464*	0.417*	0.450*	0.513*

* Coefficient different from zero at 95%

Source: Own estimates.

After 1994, there is a clear change in the (short run) employment relationship between these two regions. First, Tijuana and Nuevo Laredo have become highly correlated to their respective US neighboring States. They both show strong pro-cyclical behavior, -Nuevo Laredo's and

Tijuana's employment fluctuations follow that of California with a one-quarter lag. Second, in the case of Ciudad Juarez and Matamoros the change is more dramatic: they moved from being counter-cyclical to pro-cyclical. Here, Matamoros' employment fluctuations follow that of Texas with two-quarter lags, while Nuevo Laredo's fluctuations follow that of Texas with one-quarter lag.

There is therefore strong evidence that employment fluctuations in the border region became more synchronized after NAFTA. We find similar results when using the overall US manufacturing employment instead. In all cases, there is a movement towards higher synchronization in the fluctuations and, with the exception of Ciudad Juarez, the positive correlation became stronger.²⁷ Our results suggest that fluctuations of manufacturing employment in these Mexican cities are more correlated to their neighboring US States' manufacturing employment than to the overall US manufacturing employment. Moreover, the highest correlation between employment fluctuations on the Mexican side and US manufacturing employment occurs when they are contemporaneous. In any event, there is significant evidence of a dramatic change in the coherence of manufacturing employment fluctuations in this case as well.

It is well known that correlation coefficients do not provide information about causal relationships between the series under study. One advantage of VAR models is that it can be used for studying the dynamic response of labor markets to different shocks. For this reason, we performed the impulse response function analysis in order to establish the direction of causality of such changes; in particular, to determine if the direction is in accordance with the relations established in section 2. In what follows we estimate the 2-variable VAR model and the impulse response function with the following ordering: first US states and then the Mexican cyclical components. The optimal lag length was derived from the use of the AIC and BIC criteria, leading to a choice of 2 lags. Even though NAFTA began in January of 1994, the financial crisis that took place in December of 1994 and the rapid recovery in 1996 are shocks that might not be related with NAFTA. Therefore, we include in our VAR model dummy variables for 1995 and 1997 to control for such shocks. Figures (2) through (5) show the impulse response function of one standard deviation shock on the cyclical component of manufacturing employment in California and its effect on Tijuana's employment, and of Texas' on Ciudad Juarez, Matamoros and Nuevo Laredo's respectively, from the 1st to the 12th quarter lag.

²⁷ The results are available from the authors. They are not included due to space restrictions.

The impulse response functions show that there is a noticeable change in the pattern of response of employment's cyclical components in the Mexican cities after NAFTA. On the other hand, before NAFTA the pattern of adjustment showed an initial contemporaneous positive impact in Ciudad Juarez that become insignificant afterwards and a negative impact in Matamoros (1st – 3th quarters) to become insignificant afterwards. In the other two cities there was an insignificant effect: Nuevo Laredo and Tijuana. After NAFTA the pattern of adjustment changes: a positive shock on Texas employment induces a significant positive effect on Ciudad Juarez, Matamoros and Nuevo Laredo's employment. The significant effect for Ciudad Juarez occurs during the first five quarters and for Matamoros occurs during the first two quarters, while for Nuevo Laredo is from the 1st to 3th quarter. A positive shock on California's employment induces a positive significant effect on Tijuana's employment cyclical component from the 1st to the 5th quarter.

In short, before NAFTA cyclical components of Mexican (cities) employment and their corresponding US neighbors were not synchronized. After then, they became synchronized: when manufacturing employment in California and Texas were above their long-term trend, manufacturing employment in Mexican cities were also above their long-term trend. When using the overall US manufacturing employment instead, the change in the pattern of adjustment is also evident. First, in the case of Nuevo Laredo the nil effect (of a shock on the US employment) that existed during the first period became positive and almost permanent after the 3rd quarter during the NAFTA period. Second, in Ciudad Juarez the initial positive impact that was observed during the first period and disappear after the 3rd quarter became positive and almost permanent after the 3rd quarter during the post-1994 period. Third, the contemporaneous positive effect on Matamoros during the first period became positive from the 1st to the 6th quarters, reaching its maximum at the 4th quarter. Finally, the nil impact observed on Tijuana during the first period continued during the second one. These results indicate that local Mexican employment became positively dependent on the cyclical behavior of overall US manufacturing employment.

Figure 2
IR function and error band for California-Tijuana,
(employment-employment)
(a) period 1987-1993 and (b) period 1994-2003

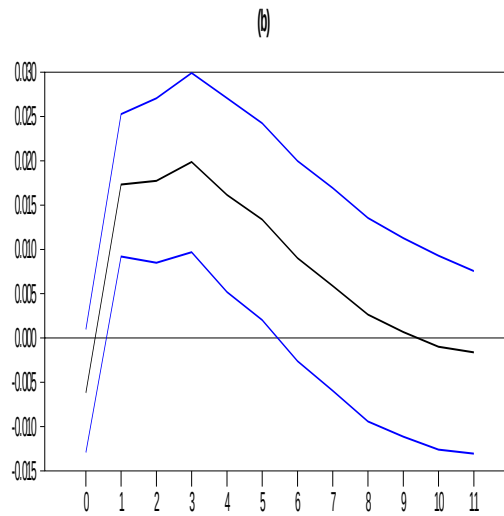
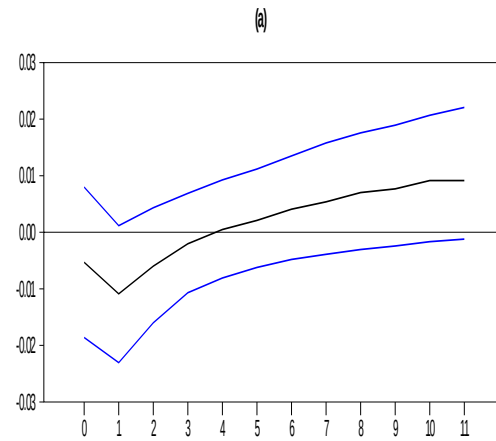


Figure 3
IR function and error bands Texas-Ciudad Juarez
(employment-employment),
(a) period 1987-1993 and (b) period 1994-2003

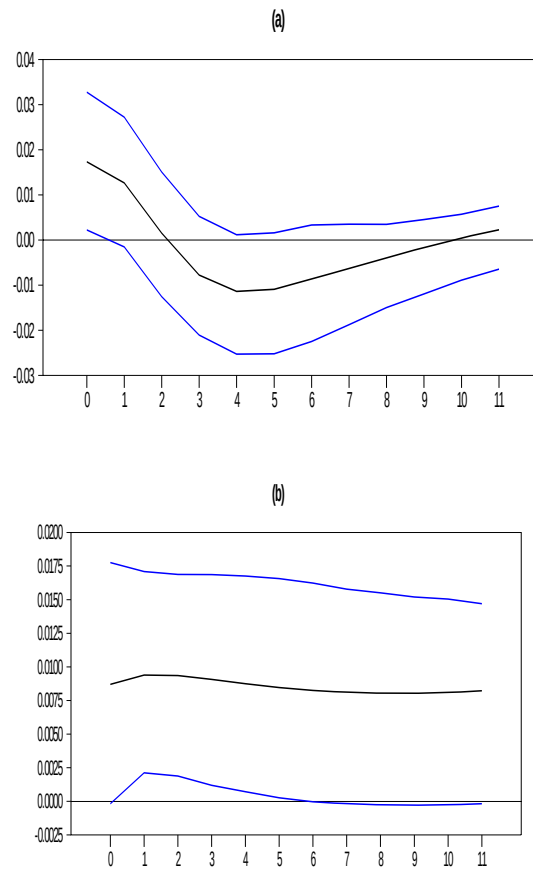


Figure 4
IR function and error bands Texas-Matamoros
(employment-employment),
(a) period 1987-1993 and (b) period 1994-2003

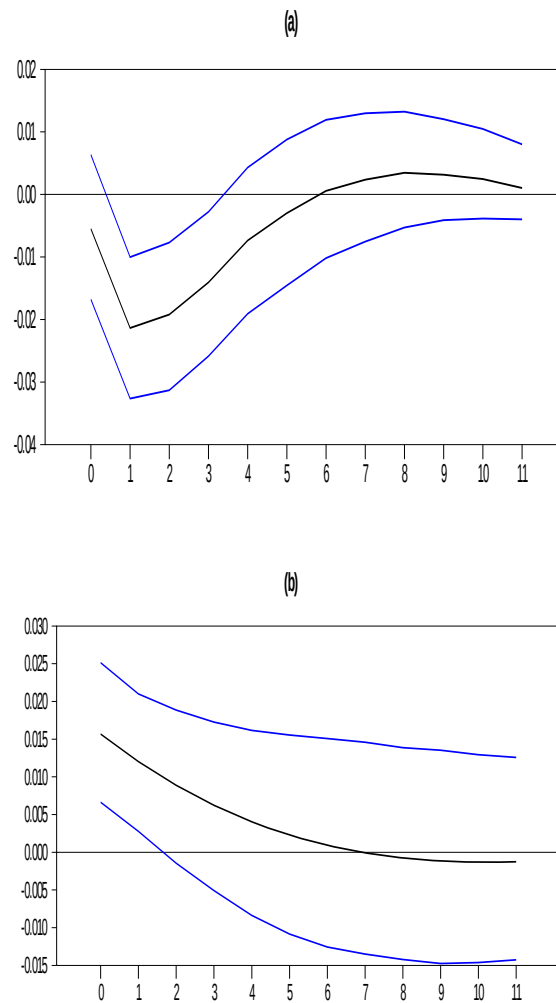
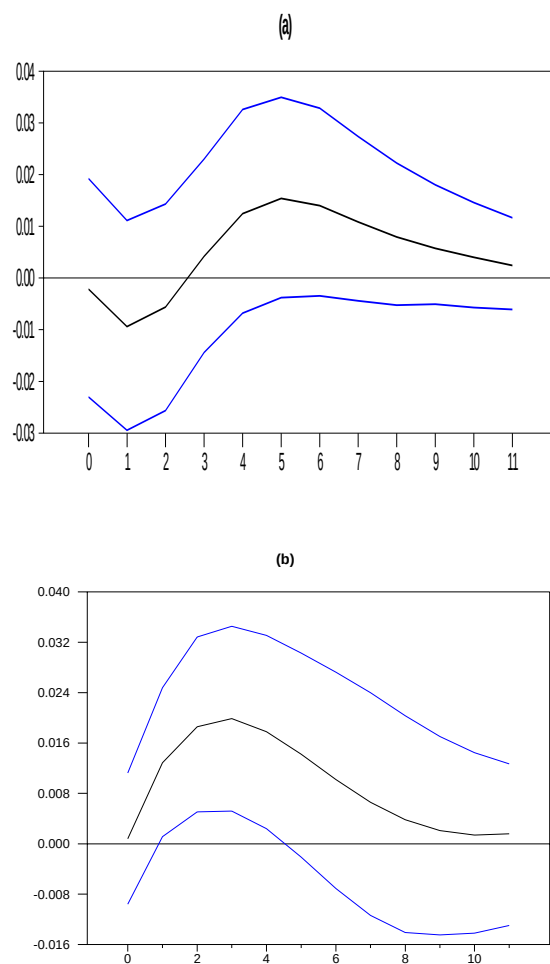


Figure 5
IR function and error bands Texas-Nuevo Laredo
(employment-employment),
(a) period 1987-1993 and (b) period 1994-2003

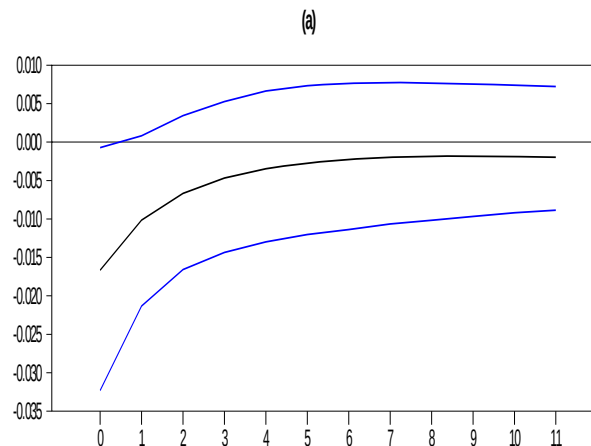


Having determined the degree of integration of the labor market in terms of employment, we now assess the impact of changes in US manufacturing employment on Mexican wages. Figures (6) through (9) show the impulse-response function of one standard deviation in California and Texas'

employment on Tijuana, Ciudad Juarez, Matamoros, and Nuevo Laredo's real wages, respectively.

Similar to employment, there is a significant change in the pattern of adjustment of short-term real wage between the two periods. Manufacturing wages in Tijuana, for instance, were barely affected by a shock on California's employment during the first period. It became positive and declined immediately until becoming insignificant after the 4th quarter during the second period. In the case of Ciudad Juarez, during the first period, a shock on Texas' employment induced a contemporaneous negative effect on short-term wages. It turned positive from the 2nd to 7th quarter, reaching its maximum at the 3rd quarter during the second period. Matamoros' wages, on the other hand, maintained the positive impact throughout both periods. The only noticeable change was the increase in the magnitude of the relationship. Finally, in the case of Nuevo Laredo the positive impact remained throughout both periods.

Figure 6
IR function and error bands California-Tijuana
(employment- wages),
(a) period 1987-1993 and (b) period 1994-2003



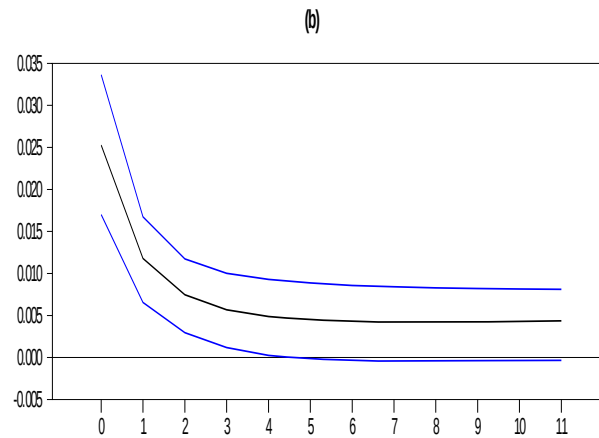
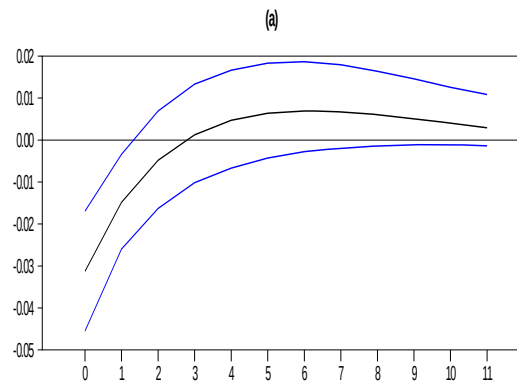


Figure 7
IR function and error bands Texas- C. Juarez
(employment-wages)
(a) period 1987-1993 and (b) period 1994-2003



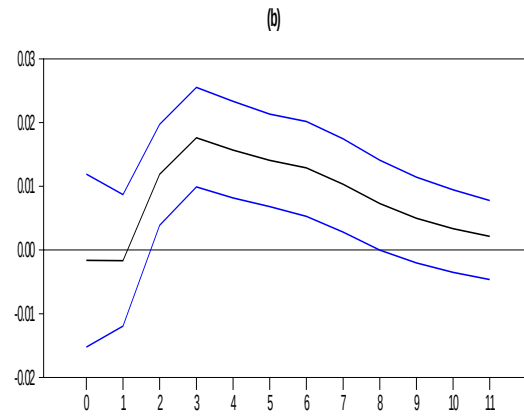
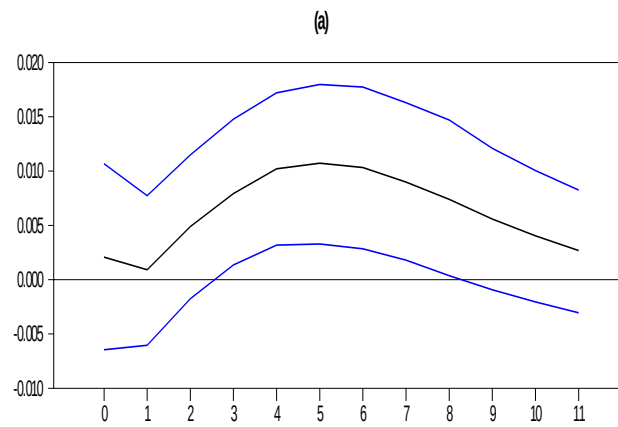


Figure 8
IR function and error bands Texas- Matamoros
(employment-wages),
(a) period 1987-1993 and (b) period 1994-2003



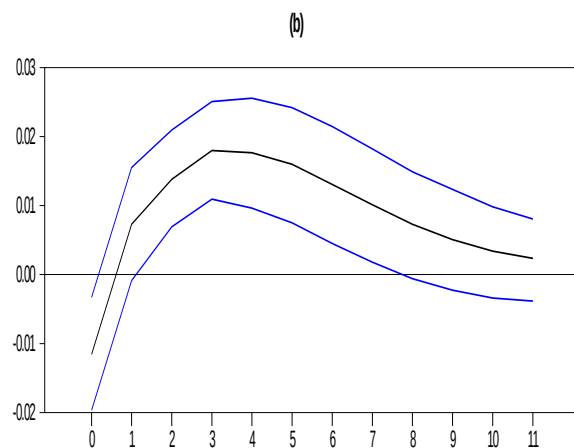
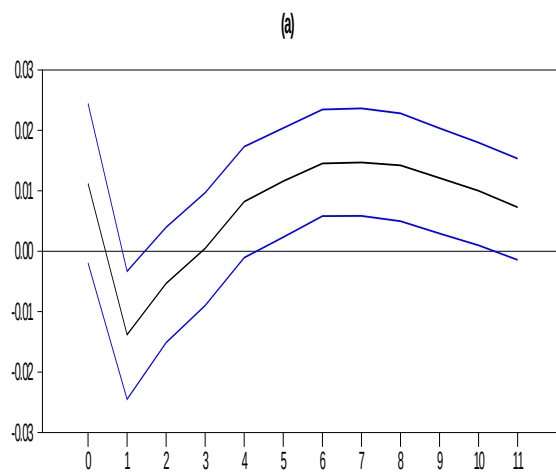
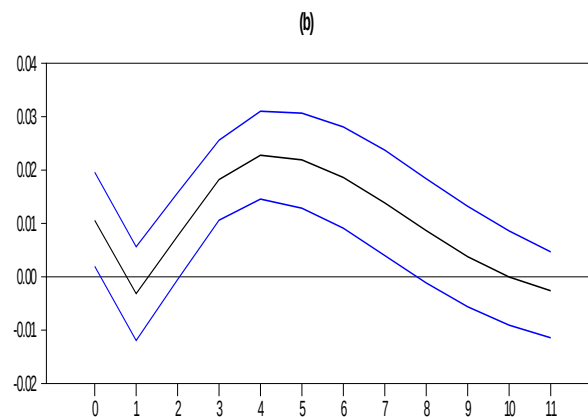


Figure 9
IR function and error bands Texas-Nuevo Laredo
(employment-wages)
(a) period 1987-1993 and (b) period 1994-2003





Our results suggest that manufacturing employment fluctuations in Mexican cities have become more synchronized to US manufacturing employment (the results hold when we look at state-wide and nation-wide data) after 1994. One contribution of this study is to measure not only the degree of labor market integration between both economies but also the magnitude of such changes. A possible explanation of such changes is that they are the result of an ongoing restructuring of the in bond industry in Northern Mexico. Table 5 presents the employment distribution by main manufacturing sectors as a percentage of total city's employment during both periods. We observe that between the two periods the main changes in the employment distribution have occurred in the Machinery, Equipment and Metal Products sector. In Ciudad Juarez, Tijuana and Nuevo Laredo there is a significant increase in the percentage of workers laboring in that sector. In fact, Matamoros is the only city that does not exhibit such changes.²⁸ In other words, the region seems to have enjoyed an inflow of foreign subsidiaries that tied Mexican labor market even more than what previously was; in particular, an increasing number of maquiladoras plants are assembling more goods classified as machinery, equipment and metal products.²⁹

²⁸ We did not include the percentage in the other sectors because the changes that occurred in them were marginal.

²⁹ Basically, as a result of the auto-component's industry and the electronics' one.

Table 5
US Border Region: Employment Distribution in Manufacturing

	Ciudad Juarez		Tijuana		Matamoros		Nuevo Laredo	
	87-94	95-03	87-94	95-03	87-94	95-03	87-94	95-03
Food, Beb. & Tobb.	2.7	2.2	2.9	2.2	2.5	2.2	2.2	1.5
Textile	2.6	1.2	0.2	0.2	1.0	0.4	0.1	0.1
Clothing	1.4	1.4	1.2	1.9	0.6	2.5	0.7	1.1
Chemical Products	1.9	1.1	5.0	2.1	2.6	2.4	2.1	1.2
Mach Eq. Met Prod.	26.9	35.4	10.2	17.0	29.2	28.0	13.3	16.0
Total	35.4	41.3	19.5	23.4	35.9	35.4	18.5	20.0

Source: ENEU, several years.

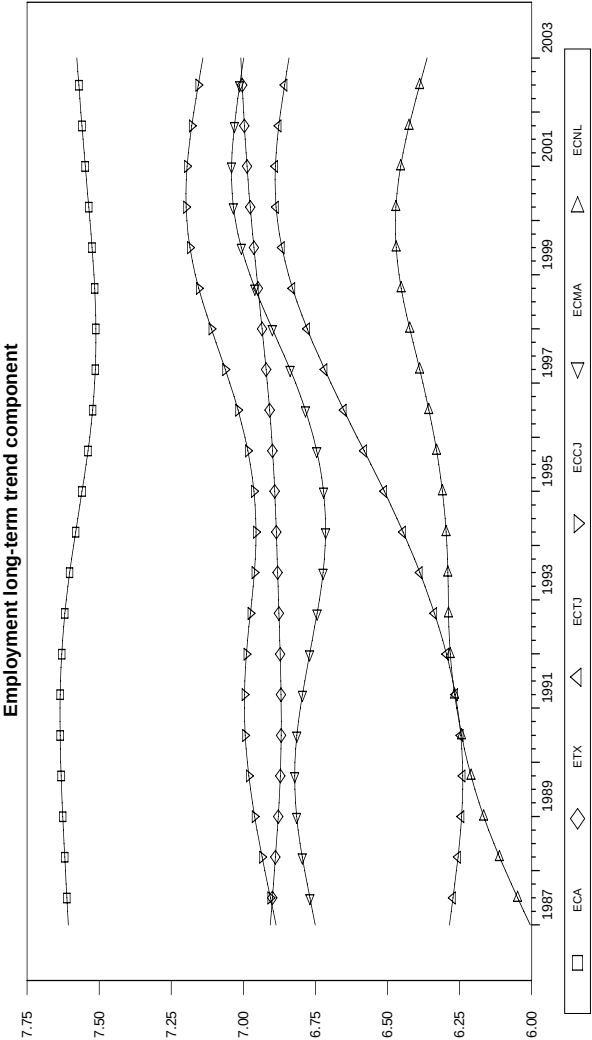
3.4 Empirical Analysis: Trend Component

We now turn to the discussion of the long-term behavior of employment in these Mexican cities and that of California and Texas. As can be observed in Figure 10³⁰, prior to 1994 although there was some resemblance in their behavior this was rather weak. After 1994, there is a movement towards a long-term synchronization of employment among these Mexican cities. The long term behavior of Tijuana's manufacturing employment deserves special comments. Prior to 1994, it showed a trend quite different from the other Mexican cities. However, after 1994 it changed significantly and moved closer to path of the other cities.

The performance of California and Texas manufacturing employment, on the other hand, is more stable. We do not observe any significant change in their long term trend throughout the period of analysis.

³⁰ The units on the vertical axis are logs of manufacturing employment.

Figure 10
Long Term Component: California, Texas and Mexican Cities



Conclusions

Since the late eighties and early nineties a key variable in emerging economies has been FDI. It has been recognized as an effective instrument not only for transferring technology to host economy but also for increasing the amount of trade flow among countries. One of the less known impacts of FDI on the host country is the degree to which it encourages labor market integration between the host and the home countries.

The literature on FDI identifies two types of FDI: horizontal and vertical. They each respond to a particular set of variables and play a specific role within the overall strategy of the MNCs: It is a fact that the type of FDI coming to Mexico is of the vertical type; that is, investment that responds to differences in relative factor prices between the home and host countries.

Some authors have argued that trade liberation in general and trade agreements in particular which accelerate the degree of economic integration among countries could also induce a greater coherence among countries' business cycles. In this respect, one would not be surprised to find higher labor markets integration. Our argument however is that labor market integration caused by vertical FDI is more direct than integration induced by increased trade flows.

The analysis of co-dependence between the US and Mexico labor markets was carried out by estimating the cyclical component of California, Texas and overall US' manufacturing employment and of four US-border Mexican cities through the Hodrick-Prescott filter. We measured labor market integration in two ways: (1) estimating the cross-correlation of manufacturing employment fluctuations between the two regions, (2) calculating the cross-correlation between US manufacturing employment and Mexican real wage. Our analysis suggests that after 1994 there has been greater labor market integration between Mexico's northern region and US' southern region. This greater integration has implied a change in the nature of the short-term relationship of manufacturing employment between Mexico and the US. The change is also significant on the relationship between Mexican real wages and US employment. We also found evidence that the long-term behavior of employment also changed unmistakably. Previous to 1994, the trend component of Mexican employment had different behavior. After 1994 there is movement toward a greater parallelism in their long-term behavior. That is, we observe that there has been a smooth movement towards a state in which their differential growth rates remain constant.

In general, our results are as expected and consistent with other studies on economic integration between the US and Mexico. However, our study provides a new light about the discussion of labor market integration for we relate labor market integration to the flow of vertical FDI. This represents a step forward with respect to previous analyses where there is not a theoretical explanation about labor market integration as in Fragoso, et al (2008). Here rests one line of future research: to develop a formal model of the role of FDI on labor market integration and to contrast it empirically. Unfortunately, due to the lack of information about the flow of FDI directed to the border cities we did not incorporate FDI explicitly in our empirical analysis.

Another important element of our analysis is that we analyze the behavior of employment instead of wages to measure the degree of labor market integration. As argued the use of wage rates to show labor market integration might not be a good idea because they could respond more to supply, demand and institutional factors (such as labor unions) than to economic integration.

One of the most important policy implications of our results is that to the extent that the host economy's labor market outcomes (i.e., employment and wage rates) depend on the performance of home economy, the former's labor market policies might be ineffective. Much of the labor market outcome would depend on the decisions that parent firms would take regarding production in the receiving country.

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Appendix

Table A1
Dickey - Fuller Test

Unemployment		Wages	
$\tau(\rho - 1)$	ϕ_z	$\tau(\rho - 1)$	ϕ_z
California	-0.144		
2.766			
Texas	1.006	Tijuana	-0.104
5.348		3.374	
Tijuana	0.879	Ciudad Juárez	0.407
1.560		1.720	
Ciudad Juárez	0.391	Matamoros	1.728
1.573		3.003	
Matamoros	0.214	Nuevo Laredo	1.503
2.084		1.588	
Nuevo Laredo	0.333		
2.968			

Source: own estimates

The results are based on the regression

$$\Delta y_t = a_0 + \gamma y_{t-1} + a_2 t + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t$$

$\tau(\rho - 1)$ and ϕ_z , test respectively, the null hypotheses, (i) $\gamma = 0$, (ii) $\gamma = a_2 = 0$. 5% critical values: -1.950 and 6.250 respectively

Table A2
Perron (1997) Test

Unemployment	$\tau(\rho - 1)$	Wages	$\tau(\rho - 1)$
California	-4.498		
Texas	-5.126		
Tijuana	-3.175	Tijuana	-4.285
Ciudad Juárez	-4.721	Ciudad Juárez	-5.418
Matamoros	-4.070	Matamoros	-5.426
Nuevo Laredo	-2.991	Nuevo Laredo	-5.742

Source: Own estimates

$\tau(\rho - 1)$ test the null hypotheses of a unit root. Critical value: 6.250

“Last-chance” sales: what makes them credible?

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Abstract

This paper analyzes the firms' standard practice of announcing clearance or “last-chance” sales, namely advertising that a particular product is not going to be available in the market anymore. In the context of a two-period signaling game, prices and advertising decisions of firms are analyzed. Then, the set of separating and pooling equilibria is characterized, so that the above usual advertising techniques can be better understood as equilibria of this model for certain parameter values. In particular, this paper shows that, when the firm which continues in the business knows that few of their current customers will come back in future periods, the set of separating equilibria shrinks. That is, fewer future prospects induce all types of firms to compete for current consumers, leading to pooling equilibria in which all firms announce a “last-chance” sale, even if some of them know they will remain in the industry next period.

Keywords: signaling, advertising, separating equilibria, information transmission.

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Resumen

Este artículo analiza la práctica de múltiples firmas respecto de anunciar grandes liquidaciones o “últimas rebajas”; en particular analiza el anuncio de que un producto concreto no estará disponible en el futuro. En el contexto de un juego de señalización de dos etapas, analizamos las decisiones de las empresas con respecto a los precios de sus productos y sus gastos en publicidad que anuncian liquidaciones. Esto permite caracterizar el conjunto de equilibrios separadores y agrupadores, lo que nos deja en condición de ofrecer una explicación de las anteriores técnicas publicitarias sobre grandes liquidaciones en el contexto de los equilibrios de nuestro modelo, para ciertos parámetros. En definitiva, este artículo demuestra que cuando la firma que continúa produciendo sabe que pocos de sus clientes volverán a realizar compras en el futuro, el conjunto de equilibrios separadores se contrae. En otras palabras, peores perspectivas de futuro inducen a todo tipo de empresas a competir por los clientes actuales, llevándolas hacia un equilibrio agrupador en el que todas las firmas anuncian grandes liquidaciones, incluso aquellas que saben que continuarán en el mercado durante el siguiente periodo.

Palabras clave: señalización, publicidad, equilibrio separador, transmisión de información.

Clasificación JEL: L12, D82.

Introduction

Why do so many firms constantly insist that a certain store, or the entire company itself, is going out of business? Can we believe it, or should we assume that all types of firms have incentives to use this advertising technique? This paper analyzes these questions in a two-period signaling model. In particular, firms play here the role of the informed participant of the market, since they know whether firm will exit the market in the next period. After observing the firm's advertising and prices, consumers update their beliefs about the producer's probabilities of actually leaving the industry, and then decide whether to buy today, or wait until the next period. Specifically, we find what strategies and parameter values can support either a pooling equilibrium -in which all types of firms announce their imminent closing and set low (clearance) prices- or a separating equilibrium -where only certain announcements are believed. In addition, in order to restrict the set of admissible equilibria, Cho and Kreps' (1987) intuitive criterion is used, so that only equilibria in which consumers sustain relatively “reasonable” beliefs are considered.

Finally, different comparative statics analysis are carried out, which can specially help us to understand why, for example, this type of advertising campaigns have massively expanded in recent years, or why we normally observe more of such advertising in cities than in small towns. In particular, we can explain the above phenomena by the fact that an increase in the probability that a customer returns to a store shrinks the set of separating equilibria, i.e., the set of admissible price-advertising combinations that the exiting firm can use. Particularly, the probability that a particular customer returns to a given store, is smaller in a big city than in a small town, and it has probably decreased in recent decades as the number of stores -as well as the introduction of internet shopping- became more important. In turn, this smaller probability of having returning customers induces the firm that stays in the market to only concentrate on the first period potential customers, trying to convince them through prices and advertising that its product is not going to be available in future periods. Therefore, firms' tendency towards a pooling equilibrium in which they all try to persuade consumers with “last-chance” sale advertising would be supported when the probability that customers return to the store is sufficiently low.

The paper is organized as follows. The next section considers the literature on signaling models, with special attention to quality signaling and the literature on multi-stage signaling games. Section 2 describes the preferences of consumers and firms, as well as the precise time structure in which this “last-chance-sale” signaling model evolves. Then, section 3 analyzes the conditions under which a set of price-advertising combinations can be supported as a separating (or pooling) equilibrium of the signaling game. In this section, we also included some comparative statics results, which might shed some light on the main questions addressed in this paper. Afterwards, section 4 refines the set of equilibria found in previous sections by eliminating those equilibria sustained by “unreasonable” off-the-equilibrium beliefs. Finally, we summarize the main results of this paper and comment about its further extensions.

1. Related literature

The literature on signaling models, initiated by Spence (1973), has been used to explain a wide array of economic -but also political- situations, from limit pricing [Battacharya (1979) and Kose and Williams (1985)], to dividend policy [Milgrom and Roberts (1982)] and warranties [Gal-Or (1989)]. Interestingly, these models have also produced different explanations about uninformative advertising, i.e., the type of advertising where the information provided by the firm is unverifiable unless the consumer actually buys the good. In particular Nelson (1974) initially suggested the possibility that this

kind of advertising -such as the one conducted by a company which introduces a new good in the market- could work as a signaling device that firms use to distinguish the quality of their products. Specifically, bad quality firms would not find convenient to imitate such an advertising campaign since it is costly, and if it had any effect on the consumers' buying decision, this effect would vanish in the next period, as soon as buyers realize the bad quality of their product.

The formalization of these ideas into a signaling model by Milgrom and Roberts (1986) provided the methodology for further research in this area. For instance, from a theoretical approach, Bagwell and Riordan (1991) analyze the signaling effect of highly stable versus declining prices as the number of customers of a given good increases, and Linnemer (2002) considers a similar model in which advertising is also included. In addition, Milgrom and Roberts' (1986) theoretical contribution triggered some empirical literature, such as Horstmann and MacDonald (2003), which checks the role of advertising as a signal of product quality in the compact disc player industry. Interestingly, many of these models consider multidimensional signaling, since firms are able to reveal their quality to the customers through prices and advertising. Additionally, they usually assume that all those consumers who bought the high-quality product buy it again in the future. Finally, Lazear (1986) analyzes clearance sales by showing how firms choose a declining path of prices for the good (such as fashionable goods).³ Our model also examines firms' price setting behavior, but complements it by introducing their optimal advertising strategies.

This paper models a "last-chance" sale with a similar methodology to the above literature: firms can use both prices and advertising announcing their clearance situation to signal their type. Furthermore, customers can decide whether to return to the firm which is still in business, although this firm's products are perceived as not exclusive by consumers, since they can easily be found in the market along different periods of time. This fact reduces, hence, the firm's incentives to reveal its type when it is continuing its business. In addition, we allow for only a proportion of these customers to come back to this firm in the future. As this paper shows, the particular pattern of returning customers greatly conditions the pricing and advertising strategy of the firm which remains in the industry, which in turn helps in the understanding of the widespread use of such "last-chance" sale advertising campaigns.

³ Extensions of this model include Epstein (1998) for applications to multiple goods, and Nocke and Peitz (2007) for extensions to firms with capacity constraints.

2. Model

Let us consider a signaling game in which consumers buy a (non-durable) consumption good from a firm. Initially, the firm privately observes its “type” $\theta \in \{L, H\}$ representing a low or high amount of product in the firm stocks. The low-stock firm represents here the seller (or product) which exits the industry in the next period, and the high-stock producer denotes the firm who keeps its business. Information about the level of stocks, θ , is not observed by consumers. In particular, the time structure of this game is the following:

1. Nature selects low or high stocks for the firm, with probability q and $1-q$ respectively. This information is revealed to the firm, but not to consumers. The stocks situation of a firm is assumed to be persistent over both periods of time.
2. The firm sets a price for its products $p \in \mathbb{R}_+$, and spends an amount $A \in \mathbb{R}_+$ on specific advertising which informs that this is the last chance of acquiring a certain product.
3. Observing the price-advertising combination (p, A) consumers update their beliefs about the probability that this combination comes from a low or a high stock firm.
4. Afterwards consumers choose whether they buy today at the current price, or they wait until next period. If consumers decide not to buy today, then they are only able to buy tomorrow if the true type of the firm is H .
5. If consumers decided not to buy in the previous period and the firm has high stocks, then the firm is called to set a second-period price, p_2 . If the firm had low stocks, then it exits the industry after the first period. In this period firms can set prices, but they cannot spend on advertising.
6. Only a portion α of consumers returns to the same store in the second period. After observing second-period prices, p_2 and having perfect recall of the actions they observed in the previous period, consumers decide whether to buy the product, given their updated beliefs about the firm's true type.

Specifically, every consumer can only buy in the second period from a firm with (persistent) high stocks. Otherwise -if the firm has low stocks- we assume that it exits the industry after the first period. Let $\pi(p, \theta, s)$ denote the payoff of a firm with true type $\theta = \{L, H\}$, which is perceived by consumers as a s -type firm, where $s = \{L, H\}$, and charges a price p in that particular period.⁴ For example, $\pi(p, H, L)$ represents the payoff for a high-stock firm which is perceived by customers as a low stock firm, i.e., consumers believe that the firm will exit. As this example emphasizes, s does not necessarily coincide with θ . Firm's profits are increasing in the price charged by the firm, p , no fixed costs are assumed, and no assumptions about the functional form of $\pi(p, \theta, s)$ are made⁵. Furthermore, let $\pi(p_{HH}, H, H)$ represent the maximum profits that a high-stock firm perceived as such by consumers- can attain by selecting the optimal price p_{HH} . We use a similar notation for the maximum profit level of any other combination of true and perceived firm's type.

In addition, we assume that a firm's operating costs are lower when it is closing its business (low stocks) than when it still continues in the industry (high stocks). This assumption can be rationalized by considering that the opportunity cost of not selling today is higher for the high-stock than for the low-stock firm. Indeed, the high-stock seller is able to sell in the next period at a price above marginal cost. However, the low-stock seller cannot sell its products in the market anymore, so any remaining stocks from the first period must be sold at a price equal to its marginal cost during the second period, when the firm liquidates its assets. Hence, for any given price and consumers' beliefs, the low-stock firm's profits during the first period are higher than those of the high-stock firm, i.e., $\pi(p, L, s) > \pi(p, H, s)$. Finally, note that this payoffs are only considering revenues and costs for a single period of time (either $t=1$ or $t=2$) and do not take into account advertising expenditures, A .

Let the payoff of the representative consumers be $U(p, \theta) = \theta - p$ from consuming one unit of the good (consumers demand either one or zero units) when the price of the good is p , and the stock level of the firm is $\theta = \{L, H\}$ where $L, H \in \mathbb{R}_+$. In particular, we assume that consumers prefer to consume goods from firms that are really leaving the industry. That is, at a given price p , $U(p, L) > U(p, H)$. This preference for products which will become scarce in the future can be understood in terms of a "snob effect", or in a more general

⁴ Note that $\pi(p, \theta, s)$ represents the case in which the firm is the monopolist in the market, as well as other cases in which the product sold by the firm is sufficiently differentiated from that of other similar firms.

⁵ Some additional conditions about $\pi(p, \theta, s)$ are only needed in section 4.

setting, because of a consumer's intention to price arbitrage along time⁶. Additionally, consumer's preferences are decreasing in the price paid for the good, p .

3. Analysis of the sequential equilibria

In this section we find the set of price-advertising combinations (p, A) which can be sent by the low stock firm, which is close to exiting the industry in order to fully reveal its stock conditions to the customers (separating equilibria). That is, we look for (p, A) pairs such that: (1) the low-stock firm prefers to send rather than being perceived as a high-stock producer; and (2) the high-stock type of firm do not find convenient to send -does not want to mimic the low-stock firm. The first of these incentive compatibility conditions is given by

$$\pi(p, L, L) - A > \pi(p_{LH}, L, H) \quad (1)$$

where p denotes a price level that, in addition to some “last-chance-sale” advertising, allows the low-stock firm to distinguish itself from the high-stock seller. Note that in the above inequality no second period payoffs are included, since the firm exits the industry after the first period, and it cannot obtain any additional profits in the future, regardless of the beliefs that consumers may have about its actual stock conditions. Similarly, the second incentive compatibility condition, about the high stock producer, determines

$$\pi(p_{HH}, H, H) + \alpha \pi_2(p_2, H, H) > \pi(p, H, L) - A \quad (2)$$

Intuitively, the left hand side represents the high stock firm's equilibrium profits in a separating sequential equilibrium in which the firm is perceived as a high stock firm by consumers. As this expression indicates, the high stock firm payoffs are twofold: On one hand, its first period profits from being perceived as a high stock firm (which are maximized when the firm sets a price level of p_{HH}). On the other hand, and since consumers identify its high stock condition, the firm can also sell in the future with a probability α . This probability can be interpreted as the proportion of customers who return to the store in the next period. If this is the case, the firm sets a profit

⁶ Different assumptions are valid regarding consumers' preferences. For example, many consumers may prefer to not buy during massive clearance sales in order to avoid using the same clothes, goods, etc. as the middle class, probably overrepresented in the population of buyers at these clearance sales. In this case, the “snob buyer” would prefer the high-stock firm products, so that he can keep some status from his purchases. The implications of such behavioral pattern are, however, beyond the scope of this paper.

maximizing price of p_2 . The particular value of p_2 that the firm sets must be $p_2=H$, since now the consumers perfectly infer the firm's stock condition from the fact that it is still operating.⁷

Lemma 1. *The high-stock firm's profit maximizing price in the second period is $p_2=H$.*

Regarding the right hand side of (2), it denotes the utility of the high-stock firm from setting a price p that, together with some “last-chance-sale” advertising, allows this high-stock firm to be perceived by customers as a low-stock producer.

In addition to the above two incentive compatibility conditions, individual rationality constraints must also be considered for both types of firms, since otherwise they would not voluntarily participate in this market. Specifically, we need that any firm's payoffs from this separating sequential equilibrium are higher than their reservation utility from not participating, which can be normalized to zero, as the following inequalities indicate.

$$\pi(p, L, L) - A > 0$$

$$\pi(p_{HH}, H, H) + \alpha \pi_2(p_2, H, H) > 0$$

These conditions are, however, derived from expressions (1) and (2) respectively. Indeed, if a firm's profits from not truthfully revealing its type (right hand side) are negative, a firm can set an extremely high price, which guarantees no sales and zero profits. That is, p_{LH} in expression (1) (or respectively p in expression 2) can be made as high as needed, so that the right-hand sides of (1) and (2) are never negative. Hence, thereafter we consider conditions (1) and (2) as the only requirements for a separating (fully revealing) sequential equilibrium. Combining both conditions we obtain a range of values for the advertising expenditures in any separating equilibrium.

$$\pi(p, L, L) - \pi(p_{LH}, L, H) > A > \pi(p, H, L) - \pi(p_{HH}, H, H) - \alpha \pi_2(p_2, H, H)$$

In order to identify the set of price-advertising pairs (p, A) that can be supported as a separating equilibrium -i.e., which satisfy conditions (1) and

⁷ Note that this must be both the original and the final stock condition of the firm in this two-period game, since we assumed that, for simplicity, the firm's stocks are persistent over both time periods.

(2) above- it is useful to represent the isobenefit curves of the low and high-stock firms. In particular, we are interested in the locus of (p, A) combinations for which these conditions bind. Formally, we can then define the low-stock firm isobenefit curve by,

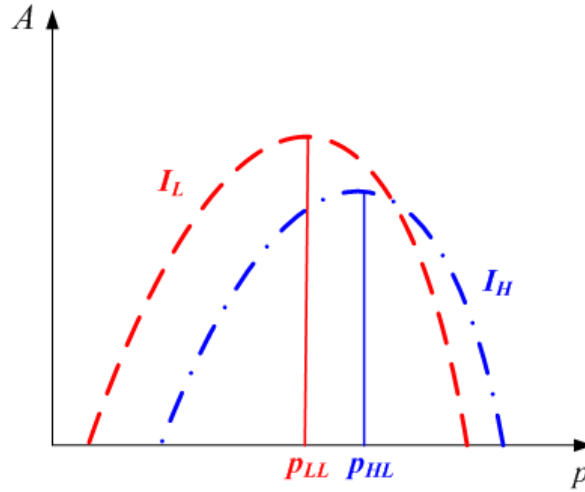
$$I_L \equiv \{(p, A) \in \mathbb{R}^2 \mid \pi(p, L, L) - A = \pi(p_{LH}, L, H) = \pi(p, H, L)\}$$

And, using expression (2) we can similarly characterize the high-stock firm's isobenefit curve

$$I_H \equiv \{(p, A) \in \mathbb{R}^2 \mid \pi(p_{HH}, H, H) + \alpha\pi_2(p_2, H, H) = \pi(p, H, L) - A\}$$

Graphically, all those (p, A) pairs below the I_L curve represent points for which condition (1) holds strictly. Equivalently, (p, A) combinations above I_H satisfy condition (2).

Figure 1



Importantly, both firm's isobenefit curves are concave in p . Indeed, for example, for a given level of the low-stock firm's profits, and given that the marginal costs of advertising are constant, the concavity of I_L is satisfied because of the pattern of the marginal utility from increasing prices for a seller. In particular, this marginal utility from a price increase is positive

until p_{LL} -intuitively, prices where the corresponding interval of the linear demand curve is inelastic- and beyond p_{LL} the marginal utility from rising prices is negative -elastic intervals of the demand curve.⁸ In other words, the marginal ratio of substitution between prices and advertising is positive until p_{LL} , but negative thereafter. A similar analysis is applicable for the isoprofit I_H .

Additionally, note that lower isobenefit curves -curves closer to the price axis- represent higher profits for either firm. Further, since $\pi(\cdot)$ do not include the advertising decision of the firm, one can observe that prices like p_{LL} represent the profit maximizing price, given a particular advertising level A , for the low-stock firm when being perceived as such by consumers. Indeed, for a fixed level of A , the price p_{LL} picks up the lowest isobenefit curve (the isobenefit curve closer to the price axis).

Then, in a separating equilibrium, both types of firms want to reach the lowest possible isobenefit curve which is compatible with revealing its type to the customers. Hence, a low-stock firm chooses any (p, A) pair in the area below I_L and above I_H . If this were the case, a high-stock firm would find imitation profitable. Therefore, price-advertising pairs below I_L and above I_H offer the low-stock producer a greater profit than it could get by hiding information about its stocks. In addition, such (p, A) combinations offer a high-stock producer lower payoffs than it could obtain by setting advertising to zero and revealing itself as a high-stock firm. Therefore, the area below I_L and above I_H denotes all price-advertising combinations which can be supported as a separating equilibrium of this signaling game. Let us now analyze some comparative statics derived from the above incentive compatibility conditions.

3.1. Comparative statics

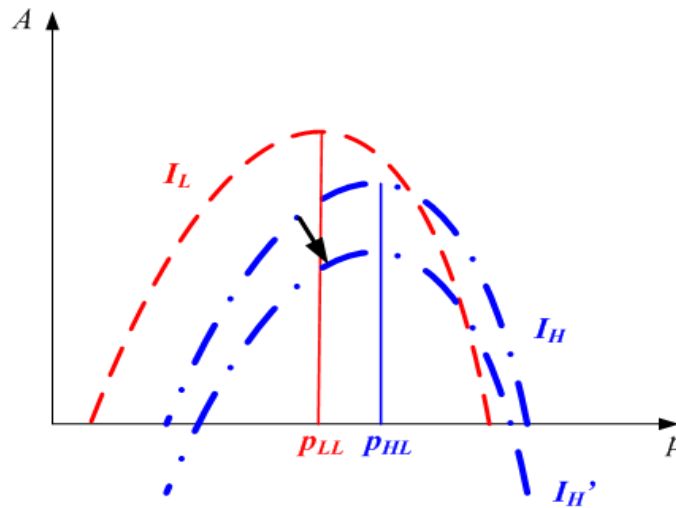
Let us analyze the comparative statics effects of varying second period incentives. In particular, we consider the dynamic incentives of the high-stock producer, and specifically, the trade-off it experiences between selling today and waiting until the next period for future customers. We include proofs in the appendix.

Lemma 2. *The set of price-advertising pairs (p, A) that can be supported as a separating sequential equilibrium of the “last-chance-sale” signaling game increases in the proportion of customers, α , who come back to make purchases at the high-stock firm.*

⁸ Note that this assumption is applicable to both linear and non-linear demand curves, as long as the price-elasticity of demand varies as a result of price changes.

The intuition of this lemma becomes clear if we look at condition (2), and check the effects of increasing α in the high-stock firm isobenefit curve. As the following figure indicates, the isobenefit curve I_H shifts downwards as α increases (i.e., reaching higher isobenefit levels). That is, as the proportion of customers who might come back to the high-stock firm rises, this producer is more willing to give up some first period profits. Indeed, this firm still obtains some profits, but higher than those it would obtain if it was able to identify its product as a “last-chance-sale” greatly appreciated by the customers. The cost of so doing for the high-stock seller would be to totally lose any second period sales, since the store would be identified as low-stock (having no future customers). This cost is clearly increasing in α , the proportion of customers who come back. Graphically, the set of (p, A) pairs below I_H shrinks, and then the set of (p, A) combinations that can support separating sequential equilibria -area between I_H and I_L - expands. Intuitively, the low-stock seller can now distinguish itself from the high-stock one by sending higher prices and smaller advertising expenditures. In other words, increases in α benefit the low-stock producer since now its separating messages are “cheaper.” In contrast, the set of (p, A) pairs that can support separating sequential equilibria shrinks as α is further decreased.

Figure 2
Effects of an increase in α



The above result can help us understand why, in recent years, so many advertising campaigns have insisted in the fact that their sales are clearance or “last-chance” sales. Indeed, more mobile customers -with an increasing array of traditional and internet shopping centers to choose from- reduce the probability that an individual customer returns to the same store (i.e., decreases α). Hence, the set of (p, A) pairs which can support a fully revealing sequential equilibrium shrinks, and induces more firms to play pooling equilibria. In this situation, as commented above, both types of stores -the ones closing their business and those which continue their operations- set prices and advertising levels which try to convince customers about a “last-chance-sale” situation.

The same idea is valid to explain why this type of advertising techniques are more commonly observed in cities than in small towns: the probability that a given customer returns to a particular store is significantly smaller in a big city than in a town, where the number of stores he can choose from is smaller. Summarizing, significant decreases in α increases the high-stock firm incentives to mimic the “last-chance-sale” strategy of the low-stock sellers, producing the recurrent pooling equilibrium.

Remark 1. The above reasoning is also applicable to the second period profits. Specifically, note that since $p_2 = H$, when the difference between H and the unit cost of this firm is small, then the profits per unit of the high-stock seller decrease, reducing $\pi_2(p_2, H, H)$. The effects of this decrease into the set of separating equilibria are analogous to a reduction in α : the set of separating sequential equilibria shrinks.

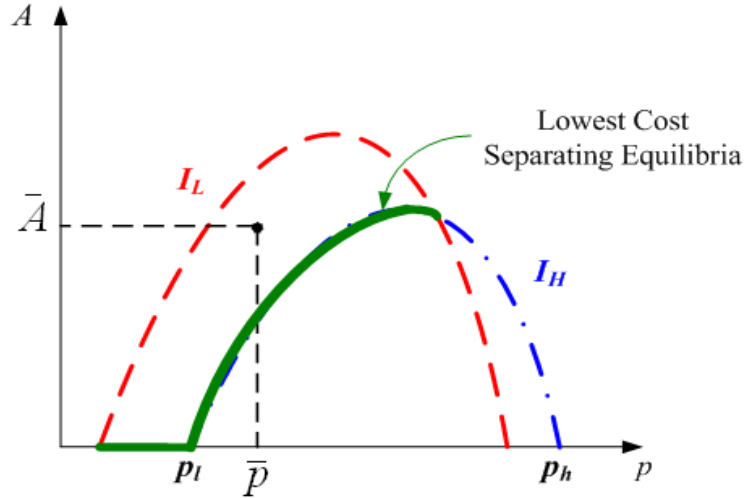
Remark 2. Finally, note that all this analysis and results can be extended to the case in which α represents the high-stock seller's discount rate, δ . In this case, a higher discount rate would indicate that the firm assigns a greater importance to future payoffs, and for this reason, it does not want to give them up (something that would happen if it mimics the low-stock seller). On the other hand, when δ approaches zero the high-stock firm does not assign any relevance to future profits, and tries to mimic the low-stock producer's strategies as much as possible given its technology⁹.

⁹ Note that even when $\alpha=0$, as commented above -both in the interpretation of α as a proportion of returning customers and as the firm's discount rate- the high-stock seller can find (p, A) pairs which does not want to imitate.

4. Equilibrium refinements

Let us now turn to the set of separating sequential equilibria found in the previous section. This set is indeed large and reduces the predictive power of the analysis. In order to overcome this problem, in the next section we apply Cho and Kreps' (1987) intuitive criterion, which greatly reduces the set of separating sequential equilibria by allowing only “reasonable” off-the-equilibrium beliefs. By so doing, we identify the set of Lowest Cost Separating Equilibria (LCSE) of this signaling game. The intuition of this criterion, when applied to this game, is clear: the low-stock firm just selects those (p, A) combinations which maximize its profits, provided that these combinations are able to signal its low-stock situation to the consumer. The low-stock firm achieves this in the solid line of the following figure, which exactly specifies those lowest price-advertising combinations among the ones which can be supported as a separating sequential equilibrium of the game.

Figure 3
Lowest Cost Separating Equilibria



Proposition 1. *From the set of price-advertising pairs (p, A) which can be supported as a separating sequential equilibrium of the game, only those satisfying*

$$\pi(p_{HH}, H, H) + \alpha\pi_2(p_2, H, H) = \pi(p, H, L) - A \quad (3)$$

survive the Cho and Kreps' (1987) intuitive criterion. Let this set of remaining equilibria be denoted as Lowest Cost Separating Equilibria (LCSE).

In order to formally characterize the set of LCSE, firstly note that a necessary condition for a positive level of advertising, $A > 0$, is that (see figure 3),

$$p^* \in (p_l, p_h) \quad (4)$$

This condition is not sufficient, however, for $A > 0$. Graphically, we can see that a sufficient condition for positive advertising is that the isobenefit curves of both types of firms must be tangent at a price level p^T such that

$$p^T \in (p_l, p_h) \quad (5)$$

Finally, we must check that the above equilibrium indeed maximizes the low-stock firm profits. Indeed, (p^*, A^*) maximizes this firm profits as long as

$$\text{the isobenefit curve } I_L \text{ is quasiconcave in } p \quad (6)$$

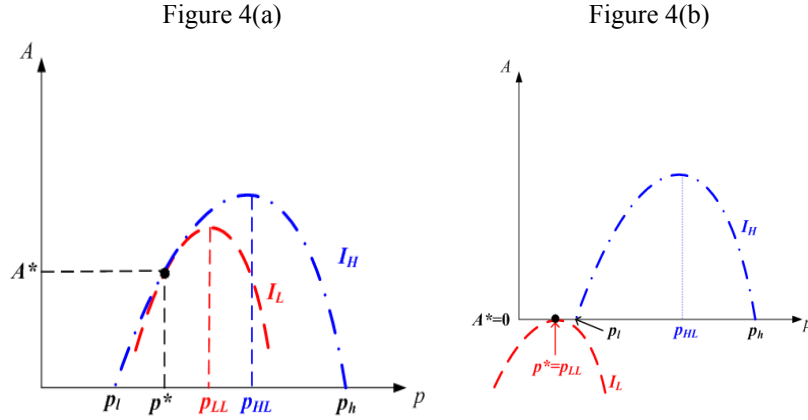
Otherwise (p^*, A^*) would be a minimum of this firm profits, and there would be no separating equilibria with positive expenditures on advertising.

Proposition 2. *Take the set of LCSE.*

1. *If conditions (4)-(6) hold, then there exists a separating sequential equilibrium with positive advertising. If, in addition, condition (6) holds strictly, then there exists a unique separating equilibrium with positive advertising.*
2. *If either condition (4), (5) or (6) fails, then all separating equilibria involve zero advertising.*

Figure 4(a) illustrates the first point of the above proposition: a LCSE with positive advertising. If the low-stock firm's isobenefit curve is strictly quasiconcave as depicted in the figure, the separating equilibrium is unique. If this condition holds with equality there are, as a consequence, a continuum of (p, A) tangency pairs which satisfy conditions (4)-(6). In contrast, if either condition fails, then there does not exist any tangency point within the price interval (p_l, p_h) . In this case, separating equilibria with no advertising exist, as figure 4(b) indicates. In fact, note that the equilibrium profile for this case

prescribes no advertising but a significantly low price, so that the low-stock firm can clearly signal its stock situation if it uses a low enough price.



Conclusions

This paper analyzes a two-period signaling model in which a firm, which either continues or exits the industry, decides what price level to set and how many resources to spend on advertising. These two choice variables, in a separating equilibrium, are used by the firm to signal to its potential customers whether the firm will exit or stay in the market. We identify the set of prices and advertising, (p, A) , which support fully revealing separating sequential equilibria. In addition, this set of separating equilibria was restricted to allow only “reasonable” beliefs, applying Cho and Kreps’ (1987) intuitive criterion.

The effects of modifying the dynamic incentives for the firm which continues in the market are also considered in a comparative statics analysis. In particular, reducing the proportion of returning customers expands the set of pooling equilibria, inducing all types of firms to announce “last-chance-sales.” Similar effects are also identified for the case that second period profits are small, and when the sellers assign a low discount rate to future payoffs.

It would be interesting to extend this two-period signaling game to a repeated signaling game. Indeed, firms and consumers interact in long relationships along time: some firms exit the market in the next time period, while other firms stay in business. In each period consumers and firms

would play a signaling game in which consumers updated their beliefs given, not only the current signals from the firm, but also all the past history of play. In this case the assumptions on the stochastic process of the random variable $\theta=\{H,L\}$ over time become very relevant. If θ is assumed to be persistent along periods, then after the actual realization of θ is known at the end of period one, the continuation game starting at period two becomes a usual repeated game with complete information, as in Kaya (2004).

If, in contrast, θ is assumed to be independently drawn each period of time, then past histories do not provide relevant information for the consumer that he could use in his belief updating. That is, the signaling game analyzed in this paper is repeated once and again, each period game being an isolated event. Probably, the most interesting repeated signaling model is that in which the stochastic process generating θ is correlated along time, i.e., the probability of drawing $\theta=H$ in period t depends on the probability of that particular realization in previous periods. Finally, it would also be important to extend the model to contexts where product quality is *not* perfectly observable to customers. In such case, advertising expenditures would be used as a signal of quality *and* stocks.

Appendix

A.1 Proof of Lemma 1

In the second period of the game, no other firm operates in the market, and consumer's beliefs when observing any firm are concentrated on high stocks. Then, the firm sets a price p_2 such that makes the consumer indifferent between buying and not buying the product, $U(p_2, H) = p_2 - H = 0$, i.e., $p_2 = H$.

A.2 Proof of Lemma 2

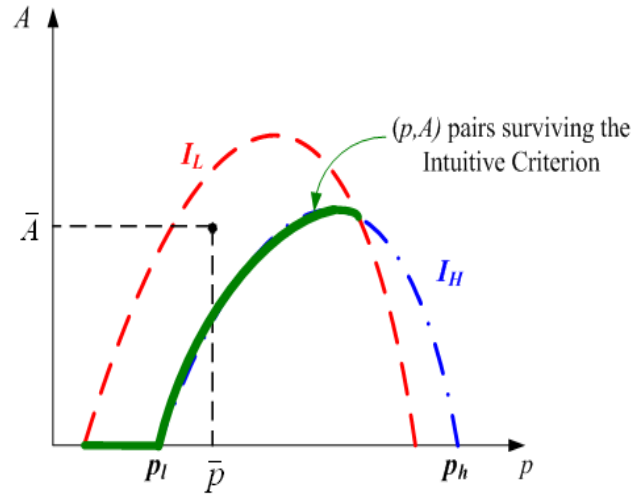
From expression (2) we know that the incentive compatibility condition of the high-stock firm is $\pi(p_{HH}, H, H) + \alpha\pi_2(p_2, H, H) > \pi(p, H, L) - A$, which indicates all (p, A) pairs above the isoprofit I_H .

$$I_H \equiv \{(p, A) \in \mathbb{R}^2 \mid \pi(p_{HH}, H, H) + \alpha\pi_2(p_2, H, H) = \pi(p, H, L) - A\}$$

For a given increase in α , the set of (p, A) pairs above the isoprofit I_H enlarges.

A.3 Proof of Proposition 1

Let us assume that $(\bar{p}, \bar{A})$ is the equilibrium strategy profile of the low-stock firm in a separating sequential equilibrium, as the figure below illustrates.



First Step:

Let us first restrict consumer's beliefs when an off-the-equilibrium message is observed (i.e., when a price-advertising pair $(\hat{p}, \hat{A}) \neq (\bar{p}, \bar{A})$ is observed) to only those types of firms from whom this off-the-equilibrium message is never equilibrium dominated. In order to simplify the consideration of different (p, A) pairs, let us start from pairs close to the I_L frontier, and then take (p, A) combinations below I_L , so that the firm's profits are higher (lower isobenefit curves). Formally,

$$\Theta^{**}(\hat{p}, \hat{A}) = \{ \theta \in \Theta \mid \pi(p, \theta, s) - A < \max_{s \in S^*(\Theta, \hat{p}, \hat{A})} \pi(\hat{p}, \theta, s) - A \} = \{L\}$$

Since the L -type of firm can benefit from sending different messages (in the area) but the H -type of firm does not.

Second Step:

Once consumers' beliefs have been restricted to Θ^{**} , we must check whether the equilibrium payoff is smaller than the one associated with the restricted set of beliefs. Indeed

$$\pi(p, L, L) - \bar{A} < \pi(p, L, L) - \hat{A} \text{ for all } (\hat{p}, \hat{A}) \neq (\bar{p}, \bar{A})$$

Therefore, the initial equilibrium strategy profile $(\bar{p}, \bar{A})$ does not survive the intuitive criterion. The same argument can be carried out for any price-advertising pair which strictly belongs to the area representing the set of separating sequential equilibria.

For any pair (p, A) in the boundary of the area representing the set of separating equilibria, however, the intuitive criterion does not eliminate any equilibrium because of holding “unreasonable” beliefs for off-the-equilibrium messages. Indeed, the first step is applicable to all of them just as above. However, the second step does not eliminate any of these (p, A) pairs.

A.4 Proof of Proposition 2

If condition (4) fails, then $p_{LL} < p_l$ or $p_{LL} > p_h$, which implies $A=0$. If condition (5) fails, then the tangency point between isoprofits I_L and I_H occurs at a price level $p^T < p_l$ or $p^T > p_h$, which also implies $A=0$. If condition (6) fails, then the firm could reduce A increasing profits. Then, all conditions (4)-(6) must be satisfied for a LCSE to be supported with positive advertising, $A > 0$. In addition, if condition (6) holds strictly, the tangency point between the isoprofits I_L and I_H is unique, and the equilibrium is unique.

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**Veinte años de estancamiento en la distribución del
ingreso de las familias Mexicanas
Un enfoque de microdatos**

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Resumen

El presente trabajo hace un análisis detallado de la evolución del ingreso total de las familias Mexicanas en los veinte años que han marcado el cambio estructural de la economía. Con base en nueve Encuestas de Ingreso Gasto de los Hogares y una división por ventiles y el uso de índices de desigualdad, se encuentra que lejos de una mejoría en la distribución del ingreso ha habido un empeoramiento y, en el mejor de los casos, un estancamiento. La particularidad de la clasificación por ventiles permite observar un mayor dinamismo en las tasas de crecimiento del ingreso de las familias con más recursos, lo que induce a pensar que a pesar del aumento generalizado del ingreso, la concentración de la riqueza también ha aumentado y las políticas públicas para minimizar las desigualdades que esto representa, no han tenido el efecto deseado.

Palabras clave: México, ingreso, desigualdad, pobreza, distribución.

Abstract

This paper presents the evolution of family income in the Mexican economy during the period 1984-2004, in which Mexico registered an important structural change. The analysis is based on microdata and inequality indexes. Once obtained the family income, was possible to identify which families improved and which families lost positions on the distribution income. Even though the whole families increased their incomes, the income growth rate

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was more dynamic for the well off families. Thus, the worse income distribution has showed the low effectiveness of public distributive policies.

Keywords: Mexico, income, inequality, poverty, distribution.

JEL classification: I30, I32.

Introducción

Es de conocimiento común que México es uno de los países con mayor grado de desigualdad en su distribución de la riqueza. Esta desigualdad impide un pleno aprovechamiento de todas las capacidades potenciales para el desarrollo de la economía del país. Cada vez hay más consenso en torno a la idea de que la desigualdad en la distribución de los recursos produce un pobre resultado en la tasa de crecimiento de la economía. Por ello, ante la exigua tasa de crecimiento de la economía de los últimos años -de las más bajas de Latinoamérica- es pertinente conocer cómo se ha comportado la distribución del ingreso en el mismo período, especialmente durante los cambios estructurales que ha sufrido la economía a lo largo de estos últimos veinte años.

En este sentido, el presente trabajo hará un breve diagnóstico de distribución del ingreso en México, así como su evolución en el período 1984-2004; para ello se acudirá a nueve encuestas de Ingreso y Gasto de los Hogares (ENIGH) y su análisis por ventiles, con el fin de evaluar con más detalle la evolución y situación del grado de desigualdad social que impera en México.

Los resultados demuestran dos tendencias definidas: un empeoramiento continuo de la distribución del ingreso, con un punto de inflexión en 1992, lo que permite una ligera reducción de la desigualdad hasta 1996, y un posterior estancamiento. Esta situación evidencia el poco efecto² que han tenido las políticas públicas de transferencias de recursos (monetarios y en especie) hacia las familias con menores ingresos y, por lo tanto, hace necesario una revisión de las mismas.

² La mejoría en la distribución del ingreso es apenas de entre el 4% y 8% (véase Vargas Téllez).

1. Antecedentes

Un estudio conducido por Lustig y Szekely (1997), para un amplio período que va desde 1950 hasta 1994, detectó un aumento en la desigualdad del ingreso entre 1989 y 1994. El resultado se explica con base en los argumentos propuestos por Cragg y Eppelbaum, quienes dicen que entre 1989 y 1994 la diferencia salarial aumentó de manera significativa a favor de los trabajadores calificados. Estos autores argumentan que la liberación comercial hizo más barata la importación de bienes de capital, de tal manera que aumentó la demanda de trabajadores y profesionistas especializados para la conducción de actividades productivas más complejas, impulsadas por dicho capital.

Otro estudio (Hernández Laos, 1999) sobre la evolución de la distribución del ingreso en México, toma el período que va de 1963 a 1989 y, con base en microdatos (encuestas), construye el ingreso familiar como base de análisis y la utilización de deciles. En sintonía con el anterior trabajo, detecta una paulatina reducción de la desigualdad del ingreso hasta 1984, año que marca un deterioro de las condiciones sociales, a raíz de la crisis de la deuda de 1982. Así, 1989 aparece más desigual con un deterioro en el índice de Gini de 8.7%, donde los deciles intermedios (5 al 9) pierden participación en el total del ingreso familiar, en beneficio del último decil que aumenta su participación de 38.1% a 48.9%, en tanto los primeros cuatro deciles mantienen su participación de 10.5%.

Dados estos resultados, es interesante contrastarlos con los que se pretenden obtener del presente estudio; sin embargo debe decirse que tal comparación ha de hacerse con cuidado, ya que se usará escalas de equivalencia que permiten capturar las economías de escala que se presentan al interior de los hogares, lo que afecta sensiblemente los resultados sobre desigualdad.

2. Los datos

Se utilizarán micro-datos, en particular, los obtenidos de la Encuesta Nacional Ingreso Gasto de los Hogares (ENIGH), para los años 1984, 1989, 1992, 1994, 1996, 1998, 2000, 2002 y 2004. Estas encuestas posibilitan la máxima cobertura en el tiempo, otorgan al análisis un cierto carácter dinámico y además, son perfectamente comparables ya que comparten la misma metodología en su construcción: un mismo marco conceptual, los mismos períodos de referencia, unidades de análisis, una cobertura geográfica, instrumentos de captación, diseño muestral y procedimientos de operación de campo. Debe afirmarse que sí existe cierta variabilidad entre

las ENIGHs, dado que a medida que más programas sociales han sido implementados³, éstos se han registrado en las ENIGHs y, por lo tanto, han afectado sobre todo el ingreso por transferencias que reciben los hogares, lo que en términos estrictos no las hace totalmente comparables; sin embargo, también vale el argumento de que la aparición de estos programas en las ENIGHs, registran los cambios en la desigualdad y en las políticas contra la desigualdad, surgidas en el período de estudio.

En el aspecto técnico, la ENIGH muestra un diseño probabilístico (en consecuencia, los resultados obtenidos a través de ellas se generalizan a toda la población), polietápico, estratificado y por conglomerados, con los hogares como unidades de observación primaria.⁴

Dado su diseño, las encuestas tienen un carácter complejo, debido a que en su construcción se han empleado técnicas que presuponen un “muestreo aleatorio simple con re-emplazamiento”, el cual es poco realista en una encuesta que toma en cuenta estratificación y agrupamiento de unidades de observación con probabilidades desiguales de selección (como es el caso de las ENIGH's); por lo tanto, se hace necesario un ajuste para evitar sesgos y resultados engañosos⁵. De esta manera, el ajuste ha sido llevado a cabo a través del factor de expansión (recíproco de la probabilidad de que un hogar sea seleccionado) y de los estratos (rurales y urbanos) de las unidades primarias de muestreo.

3. El ingreso familiar equivalente

Para el análisis que ha de hacerse en este trabajo, se utilizará el Ingreso Familiar Equivalente conformado por las diferentes partidas de ingresos (tabla 1)

³ PROCAMPO, Progres-Oportunidades.

⁴ INEGI, Documento Metodológico de la ENIGH, p107.

⁵ Ver Sul Lee, Forthofer & Lorimer.

Tabla 1
Conformación del ingreso familiar

Monetarios	No Monetarios
Remuneraciones al Trabajo	Autoconsumo
Negocios Propios	Pagos en Especie
Cooperativas	Regalos
Sociedades	Estimación de Alquiler
Empresas-Sociedades	de Vivienda
Propiedad	
Transferencias	
Percepciones Financieras	

La medición del bienestar económico, ya sea a través del ingreso o del gasto, encierra cierta controversia por el hecho de encontrar una cuantificación apropiada de las necesidades y tamaños de las familias y de sus miembros. Dado que el ingreso *per cápita* no toma en cuenta las economías de escala que se generan al interior de una familia, ni tampoco sus necesidades individuales, han surgido las escalas de equivalencia, las cuales intentan mostrar el costo de vida relativo entre familias de diferente tamaño y su composición, y puesto que dentro de una familia existen bienes “públicos” como puede ser la vivienda y bienes “privados” como son los alimentos, no existe un claro consenso sobre la construcción y ponderación de dichas escalas.

Desde el trabajo pionero de Engel (1895), que propone el gasto proporcional en alimentos como una medida de bienestar de las familias para construir un índice de manutención, y que requiere estimar una curva de Engel o curva de demanda a precios constantes, hasta el surgimiento de las llamadas escalas paramétricas pasando por las subjetivas, ha existido una creciente polémica sobre cuál es la más apropiada; pero al mismo tiempo, como ha afirmado Buhmann: “mientras no surja una escala de equivalencia teóricamente satisfactoria, el rango de equivalencias potenciales que pueden ser usadas, será de un amplio espectro”. Además, se ha encontrado que la elección del tipo de escala de equivalencia tiene sistemáticamente efectos absolutos y relativos sobre la reclasificación de medidas de desigualdad y pobreza, dentro de un análisis comparativo. Buhmann [1998].

En este sentido, debe decirse que a través de una escala paramétrica que contiene las economías de escala dentro de las familias(θ)⁶ y con sólo los

⁶ Donde el valor de θ está entre 0 y 1, de tal modo que si $\theta \rightarrow 1$ disminuyen las economías de escala, en tanto que si $\theta \rightarrow 0$ las economías aumentan.

valores de 0 y 1, Coulter, Cowell y Jenkins [2007] establecieron el impacto que tienen las escalas de equivalencia sobre la medición de la distribución del ingreso y la pobreza. Estos autores apuntaron que un cambio en θ produce un efecto ambiguo sobre la distribución del ingreso, que se divide en dos: efecto concentración y efecto reordenamiento. Donde, en el primero, la relación ingreso-tamaño de familia afecta al resultado, de manera que a medida que disminuye θ , las familias grandes se benefician. Mientras que el efecto reordenamiento, que es el que registra el cambio de posición de los individuos tras su clasificación por su ingreso equivalente, es ambiguo y también dependerá del parámetro θ ; de tal manera que el efecto que predomine, estará en función de las economías de escala. Sin embargo, existe un cierto consenso para los índices de desigualdad más utilizados en la literatura, donde la relación que existe entre θ y la desigualdad, tiene forma de “U”; lo que significa que al aumentar el parámetro θ desde 0 hasta 1, se observa una caída en la desigualdad del ingreso, y una vez que se ha alcanzado el punto de desigualdad mínima, ésta comienza a aumentar de forma gradual, a medida que el parámetro se acerca a 1.

Precisamente, aunque carecen de un sustento teórico apropiado y a pesar de que están más bien basadas en el comportamiento, son las escalas paramétricas las que han sido más utilizadas justamente por su simplicidad y claridad. Este trabajo no es la excepción, se utilizará una escala biparamétrica del tipo $(A+pK)^\theta$, propuesta por Citro y Michel [1995], aunque modificada ligeramente si se compara con la utilizada por la Comisión Europea [1991]. Por lo tanto, la escala incorpora las necesidades de las personas a través del parámetro p , y las economías de escala de las familias por medio de θ , donde A es el número de adultos y K el de los niños, aunque se distingue dos grupos de niños por sus edades, y de adultos, por sus necesidades.

Dada una ligera heterogeneidad conceptual en las encuestas, se recomienda usar una escala biparamétrica en donde se consideran de manera conjunta tanto los factores de escala como los de equivalencia. De este modo, la escala elegida será: $[1 + 0.8(A) + 0.4(0-10\text{años}) + 0.6(11-14\text{ años})]^{0.5}$. Donde el segundo adulto equivale a gastar sólo el 80% del primero, y hay dos categorías de niños, pequeños y grandes con un gasto respectivo del 40% y 60% de un adulto. Los diferentes factores de necesidades para los niños están basados en aplicaciones de la Comisión Europea y la OCDE,⁷ que para el caso de México simplemente se deduce analizando el gasto público por educación según el nivel educativo. Por su parte, la justificación de asignar un relativamente alto nivel de economía de escala ($\theta=0.5$) se basa en el hecho de que las familias mexicanas transfieren o comparten

⁷ Organización de la que México es miembro.

importantes “bienes privados”, como los libros de texto, ropa y otros bienes⁸. Una vez determinada la escala de equivalencia a utilizar, se procederá a su aplicación exclusivamente para hacer el análisis en el siguiente apartado.

4. Distribución del ingreso y desigualdad

Analizar la distribución del ingreso y su evolución en los veinte años que comprende el período 1984-2004, ayudará a tener un primer acercamiento al nivel de éxito o fracaso que han tenido las políticas públicas en el combate a la desigualdad.

Para llevar a cabo el análisis, se ha procedido primero a construir la variable ingreso utilizando todos los tipos de ingreso que recogen las ENIGHs. Debe decirse que es muy importante la elección de los tipos de ingreso que la conforman, ya que de su inclusión o exclusión dependerá en buena medida, los resultados que se obtengan.

Y, para comparar los resultados obtenidos con los de otros estudios, se han utilizado tanto los Ingresos Monetarios⁹ como los No Monetarios, que se han tomado directamente de la tabla de Ingresos de la ENIGH para los diferentes años de estudio¹⁰. Para que esto sea posible, se imputaron a cada familia los diferentes tipos de ingresos que conforman ambas fuentes. Posteriormente, se ajustaron los ingresos -a través de la escala de equivalencia derivada en la sección anterior- para obtener un Ingreso Familiar Equivalente y facilitar su comparación con estudios similares.

4.1 La Cabalgata de Pen

Una vez que se han ordenado todos los hogares de manera progresiva, por nivel de ingreso familiar equivalente¹¹, se ha procedido a su exposición gráfica para trazar La Cabalgata de Pen, con la cual se pretende tener una primera ilustración de la distribución de la renta en México.

⁸ En estudios para Estados Unidos, se utilizan valores de θ entre 0.65 y 0.75, en donde se registra un alto nivel de consumo dado el poder adquisitivo de las familias; por ello, en el caso de México, es perfectamente posible tener mayores economías de escala dentro de las familias, justificando niveles de $\theta=0.5$.

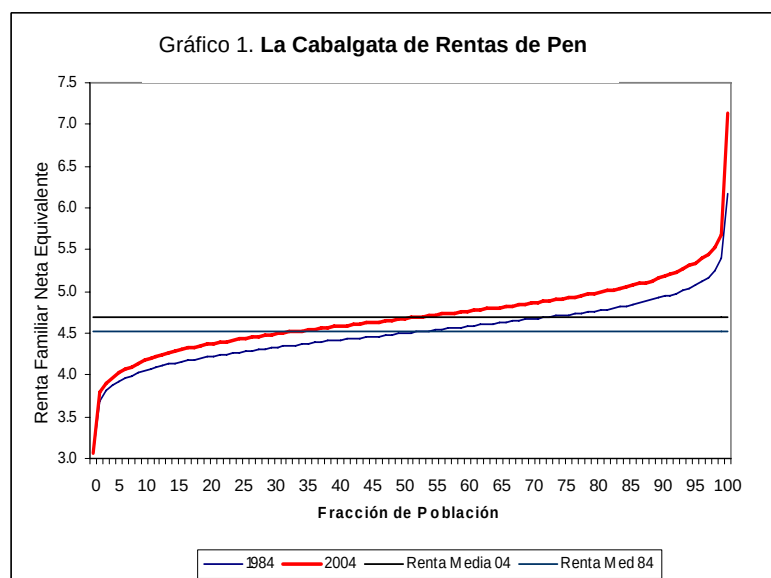
⁹ Ver Anexo: Conceptos.

¹⁰ Si bien, hay total compatibilidad entre todas las ENIGH tomadas para este estudio, la conformación del ingreso familiar sí varía un poco a partir de 1996, debido a la inclusión del PROCAMPO (1996) y del PROGRESA (1998), como parte de las transferencias recibidas por las familias. De esta manera, la conformación del ingreso varía ligeramente, minimizando el efecto de la desigualdad.

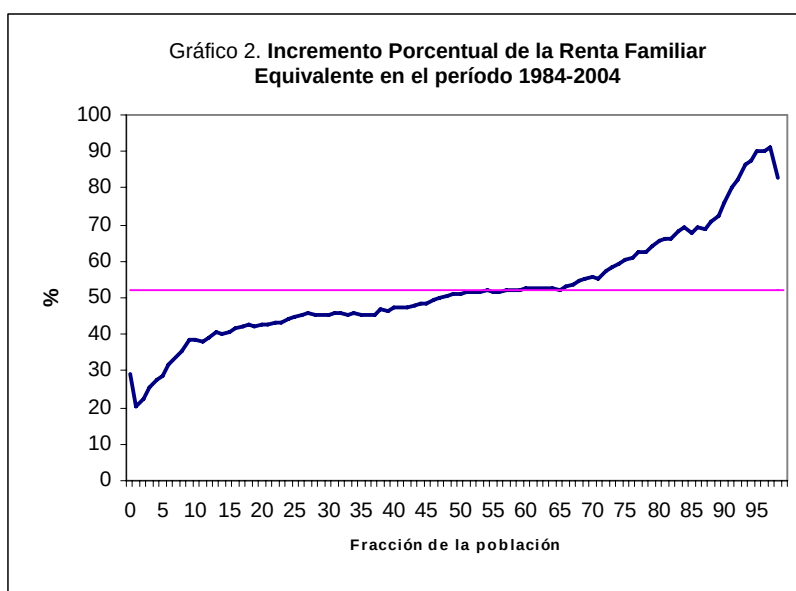
¹¹ En la sección anterior, se especificó cómo se calculó la escala de equivalencia elegida.

El Desfile de los Enanos (The dwarf's parade) expresa precisamente eso, un desfile de pequeños ingresos (vistos de perfil), los cuales van creciendo lentamente a medida que crece el ingreso, entonces, el desfile se acerca a su término, y al final, aparecen unos cuantos gigantes que multiplican su altura.

Cuando se compara las cabalgatas de 1984 y 2004, se aprecia inmediatamente que todos los individuos han crecido. Dado lo anterior, se puede decir que se cumple el criterio de “dominancia de rango” de Saposnik que deduce que al haberse incrementado el ingreso real, en todos los estratos de población, el bienestar se ha incrementado para todas las funciones de bienestar social individuales, simétricas, aditivamente separables y crecientes con el ingreso. De igual manera, si se toma en cuenta un mismo umbral de pobreza para ambas series, se podría decir que el número de hogares en pobreza, ha disminuido, aunque ésta es una afirmación que puede ser bastante discutible, y más sí se la compara con otros análisis de medición de la pobreza, lo cual queda fuera del alcance de este trabajo.



Por otro lado, si se observa con detenimiento el gráfico 1, se apreciará un pequeño pero significativo ensanchamiento del espacio existente entre las dos curvas, en los últimos niveles de ingreso; lo que significa que ha crecido más el ingreso en los estratos con ingreso más alto. Esto es evidente al observar el gráfico 2, el cual muestra que apenas un tercio de las familias con mayor ingreso supera el incremento promedio (52.9%) del ingreso de los últimos veinte años; en contraste, la primera mitad de las familias no alcanzó a incrementar su ingreso ni siquiera al nivel promedio.



4.2 Análisis por ventiles

La ventaja de hacer un análisis por ventiles en lugar del que se hace por deciles, es que se puede capturar con exactitud el comportamiento de la distribución del ingreso; puesto que, a mayor desagregación de los datos, se detecta de manera más clara la evolución de la participación de los hogares en el ingreso total de las familias. Con este propósito se han preparado las tablas 2, 3, 4 y 5, que guardan relación entre sí; sin embargo, también muestran aspectos diferentes de la distribución del ingreso.

Con base en el ingreso familiar equivalente monetario y no monetario como variable de análisis, la tabla 2 muestra el ingreso familiar en pesos de 2002, y al estar en términos monetarios, evidencia la disparidad entre ventiles. Por su parte, la tabla 3 muestra a través de un índice que utiliza a los ingresos medios como valor de referencia, la disparidad de los ingresos entre ventiles tanto hacia arriba como hacia abajo de dicha mediana, este índice expresa de manera clara la desigualdad y evolución de los ingresos entre familias. La tabla 4 muestra el crecimiento del ingreso familiar entre encuesta y encuesta, así como, el acumulado para todo el periodo de estudio. Esto permite analizar el comportamiento del ingreso por periodos cortos de tiempo e identificar situaciones concretas, por ejemplo, el impacto de la crisis cambiaria (Efecto Tequila) de finales de 1994 o la posterior recuperación de la economía. Finalmente, en la tabla 5, se aprecia tanto la participación porcentual por ventil como la acumulada, esta desagregación muestra con mayor claridad el contraste entre el último y primer ventil, lo que puede alcanzarse a través del análisis por deciles.

Así, en la tabla 2 se observa, con detalle la dinámica del ingreso real de las familias por ventiles; y aunque todos han mostrado, en 2004, ingresos mayores a los existentes en 1984, hay diferencias en el comportamiento; de esa forma, el primer ventil y los penúltimos cuatro ventiles aún no han recuperado el nivel de renta máximo de 1992, previo a la crisis de 1994; mientras que los ventiles restantes, han recuperado y aumentado el nivel de ingreso de 1992. En suma, se observa una recuperación general más bien débil, con excepción del último ventil. De ello, se deduce dos situaciones: primero, el fuerte impacto que tuvo la crisis de 1994 sobre los ingresos familiares, ya que después de transcurridos diez años, aún no han recuperado todas las familias su nivel de ingreso; segundo, el relativo empobrecimiento que muestran las familias con rentas medias-altas y el aumento en la concentración de los ingresos, con el consecuente enriquecimiento del 5% de las familias más ricas.

Tabla 2
Evolución de la distribución del ingreso en México I 1984-2004
Ingreso familiar equivalente anual monetario y no monetario
pesos constantes de 2002

Percentil	1984	1989	1992	1994	1996	1998	2000	2002	2004	Cambio % 2004/1984
5	8,648	9,123	12,130	12,125	10,088	8,842	10,530	12,733	11,602	34.2
10	11,777	12,515	16,099	16,220	13,040	12,183	14,091	17,173	16,826	42.9
15	14,276	15,282	20,237	19,232	15,833	15,089	17,073	20,928	20,832	45.9
20	16,729	17,669	23,460	22,563	18,206	17,868	20,248	24,025	24,554	46.8
25	19,260	20,098	26,409	25,891	20,538	20,592	23,148	27,252	28,188	46.4
30	21,406	22,435	29,821	29,092	22,873	23,297	26,234	30,577	31,785	48.5
35	23,966	24,656	33,315	32,409	25,318	26,001	29,397	33,987	35,452	47.9
40	26,564	27,440	36,930	36,212	28,039	28,979	32,466	37,771	39,421	48.4
45	28,834	30,551	40,624	40,036	30,964	32,325	35,858	41,765	43,548	51.0
50	31,428	33,862	45,192	44,064	34,049	35,588	40,278	45,922	48,278	53.6
55	34,293	37,340	50,632	48,588	37,489	39,572	44,941	50,871	53,443	55.8
60	38,693	40,908	56,491	53,819	41,186	43,849	50,169	56,512	59,041	52.6
65	43,194	45,260	62,767	60,053	45,860	49,067	56,137	62,745	65,864	52.5
70	48,123	51,106	71,973	66,920	51,299	54,985	62,387	70,963	74,086	53.9
75	53,767	57,999	83,690	77,143	58,687	62,311	71,234	80,511	84,225	56.6
80	60,882	67,435	98,754	90,885	68,324	71,601	82,078	94,362	98,122	61.2
85	70,969	80,582	120,095	110,281	83,394	87,596	100,634	112,662	118,463	66.9
90	89,625	101,108	162,776	143,740	107,278	115,572	132,817	145,094	150,598	68.0
95	128,715	148,241	250,651	226,089	157,353	169,703	208,150	217,261	221,365	72.0

Fuente: Elaboración propia con datos de las ENIGHs.

En la tabla 3, se han indizado los ingresos para nueve ENIGHs, de manera que pueda apreciarse con más detalle el comportamiento y evolución del ingreso. Tal indización ha tomado como base la mediana del número de

familias. Cuando se calcula el cambio porcentual de los últimos veinte años, se aprecia un mayor alejamiento del índice cien para la mitad más pobre de la población; mientras que la mitad más rica ha mantenido su posición o incluso ha aumentado su número índice. La pérdida de posición relativa con respecto a la mediana es mayor entre los ventiles más pobres, y dicha pérdida se va transformando en ganancia y aumentando a mayores tasas a medida que aumenta el ingreso de los ventiles, lo que refleja el aumento de la desigualdad.

Tabla 3
Evolución de la distribución del ingreso en México 1984-2004
Ingreso familiar equivalente anual monetario y no monetario
Índice mediana = 100 y cambio 1984-2004 en porcentaje

Ventil	1984	1989	1992	1994	1996	1998	2000	2002	2004	Cambio % 2004/1984
5	27.5	26.9	26.8	27.5	29.6	24.8	26.1	27.7	24.0	-12.7
10	37.5	37.0	35.6	36.8	38.3	34.2	35.0	37.4	34.9	-7.0
15	45.4	45.1	44.8	43.6	46.5	42.4	42.4	45.6	43.2	-5.0
20	53.2	52.2	51.9	51.2	53.5	50.2	50.3	52.3	50.9	-4.5
25	61.3	59.4	58.4	58.8	60.3	57.9	57.9	59.3	58.4	-4.7
30	68.1	66.3	66.0	66.0	67.2	65.5	65.5	66.6	65.8	-3.3
35	76.3	72.8	73.7	73.6	74.4	73.1	73.1	74.0	73.4	-3.7
40	84.5	81.0	81.7	82.2	82.4	81.4	80.6	82.3	81.7	-3.4
45	91.7	90.2	89.9	90.9	90.9	90.8	89.0	90.9	90.2	-1.7
50	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
55	109.1	110.3	112.0	110.3	110.1	110.1	111.6	110.8	110.7	1.4
60	123.1	120.8	125.0	122.1	121.0	121.0	124.6	123.1	122.3	-0.7
65	137.4	133.7	138.9	136.3	134.7	134.7	139.4	136.6	136.4	-0.7
70	153.1	150.9	159.3	151.9	150.7	150.7	154.9	154.5	153.5	0.2
75	171.1	171.3	185.2	175.1	172.4	172.4	176.9	175.3	174.5	2.0
80	193.7	199.1	218.5	206.3	200.7	200.7	203.8	205.5	203.2	4.9
85	225.8	238.0	265.7	250.3	244.9	244.9	249.8	245.3	245.4	8.7
90	285.2	298.6	360.2	326.2	315.1	315.1	329.7	316.0	311.9	9.4
95	409.6	437.8	554.6	513.1	462.1	462.1	516.8	473.1	458.5	12.0
Media	129.1	131.1	144.7	138.0	134.5	134.5	138.2	135.6	133.6	3.5

Fuente: Elaboración propia con datos de las ENIGHs.

Como se ha referido, la evolución del ingreso no ha sido uniforme en los últimos veinte años; en la tabla 4, se observa cómo la tasa promedio de crecimiento para todos los ventiles fue apenas de 9.4% para los últimos cinco años de la década de 1980, acusando los efectos de las crisis recurrentes de deuda y balanza de pagos de esos años. En cambio, en los primeros años de 1990, a raíz de alguna serie de reformas y pactos con todos los sectores de la sociedad, que propiciarían la recuperación de la economía, se aprecia un fuerte aumento del ingreso promedio (47.2%), en sólo tres años. Sin embargo, durante esos años, los ventiles con mayor ingreso siempre registraron mayor dinamismo en sus tasas de crecimiento que los de menores ingresos.

Tabla 4
Evolución de la distribución del ingreso familiar equivalente
en México 1984-2004
Tasas de crecimiento acumulativas para diferentes periodos por ventiles de
ingreso anual equivalente monetaria y no monetaria y crecimiento acumulado en

Ventil	89/84	92/89	94/92	96/94	98/96	00/98	02/00	04/02	Annual 04/84	Total 04/84
5	5.5	33.0	0.0	-16.8	-12.3	19.1	20.9	-8.9	1.6	34.2
10	6.3	28.6	0.8	-19.6	-6.6	15.7	21.9	-2.0	1.9	42.9
15	7.0	32.4	-5.0	-17.7	-4.7	13.2	22.6	-0.5	2.0	45.9
20	5.6	32.8	-3.8	-19.3	-1.9	13.3	18.7	2.2	2.0	46.8
25	4.4	31.4	-2.0	-20.7	0.3	12.4	17.7	3.4	2.0	46.4
30	4.8	32.9	-2.4	-21.4	1.9	12.6	16.6	3.9	2.1	48.5
35	2.9	35.1	-2.7	-21.9	2.7	13.1	15.6	4.3	2.1	47.9
40	3.3	34.6	-1.9	-22.6	3.4	12.0	16.3	4.4	2.1	48.4
45	6.0	33.0	-1.4	-22.7	4.4	10.9	16.5	4.3	2.2	51.0
50	7.7	33.5	-2.5	-22.7	4.5	13.2	14.0	5.1	2.3	53.6
55	8.9	35.6	-4.0	-22.8	5.6	13.6	13.2	5.1	2.4	55.8
60	5.7	38.1	-4.7	-23.5	6.5	14.4	12.6	4.5	2.3	52.6
65	4.8	38.7	-4.3	-23.6	7.0	14.4	11.8	5.0	2.3	52.5
70	6.2	40.8	-7.0	-23.3	7.2	13.5	13.7	4.4	2.3	54.0
75	7.9	44.3	-7.8	-23.9	6.2	14.3	13.0	4.6	2.4	56.7
80	10.8	46.4	-8.0	-24.8	4.8	14.6	15.0	4.0	2.5	61.2
85	13.5	49.0	-8.2	-24.4	5.0	14.9	12.0	5.1	2.7	66.9
90	12.8	61.0	-11.7	-25.4	7.7	14.9	9.2	3.8	2.8	68.0
95	15.2	69.1	-9.8	-30.4	7.8	22.7	4.4	1.9	2.9	72.0
Media	9.4	47.2	-7.0	-24.7	5.2	15.6	11.8	3.6	2.5	58.9

Fuente: Elaboración propia con datos de las ENIGHs.

Cuando se comparan los años 1994 y 1996, se aprecia, el devastador efecto de la crisis financiera al final de 1994. Se observa un empobrecimiento generalizado con una caída importante de la renta equivalente, afectando un poco más a las últimas ventilas, debido en parte a su mayor integración a la economía formal y a los circuitos financieros y, por lo tanto, quedan más expuestas a las consecuencias negativas de la devaluación y altas tasas de interés. A partir de 1996, se aprecia una recuperación generalizada de la renta en todos los ventiles, cuya principal característica es que por primera vez los primeros ventiles tienen un dinamismo mayor o al menos igual que los últimos ventiles. Desafortunadamente, una vez más, la leve recesión de 2002 deja sentir sus efectos de forma retardada con un menor dinamismo del crecimiento del ingreso y en especial, para los tres primeros ventiles, los cuales registran tasas negativas. En resumen, en los últimos veinte años, se observa un pobre crecimiento de la renta con una tasa anualizada promedio de 2.47% y una acumulada de 58.94%, con un desenvolvimiento desigual, en donde los ventiles con mayor ingreso presentan mayor dinamismo con mayores tasas de crecimiento del ingreso.

El aumento de la desigualdad vuelve a quedar de manifiesto en la tabla 5, la cual indica la participación del ingreso por ventil, tanto simple como acumulado dentro del ingreso total, y en donde claramente se aprecia una pérdida de la participación del ingreso de los primeros diecisiete ventiles, mientras que los tres ventiles restantes, los que contienen al 15% de la población más rica, aumentaron su participación, en especial el último ventil, con un crecimiento de 7.9%. El hecho de que éste último ventil mantenga el 27% del total de la renta equivalente de las familias, ejemplifica la alta concentración del ingreso que existe en México.

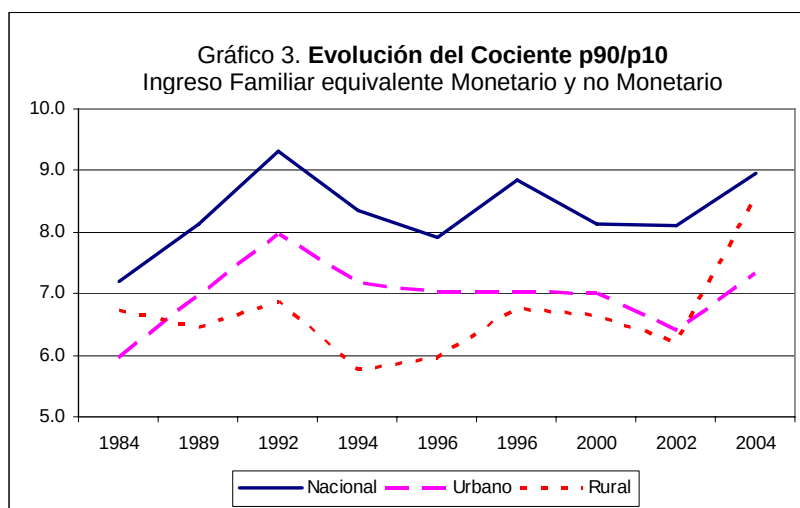
Tabla 5
Evolución de la distribución del ingreso familiar equivalente en México
1984-2004 (II)
Proporción por ventíl y proporción acumulado por ventiles
En porcentaje del ingreso neto anual equivalente monetario y no
monetario

Percentil	1984	1989	1992	1994	1996	1998	2000	2002	2004	Cambio 04/84
Proporción de cada ventíl										
5	0.67	0.59	0.55	0.66	0.69	0.58	0.58	0.68	0.64	-4.5
10	1.08	1.03	0.84	0.99	1.09	0.93	0.93	1.05	1.05	-2.7
15	1.37	1.28	1.09	1.24	1.34	1.19	1.18	1.33	1.36	-1.1
20	1.65	1.54	1.32	1.45	1.59	1.44	1.40	1.56	1.60	-3.5
25	1.92	1.76	1.48	1.68	1.79	1.68	1.63	1.79	1.82	-5.1
30	2.16	1.99	1.68	1.91	2.03	1.93	1.86	2.02	2.04	-5.9
35	2.41	2.19	1.88	2.14	2.24	2.15	2.09	2.24	2.28	-5.5
40	2.70	2.44	2.10	2.39	2.47	2.41	2.31	2.49	2.50	-7.3
45	2.96	2.72	2.35	2.65	2.74	2.68	2.57	2.76	2.76	-6.9
50	3.19	2.97	2.55	2.93	3.02	2.96	2.83	3.04	3.04	-4.7
55	3.49	3.33	2.87	3.20	3.31	3.28	3.19	3.36	3.35	-4.0
60	3.87	3.64	3.21	3.63	3.64	3.64	3.58	3.74	3.71	-4.3
65	4.35	4.09	3.54	3.88	4.03	4.05	3.98	4.14	4.11	-5.4
70	4.86	4.41	4.02	4.41	4.50	4.55	4.44	4.64	4.55	-6.3
75	5.41	5.10	4.64	5.02	5.10	5.13	5.00	5.24	5.11	-5.5
80	6.08	5.85	5.43	5.85	5.88	5.79	5.75	6.10	5.88	-3.3
85	7.03	6.86	6.50	6.96	7.00	6.90	6.75	7.17	6.93	-1.4
90	8.53	8.41	8.35	8.75	8.69	8.72	8.59	8.93	8.60	0.9
95	11.20	11.31	11.84	12.49	11.84	12.04	12.22	12.14	11.61	3.7
100	25.08	28.49	33.75	27.75	27.01	27.93	29.12	25.59	27.05	7.9
Proporción acumulada										
5	0.67	0.59	0.55	0.66	0.69	0.58	0.58	0.68	0.64	-4.5
10	1.75	1.62	1.39	1.65	1.78	1.51	1.51	1.73	1.69	-3.40
15	3.12	2.90	2.48	2.89	3.12	2.70	2.69	3.06	3.05	-2.40
20	4.77	4.44	3.80	4.34	4.71	4.14	4.09	4.62	4.65	-2.80
25	6.69	6.20	5.28	6.02	6.50	5.82	5.72	6.41	6.47	-3.40
30	8.85	8.19	6.96	7.93	8.53	7.75	7.58	8.43	8.51	-4.00
35	11.26	10.38	8.84	10.07	10.77	9.90	9.67	10.67	10.79	-4.30
40	13.96	12.82	10.94	12.46	13.24	12.31	11.98	13.16	13.29	-4.90
45	16.92	15.54	13.29	15.11	15.98	14.99	14.55	15.92	16.05	-5.30
50	20.11	18.51	15.84	18.04	19.00	17.95	17.38	18.96	19.09	-5.20
55	23.60	21.84	18.71	21.24	22.31	21.23	20.57	22.32	22.44	-5.00
60	27.47	25.48	21.92	24.87	25.95	24.87	24.15	26.06	26.15	-4.90
65	31.82	29.57	25.46	28.75	29.98	28.92	28.13	30.20	30.26	-5.00
70	36.68	33.98	29.48	33.16	34.48	33.47	32.57	34.84	34.81	-5.10
75	42.09	39.08	34.12	38.18	39.58	38.60	37.57	40.08	39.92	-5.20
80	48.17	44.93	39.55	44.03	45.46	44.39	43.32	46.18	45.80	-4.90
85	55.20	51.79	46.05	50.99	52.46	51.29	50.07	53.35	52.73	-4.50
90	63.73	60.20	54.40	59.74	61.15	60.01	58.66	62.28	61.33	-3.80
95	74.93	71.51	66.24	72.23	72.99	72.05	70.88	74.42	72.94	-2.70
100	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00

Fuente: Elaboración propia con datos de las ENIGHs

4.3 Indicadores de desigualdad

Para conocer de forma aún más clara y sintética la evolución de la desigualdad, se calculó el Índice de Gini para cada Encuesta Ingreso-Gasto para el total de los hogares; además, se hizo una distinción entre hogares rurales y urbanos. Así, en el gráfico 3 y en la tabla 6, se aprecia un comportamiento de tendencia similar para los tres estratos de población (total, urbano y rural); si bien el Gini del estrato rural siempre ha sido menor, no obstante, en el último año de estudio registra un aumento significativo. En general, el índice de Gini para el total de la población presenta en 2004 un valor superior al registrado veinte años atrás, mismo que a pesar de una evolución cambiante, en un primer momento aumentó hasta llegar a registrar un valor de 0.538 (1992), para luego decrecer lentamente y después volver a aumentar (2004). De esta manera, se asiste a una lenta aunque vacilante reducción de la desigualdad, después del importante aumento registrado, como consecuencia de las crisis económicas que se presentaron durante la década de 1980. Tales vaivenes muestran que no existe una clara y contundente tendencia en la disminución de la desigualdad, ya que después de veinte años, el país ha sido incapaz de romper con el alto nivel de desigualdad manifiesto después de la crisis de la deuda externa de 1982.



En la tabla 6, se obtuvo el índice de Atkinson para tres niveles de aversión a la desigualdad de la función social de utilidad. El índice de Atkinson mide la fracción de ingreso total que podría ser sacrificada sin ninguna pérdida de bienestar social, si el resto del ingreso fuese distribuido equitativamente. Cabe advertir que algunos economistas dudan de la efectividad en la medición de la desigualdad, debido a que el nivel de desigualdad resultante está determinado por la actitud que tenga la sociedad hacia la desigualdad, de manera que no hay consistencia en los resultados¹². En este sentido, el índice está influido por los juicios de valor que tenga el investigador o tomador de decisiones, en el momento de elegir el nivel de aversión al riesgo de una sociedad. Y si bien existen estudios sobre el nivel de aversión al riesgo apropiado, no existe un consenso sobre los parámetros; no obstante, para varios países desarrollados se ha encontrado un nivel que fluctúa entre $1.4 \leq 1.9$ ¹³.

¹² Véase Peter Lambert página 127.

¹³ Los valores inferidos para EEUU se basan en el efecto que un impuesto federal sobre la renta causa a cada unidad de ingreso una igual pérdida de utilidad. (Lambert página 129).

Tabla 6
Índice de desigualdad de la distribución del ingreso monetario y no
monetario de las familias mexicanas

Año	Índice de Gini			Índice de Atkinson		
	Nacional	Urbano	Rural	Nacional	e = 0.5 Urbano	Rural
1984	0.4428 0.0078	0.4204 0.0096	0.4409 0.0138	0.1645 0.0067	0.1491 0.0079	0.1626 0.0122
1989	0.4933 0.0107	0.4740 0.0136	0.4235 0.0080	0.2100 0.0132	0.1967 0.0163	0.1496 0.0067
1992	0.5380 0.0093	0.5185 0.0118	0.4885 0.0147	0.2477 0.0111	0.2309 0.0136	0.2084 0.0162
1994	0.4924 0.0052	0.4695 0.0064	0.4100 0.0065	0.2010 0.0050	0.1830 0.0059	0.1390 0.0049
1996	0.4829 0.0075	0.4647 0.0095	0.4297 0.0067	0.1959 0.0090	0.1831 0.0110	0.1528 0.0051
1998	0.4969 0.0071	0.4659 0.0089	0.4604 0.0110	0.2069 0.0079	0.1829 0.0096	0.1803 0.0107
2000	0.4877 0.0061	0.4646 0.0071	0.4461 0.0127	0.1984 0.0059	0.1799 0.0065	0.1689 0.0129
2002	0.4677 0.0073	0.4314 0.0041	0.4662 0.0421	0.1831 0.0090	0.1526 0.0034	0.2081 0.0557
2004	0.5014 0.0063	0.4772 0.0071	0.4999 0.0148	0.2144 0.0075	0.1949 0.0082	0.2152 0.0181

Año	Índice de Atkinson			Índice de Atkinson		
	Nacional	e = 1 Urbano	Rural	Nacional	e = 2 Urbano	Rural
1984	0.2894 0.0087	0.2613 0.0104	0.2839 0.0154	0.4823 0.0097	0.4376 0.0128	0.4651 0.0162
1989	0.3486 0.0132	0.3222 0.0167	0.2658 0.0087	0.5436 0.0104	0.4993 0.0139	0.4462 0.0096
1992	0.3968 0.0115	0.3700 0.0145	0.3353 0.0177	0.5771 0.0093	0.5391 0.0122	0.4969 0.0155
1994	0.3405 0.0061	0.3110 0.0074	0.2445 0.0068	0.5225 0.0058	0.4810 0.0074	0.3980 0.0078
1996	0.3302 0.0093	0.3068 0.0116	0.2660 0.0071	0.5106 0.0078	0.4741 0.0100	0.4255 0.0081
1998	0.3496 0.0086	0.3079 0.0106	0.3027 0.0127	0.5410 0.0075	0.4756 0.0097	0.4695 0.0122
2000	0.3368 0.0071	0.3050 0.0081	0.2867 0.0148	0.5218 0.0067	0.4707 0.0081	0.4499 0.0137
2002	0.3160 0.0090	0.2684 0.0045	0.3160 0.0634	0.5051 0.0073	0.4346 0.0050	0.4640 0.0428
2004	0.3598 0.0077	0.3238 0.0087	0.3545 0.0183	0.5633 0.0062	0.4997 0.0074	0.5415 0.0146

Fuente: Elaboración propia con datos de las ENIGHs

Siguiendo a Moore¹⁴ y de modo un tanto arbitrario, se eligieron tres niveles de aversión a la desigualdad, donde un mayor “ e ” implica una sociedad más aversa a la desigualdad.

De esta manera, con una sociedad poco preocupada por la desigualdad $e = .05$, se puede alcanzar el mismo bienestar social con alrededor tan sólo del 80% del ingreso obtenido, siempre y cuando el ingreso se distribuya equitativamente; de hecho, los años de menor “desperdicio” de ingreso nacional son 1984 y 2002, con tan sólo 16.5% y 18.3%, respectivamente. A medida que aumenta el rechazo a la desigualdad, aumenta el ingreso “desperdiciado” en la obtención de cierto nivel de bienestar social, así, con un valor de $e=2$, se desperdicia alrededor del 50% (según cada año); lo que implica que el nivel de bienestar social alcanzado se obtendría con sólo la mitad del ingreso, siempre y cuando la sociedad sea completamente igualitaria. Este nivel de aversión al riesgo confirma también que 1984 y 2002 son los años con menor desperdicio de ingreso, en directa sintonía con los menores índices de Gini registrados en tabla 6. También se observa un importante deterioro del ingreso de las familias rurales, ya que para los tres parámetros utilizados, los índices de Atkinson muestran un mayor nivel de desigualdad que en las familias urbanas, a pesar de que en 1989 registraban niveles de desigualdad menores.

Finalmente, otro indicador que da fe del estancamiento en la reducción de la desigualdad es el cociente de la relación de ingresos promedio entre el noveno y primer decil, el cual indica cuántas veces es mayor el ingreso del decil más rico comparado con el más pobre (Gráfico 3). El comportamiento de dicho cociente muestra un incremento que va de 7.2¹⁵ en 1984, hasta 9.3 en 1992, para después seguir un comportamiento vacilante que lo ubica cercano a nueve, superior al valor inicial, y mostrando una completa sintonía con la evolución del índice de Gini.

¹⁴ Moore propone rangos (0.5, 1 y 2) de bienestar para un grupo importante de países.

¹⁵ Sólo para tener una idea del valor tan alto, debe decirse que para países europeos, este valor oscila entre 2 y 4.

Conclusiones

Con este breve acercamiento a la evolución de la distribución de la renta en México, en los últimos veinte años, se deduce que existe prácticamente un “estancamiento” en la disminución de la desigualdad.

Al principio de la década de 1990 y después de un rápido deterioro en la concentración de la riqueza durante la segunda mitad de 1980, que llevó a la evolución del ingreso a niveles de desigualdad muy altos, se aprecia una evidente mejoría, seguida de cierto inmovilismo que conduce a un estancamiento de la distribución, e incluso un ligero empeoramiento en los primeros años del nuevo milenio. Además, cuando se hace una división de la población por decil o ventíl, se aprecia un contundente deterioro del ingreso para los primeros tres deciles y en especial para el 15% más pobre, con una pérdida de posiciones en la distribución del ingreso con respecto al nivel registrado veinte años atrás. En contraste, en el último decil se observa una creciente participación del ingreso con posiciones ganadas en los últimos veinte años. Esta situación contraviene la lógica en la evolución hacia el desarrollo que un país como México debiera seguir, ya que en lugar de que la brecha entre los primeros y últimos deciles se vaya cerrando, se ha dado una especie de polarización en los dos extremos de la renta como nodos. Esta tendencia se confirma cuando se observan las posiciones de las tasas de crecimiento del ingreso de cada ventíl con respecto a la mediana; así, en la medida que aumenta progresivamente el nivel del ventíl, la caída en la pérdida de posiciones con respecto a los últimos veinte años va disminuyendo y, de ser negativa se torna positiva, con una clara tendencia a aumentar en la medida que el ingreso va creciendo.

Los resultados -desde diferentes perspectivas de análisis- confirman mayor concentración o, en el mejor de los casos, estancamiento en la distribución del ingreso. Ello conlleva a reflexionar sobre las causas que han frenado la disminución de la desigualdad. Los resultados obtenidos están en sintonía con la tendencia de deterioro en la distribución de la renta, calculados por estudios similares previamente citados, con la salvedad de que el presente estudio al abarcar un período más reciente de tiempo y un análisis más detallado (ventiles) del comportamiento del ingreso familiar, confirma el estancamiento en el avance hacia una menor desigualdad, donde incluso se encuentra un deterioro de los estratos medios (ventíl 7 a 18) a favor del último ventíl.

Esta situación evidencia fallas en las políticas distributivas de los últimos años y fallas en el diseño institucional. Es evidente que es necesario un nuevo acuerdo institucional entre los actores económicos para dinamizar el crecimiento económico. En las décadas de 1960 y 1970, cuando el

crecimiento económico era sólido y sostenido, la desigualdad venía disminuyendo de manera constante. Algunos estudios como el de Hernández Laos (1999) han validado la hipótesis de Kuznets, por lo que será necesario entrar de nuevo en una senda de crecimiento económico para que teniéndolos en cuenta, detone la expansión de los sectores modernos de la economía con mayor valor agregado, un crecimiento real de los salarios y la consecuente disminución de la pobreza y la desigualdad. A mayor población activa incorporada a sectores productivos, menor será la brecha salarial entre sectores. La crisis económica ha ocasionado un encogimiento relativo en los sectores formales de la economía, que ha afectado a los salarios reales de estos sectores y por lo tanto, al mercado interno; en consecuencia, eso ha cerrado el círculo con un menor dinamismo en los sectores referidos. Ello explica por qué los estratos intermedios de la distribución del ingreso han sido los perdedores durante estos años.

De este modo, el nuevo marco institucional a construirse deberá cumplir con el objetivo de dinamizar el crecimiento, fortaleciendo los mercados competitivos y el mercado interno, a través de una serie de medidas que impliquen mejor regulación, menor corrupción, más grados de educación, la capacitación necesaria para la población y eficiencia en la gestión de las políticas redistributivas; sólo así será posible revertir la desigualdad y la pobreza que han afectado a los hogares mexicanos en los últimos años.

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Anexo de Conceptos

Ingresos Monetarios de los Hogares Remuneraciones al trabajo

Sueldos y salarios o jornal.
Destajo.
Comisiones y propinas.
Horas extras.
Aguinaldo.
Incentivos, gratificaciones o premios.
Bono, percepción adicional o sobresueldo.
Primas vacacionales y otras prestaciones en efectivo.
Reparto de utilidades.

Ingresos por negocios propios

Negocios industriales.
Negocios comerciales.
Prestaciones de servicios.
Producción agrícola.
Cría, explotación y producción de derivados de animales.
Reproducción, corte y tala de árboles.
Recolección de flora, productos forestales, caza y captura de animales.
Cría y explotación de plantas y animales acuáticos y pesca.

Ingresos por cooperativas

Sueldos o salarios.
Ganancias o utilidades.

Ingresos de sociedades.

Sueldos y salarios o jornal.
Ganancias o utilidades.

Ingresos de empresas que funcionan como sociedades

Sueldos y salarios o jornal.
Ganancias o utilidades.

Ingresos por venta de la propiedad

Alquiler de tierras, terrenos que están dentro del país.
Alquiler de tierras, terrenos que están fuera del país.
Alquiler de tierras de donde se extraen minerales: agua, arena, piedra, etc.
Alquiler de casas, edificios, locales y otros inmuebles que están dentro del país.

Alquiler de casas, edificios, locales y otros inmuebles que están fuera del país.

Intereses proveniente de inversiones a plazo fijo.

Intereses proveniente de eventos de ahorro.

Intereses proveniente de préstamos a terceros.

Rendimientos provenientes de acciones o dividendos.

Rendimientos provenientes de bonos.

Rendimientos provenientes de cédulas.

Alquiler de marcas, patentes y derechos de auto.

Otros ingresos por renta de propiedad no considerados en los anteriores (especifique).

Transferencias

Jubilaciones y/o pensiones originadas dentro del país.

Jubilaciones y/o pensiones provenientes de otros países.

Indemnizaciones recibidas de seguros contra riesgos a terceros.

Indemnizaciones por accidentes de trabajo.

Indemnizaciones por despido y retiro voluntario.

Becas y donativos provenientes de organizaciones no gubernamentales.

Becas y donativos provenientes del gobierno.

Regalos o donativos en dinero provenientes de otros hogares.

Ingresos provenientes de otros hogares.

Beneficios de progreso u oportunidades.

Beneficios de PROCAMPO.

Otros ingresos

Otros ingresos corrientes no considerados en los anteriores.

Percepciones financieras y de capital

Retiro de inversiones, ahorros, tandas, y cajas de ahorro, etc.

Pagos recibidos que usted hizo a otras personas no miembros del hogar.

Préstamos recibidos de personas no miembros del hogar o instituciones.

Venta de monedas, metales preciosos, joyas y obras de arte.

Venta de acciones.

Venta de bonos.

Venta de cédulas.

Venta de marcas, patentes y derechos de autor.

Herencia, dotes y legados.

Lotería y juegos de azar.

Ventas de casas, terrenos, condominios etc., que están dentro del país propiedad de algún miembro del hogar.

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Ventas de casas, terrenos, condominios etc., que están fuera del país propiedad de algún miembro del hogar.

Venta de maquinaria, equipo, animales de producción, vehículos etc., utilizados en el negocio propio del hogar.

Venta de vehículos, aparatos eléctricos de segunda mano, etc.

Préstamos hipotecarios por bienes inmuebles, casas, terrenos, edificios locales.

Seguros de vida.

Otras percepciones financieras y de capital no consideradas en las anteriores (especifique).

Ingresos No Monetarios

Autoconsumo

Productos y servicios de consumo final procesado y/o elaborado por un miembro de la familia, estimados con base en el valor de mercado.

Pago en Especie

Como parte o el total del sueldo.

Como prestación por el trabajo.

Regalos

Recibidos por personas ajenas al hogar.

Estimación del alquiler de la vivienda.

Ya sea propia, recibida como prestación o prestadas.

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