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Are more severe recessions followed by stronger recoveries? Evidence from the Mexican states employment

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Abstract

On the basis of the suggestions of Friedman (1969, 1993) and Moore (1965) and considering the framework proposed by Balke and Wynne (1994, 1995), this paper evaluates whether recoveries growth depends on the characteristics of prior recessions (depth, steepness and duration) in the case of the Mexican states employment during the 2001-2003 and 2008-2009 recessions. The original models are extended to include the effects of external and fiscal shocks, as measured by the annual growth rates of the tradable goods production sector and the federal government expenditure of the year the recoveries start, trying to capture the initial impulses that may have taken the economy out the recession.

The recession and recovery periods (turning points, namely peaks and troughs) are identified by using the classical business cycles methodology introduced by Artis, Kontolemis and Osborn (1998) that follows the spirit of Mitchel (1927) and Burns and Mitchel (1946). Recoveries growth is measured as the monthly average growth rate from the end of the prior recession up to 9, 12 and the number of months required to get the prior *peak*. Conventional linear regression models are estimated for total, permanent and temporary employment. To avoid possible problems of collinearity between depth and duration, on the one hand, and steepness, on the other, these variables were included in two different specification models for each type of employment. The corresponding tests indicate that the estimated models present acceptable specifications, in general.

Our main results suggest that depth and steepness of prior recessions (as measured by the percentage accumulated drop and the monthly average growth rate of employment over the recession, respectively) have separated negative effects on subsequent growth recoveries, especially after the 2001 recession. Regarding the effects of other shocks pulling the economy out the recession, our results suggest that the fiscal policy followed by the federal government did not contribute to the recovery from the 2008 recession at state level since the coefficients are negative, which would imply the existence of a pro-cyclical policy at least at the end of the recession period. In turn, in the models of total and permanent employment, the tradable goods sector has robust positive and significant effects that reflect the important role of the external demand in the recovery from the Great Recession. These two variables had no significant effects of the recovery following the 2001 recession.

In general, the evidence reported in this paper is consistent with the implications of different models that try to explain the “bounce-back” effect and provides some support to the hypothesis that deeper or steeper recessions are followed by stronger recoveries in the Mexican states.

Key words: Employment, Regional business cycles, Recessions, Recoveries.

JEL Classification: E24, E32, R11, E39

Introduction

The severity and spread of the Great Recession as well as the weakness and uncertainty of the current world recovery has called the attention of some researchers to the dynamics of business cycle regimes. For example, regarding the current expansion, Dominguez and Shapiro (2013) analyze the effects of domestic fiscal policies and financial mechanisms as well as the role of shocks emanating from Europe, whilst Bordo and Haubrich (2012) study the effects of residential investment in the case of the United States (US). In turn, Elwell (2013) has investigated the causes of the weakness of private spending and Abiad et al. (2009) has focused on the role of impaired financial systems and external imbalances in several economies

Thus, although there may be multiple factors conditioning the dynamics of expansions, a branch of the literature has focused on the analysis of economic activity over their early stages. According to an old idea advanced by Friedman (1969, 1993) and Moore (1965), a recovery, understood as the immediate phase following a recession, can be stronger than the rest of the expansion phase, and its intensity may be negatively associated to the magnitude of the prior recession. The dynamics of this process can be thought as a self-corrective response to low economic activity and, consequently, as an endogenous response of the system. This relationship has commonly been known as the “bounce-back” effect.

This subject received some attention during the nineties. For example, Balke and Wynne (1994) study whether early stages of an expansion are different from its later stages, while Wynne and Balke (1992, 1993) and Balke and Wynne (1995) examine the hypothesis that the severity of a recession favorably affects the growth rate of output during the period immediately after the recession. In general, these authors report evidence that supports the hypothesis of a “bounce-back” effect in the cases of the US and the G-7 countries. Interestingly, afterwards, this subject has been scarcely addressed in the literature despite its evident importance.

In the case of Mexico, there are some studies addressing the characteristics and synchronization of the business cycle regimes. For example, by using the classical business cycles approach introduced by Mitchell (1927) and Burns and Mitchell (1946), Erquizio (2006, 2008) combines different variables to obtain monthly composite indexes to represent

the business cycle of several Mexican states, while Erquizio (2011) builds annual indexes to measure recessions of 1995, 2001-2003 and 2008-2009. In turn, Mejía (2007) and Mejía and Erquizio (2012) use the same approach to identify state expansions and recessions and to measure regime asymmetries in terms of mean, volatility and duration. They also estimate the degree of synchronization between the regimes of the cycle and find that it is rather moderate across the states. Nonetheless, these authors claim that there has been an increasing synchronization of the Mexican business cycle regimes with those of the US economy especially during the North American Free Trade Agreement (NAFTA) era.

Despite these papers have contributed to a better understanding of the business cycle regime characteristics and interactions, the relationship between recessions and expansions has not been explicitly analyzed in the case of Mexico. Therefore, the aim of this paper is to measure the effects of duration (in months), depth (accumulated fall of employment) and steepness (monthly average growth rate) of recessions on the growth rate of economic activity in the early stages of recoveries, according to the lines suggested by Friedman (1969, 1993) and Moore (1965) in the case of the Mexican states.¹ The analysis is carried out by using different measures of formal employment as indicators of economic activity to characterize recessions and recoveries. We find some evidence of a negative association between the severity of recessions and employment growth over the early stages of recoveries, especially those following the 2001-2003 recession.

The rest of this paper is organized as follows. Section 1 offers a brief review of the theoretical literature addressing the effects of recessions on recoveries, while section 2 describes the methodology to identify the business cycle regimes and their characteristics as well as the econometric methodology to be used. Section 3 presents and discusses the results. Finally, some conclusions are presented.

1. Some theoretical considerations

In the classical tradition the business cycle refers to fluctuations found in the aggregate economic activity and "... consists of expansions occurring at about the same time in many

¹ As explained later, the model specification also includes the effects of other shocks that could have contributed the economy to overcome recessions.

economic activities, followed by similarly general recessions, contractions, and revivals, which merge into the expansion phase of the next cycle....” (Burns and Mitchell 1946, 3). Although some branches of this literature have focused on the dynamics of two phases of the cycle, some others have kept the analysis of four phases.² In the latter, the increase of economic activity immediately after the end of a recession has been named recovery while the rest of that increased has become known as expansion.

The dynamics of recoveries can be complex and their magnitude and intensity can be explained by multiple factors. Some time ago, Friedman (1969, 1993) and Moore (1965) called the attention to the possibility that deeper recessions could be followed by stronger recoveries. In particular, by focusing on the first months of a recovery, Moore (1965) reports three stylized facts. First, there exists a negative relationship between a contraction and the subsequent recovery, which depends on the magnitude of the former (e.g. a severe recession yields a vigorous recovery, and vice versa). Second, the average growth rates in the early months of a recovery are greater when are preceded by deeper recessions. Third, the growth rates of the first 6 and 12 months of a recovery are greater than those of the subsequent time periods and the growth rates of the last 12 months of a recovery are smaller than those of the first 12 months. This relationship has come to be known as a “bounce-back” or “rubber-band” effect and it can be seen as a self-corrective response to low economic activity (see Wynne and Balke 1992).

However, despite the notion of a “bounce-back” effect may be intuitively attractive it has not been explicitly addressed in most models of business cycles even if the mechanics of growth in the early stages of an expansion is implicit in some of them. For example, Friedman (1969, 1993) argued that contractions are the result of random perturbations in demand that take the economy temporarily away from its long-run level of production.³ Thus, a negative shock would cause a fall in economic activity and generate a capacity excess, which, in turn, would favor fast recoveries before the inexistence of restrictions in the use of the productive factors. Since deeper contractions imply greater capacity excess,

² Conventionally the phases or regimes of the business cycle are expansion and recession (Boldin, 1994; Artis, Kontolemis and Osborn, 1997), but some analysts consider the four phases defined by Burns and Mitchell (1946), namely recovery, expansion, recession and contraction.

³ However, although this level is limited upward by capacity constraints, it may increase over time as the economy accumulates resources and incorporates technological advances.

they will be followed by faster recoveries due to the “bounce-back effect”. It is important to mention that in this model high growth rates during the early recovery are related to inventory replenishment implemented by firms to face the eventual expansion of demand. In that sense, this process may be seen as a self-corrective response of the system. By using another analogy, Friedman (1969) called this the “plucking model”.⁴

On the other hand, in a standard real business cycle model, which assumes rational economic agents and competitive markets, cyclical fluctuations are caused by exogenous random technology shocks hitting constantly and taking the economy away from its long run equilibrium growth path (see King, Plosser and Rebelo 1988). In that sense, negative shocks generate recessions, with falls in production, consumption, investment and employment, among other variables, and vice versa. Then, a recovery from a recession can be seen as the return of the economy to its steady state equilibrium and its dynamics would be essentially the same as the transitional dynamics of the standard neoclassical growth model. Therefore, it is expected the economy to grow faster the further the capital stock is from its long run equilibrium level. Consequently, large technology shocks, that provoke partial reductions in the capital stock, should be immediately followed by periods of vigorous growth.

Other models have also tried to explain the relationship between recessions and growth. In line with the ideas of Schumpeter (1939), the creative destruction models claims that technological change involves a wide process of historical and irreversible process of innovation and also it implies the reallocation of productive factors across sectors,⁵ which modifies the economic structure, destroying old firms and creating new ones (Tichy 2011). Expansion caused by technological changes actually constitute deviations from the long run equilibrium position and, in that sense, become disproportionate, discontinuous and inharmonic processes that generate cyclical fluctuations. Hence, contractions are not only a reaction of the system to the distortions generated by expansions, but also a process of adaptation of the existing firms to more difficult conditions implied by technological

⁴ Friedman provides empirical support for this view. However, his results do not show an analogous effect from prior strong recoveries on subsequent recessions, a fact that exhibits an asymmetric relationship along the business cycle regimes.

⁵ A process of innovation involves not only new technologies (embedded in the production function), but also new products, novel forms of organization, new markets, incumbent firms and new personnel (Hansen 1965).

progress. In this logic, a more vigorous economy may emerge from recessions because obsolete and unproductive firms are expelled from the system (the “cleansing effect”) and entrant firms ought to operate at higher levels of efficiency (Caballero and Hammour 1994; Aghion and Saint-Paul 1991). At the end, this process may generate higher output growth rates. In general, brief and deep recessions, characterized by a significant destruction of firms and job positions, may be followed by periods of rapid output growth.

2. Empirical methodology

The estimation of the effects of recessions on subsequent recoveries in the Mexican states is based on the approach suggested by Wynne and Balke (1992) and Balke and Wynne (1995) and consists of two stages. The first one relates to the identification of the turning points that define the business cycle regimes, which, in turn, allows us to characterize recessions and compute recoveries growth. The second stage refers properly to the econometric estimation of the effects of the recessions characteristics on the recoveries growth rates.

Thus, in the first stage, the recession and recovery regimes are identified and characterized by applying the classical business cycles approach of Mitchell (1927) and Burns and Mitchell (1946), which emphasizes not only the identification of the cycle regimes, but also the analysis of their characteristics.⁶ To identify the cycle regimes it is necessary to date the business cycle *turning points*, which, according to Boldin (1994), are classified as *peaks* - the period immediately preceding a decline in real activity, or *recessions* -and *troughs* -the period immediately preceding an upturn, or *expansion*. The *period* or *duration* of a cycle is the length of time required for the completion of a full cycle and may be measured by the time between two successive peaks or two successive troughs. In addition, the *duration* of a cycle regime can be measured by the time between a peak (trough) and a trough (peak) in the case of a recession (expansion). It is important to emphasize that we will consider a decline as a recession only when an identified peak precedes it and we will consider an upturn as expansion only when it is preceded by a trough. Otherwise, we will talk just about downturns or declines and upturns, respectively.

⁶ An alternative empirical methodology to study this phenomenon is the growth cycles approach, which underlines the analysis of the co-movement between the deviations from a trend of multiple macroeconomic variables, without the explicit identification of the business cycle regimes (Kydland and Prescott 1990).

In this paper, the classical business cycles methodology of Artis, Kontolemis and Osborn (1997), AKO hereafter, is used to date the turning points and the regimes of the specific state cycles.⁷ In general, the AKO methodology can be summarized in the following steps.⁸ In step one, extreme values are identified and replaced since our attention focuses on broad upward and downward movements, and these values may distort the procedure.⁹ In step two, original values are smoothed by using a centered moving average of seven periods to reduce the importance of short-run erratic fluctuations. Turning points are tentatively defined in this smoothed series by the identification of points higher (peaks) or lower (troughs) than twelve periods on either side, with peaks and troughs required to alternate. In Step three, we return to the unsmoothed series and use similar rules to identify tentative turning points, with the additional requirements that the amplitude of a phase to be at least as large as one standard error of the monthly log changes and the duration of a cycle be at least fifteen months. The final stage compares the two sets of tentative turning points: when there is a close correspondence between the two sets of tentative turning points (± 5 months), the existence of a turning point is confirmed and dated as that identified in the unsmoothed (original) series. The turning points and the business cycle regime characteristics are presented in the next section.

In the second stage, the effects of recession characteristics on growth recoveries are estimated by using the specifications suggested by Wynne and Balke (1992) and Balke and Wynne (1995). In particular, they estimate the relationship between the characteristics of prior recessions and the average growth rates over subsequent recoveries on the basis of the following model,

$$(y_{iT+k} - y_{iT}) = \alpha + \gamma(T_i - P_i) + \delta(y_{iT} - y_{iP}) + u_i \quad (1)$$

⁷ The main advantage of the AKO methodology is that it is based only on a univariate analysis and generates turning points for the US economy very close to those of the National Bureau of Economic Research (NBER), which is an organization with a long tradition in the analysis of the US business cycles. Its turning points dating procedure is based on the analysis of different series according to different methodologies (see Moore and Zarnowitz 1986; Boldin 1994).

⁸ See Artis, Kontolemis and Osborn (1997) for further methodological details. Mejía (2007) and Mejía and Erquizio (2012) use this approach to analyze the cycles of the Mexican states.

⁹ An extreme value is defined as that whose (log) change is greater than 3 standard errors of that series; extreme values are replaced by the arithmetic average of the two corresponding adjacent observations of the original (seasonally-adjusted) series in levels.

where i denotes the i -th state, y stands for the natural logarithm of employment, P is the date of the peak defining the beginning of the recession and T is the date of the trough denoting its end,¹⁰ while u_i is a disturbance term that follows a white noise process. Then, according to expression (1), the magnitude of the recovery of employment during the first k months after the trough is related to the duration (in months) of the prior recession ($T_i - P_i$) and its “depth”, as measured by the difference between employment at the peak and trough dates, ($y_{iT} - y_{iP}$). Moreover, model (1) can be generalized in the following terms:

$$l_i(k) = \alpha + \beta s_i + \gamma(T_i - P_i) + \delta(y_{iT} - y_{iP}) + u_i \quad (2)$$

where $l_i(k)$ is the average monthly growth rate of employment during the first k months of the expansion and s_i is its average monthly growth rate over the course of the prior recession; conventionally, s_i is considered as a measure of the “steepness” of the decline in employment during a recession. Therefore, the average growth rate of employment in the first k months of an expansion can be explained by the steepness of the prior recession, its duration in months and its depth. In particular, if steepness, as a measure of the severity of a recession, is the most relevant explaining factor, it is expected β to be negative and significant. If, on the other hand, duration is the important factor, γ would be positive implying that longer recessions favor stronger recoveries. Finally, if deeper recessions precede stronger recoveries, δ would be negative and significant.

This general model estimated by Wynne and Balke (1992) and Balke and Wynne (1995) is modified to give account of two possible sources of specification errors. First, on the basis of their construction, there may be some degree of collinearity between depth and duration, on the one hand, and steepness, on the other.¹¹ Second, even if rapid growth over early recoveries can be seen as a self-corrective response of the system to low economic activity, other shocks can actually explain output revivals. In particular, given the high degree of integration of the Mexican to the US economy, the recuperation of the latter may have pulled the former through a greater demand of Mexican exports, which, in turn, affected positively to the growth rate of the tradable goods sector, t_i . On the other hand, the central

¹⁰ More specifically, for example, y_{iT} refers to the log of employment at the date of the trough.

¹¹ Formally, steepness = depth/duration. However, they are not necessarily identical. For example, a large depth can be associated to a long recession generating a low steepness, and viceversa.

government followed a countercyclical fiscal policy in an attempt to mitigate the effects of the Great Recession mainly through increases in the growth rate of the federal government expenditure, g_i (see Villagómez and Navarro, 2010). Therefore, the model specifications are as follows:

$$\text{Model A} \quad l_i(k) = \alpha + \gamma(T_i - P_i) + \delta(y_{T_i} - y_{P_i}) + \varphi t_i + \omega g_i + u_i \quad (3)$$

$$\text{Model B} \quad l_i(k) = \alpha + \beta s_i + \varphi t_i + \omega g_i + u_i \quad (4)$$

Then Model A relates the average growth rate of employment during the first k months of an expansion to recession duration and depth, while Model B does so to recession steepness. In addition, both models include the growth rates of the federal government expenditures and the tradable goods sector¹² of the year when recovery started trying to capture the initial impulse of those shocks. It is expected external shocks to have positive effects on the production of tradable goods and, therefore, on the employment recovery ($\varphi > 0$). Whilst, the sign of the coefficient of g_i may be positive or negative depending on the actual effects of the fiscal policy across the Mexican states: if it was countercyclical over the recession period $\omega > 0$, and vice versa.

3. Recession characteristics and recoveries: empirical evidence

3.1. Synchronization of the US and Mexican business cycles: some general facts

The methodologies described in the previous section are used to estimate the effects of the recessions experienced by the Mexican economy in 2001-2003 and 2008-2009 (2001 recession and 2008 recession, hereafter) on the subsequent recoveries. As it is very well known, these recessions were originated within the US economy and propagated to the rest of the world, especially to its main trade partners and foreign investment receptors like Mexico.¹³

As it has been widely documented in the literature, since the mid-eighties the Mexican authorities followed an ambitious process of reforms to modernize the economy, including

¹² The tradable goods sector includes: agriculture, livestock, forestry, fishing, hunting, mining, manufacturing, temporary accommodation and preparation of food and beverage services.

¹³ For analyses of the 2001 recession, see, for example, Nordhaus (2002) and Kliesen (2003); the recession of 2008 is widely analyzed by Blanchard (2009) and Imbs (2009).

foreign trade and investment liberalization, re-privatization of public firms and deregulation of markets (Aspe, 1993; Moreno-Brid and Ros, 2009). Consequently, the Mexican manufacturing exports to the US and investments coming from the same country grew at exponential rates (Kose, Meredith and Towe, 2004; Tornell, Westermann and Martínez, 2004). Moreover, aggregate business cycles of both economies became increasingly synchronized as a major consequence of the increase in international transactions, especially after the North American Free Trade Agreement (NAFTA) entered into force in 1994, such as several studies have documented (Gutiérrez, Mejía and Cruz, 2005; Ramírez and Castillo 2009; Mejía and Erquizio, 2012).¹⁴

Therefore, it was not surprising the quick and rather violent transmission of the last two US recessions to the Mexican economy. Table 1 shows the main properties of these episodes in Mexico, dated by using the AKO methodology and two measures of output.¹⁵ On the basis of quarterly Gross Domestic Product (GDP) and the monthly Global Index of Economic Activity (GIEA), the recessions are characterized in terms of their duration, depth and steepness.¹⁶ Regarding duration, the first recession started in Mexico in 2000.08 (2000.III) and lasted for 19 months (6 quarters), while in the US, according to the NBER, the peak defining its beginning was dated in 2001.03 (2001.I) with a duration of 8 months (3 quarters). This timing and the difference in duration make evident the high sensitivity of the Mexican economy not only to declines in the US economic activity, but also to its deceleration. In turn, the second recession started in 2008.03 (2008.II) and ended in 2009.05 (2009.II), with a duration of 14 months (4 quarters). Interestingly, although the

¹⁴ Indeed, although still there is some debate, it is evident that the regimes of the Mexican and US business cycles lacked synchronization during the eighties and the first half of the nineties (Mejía, 1999; Mejía, 2004). In particular, according to the NBER (www.nber.org) during the eighties the US had recessions in the periods 1980.01-1980.07 and 1981.07-1982.11, while Mexico had similar regimes in 1981.09-1983.11 and 1985.07-1986.09 (Mejía, 2004). In turn, during the nineties, the former had a recession between 1990.07 and 1991.03, while the latter had one in the period 1994.06-1995.07.

¹⁵ For comparison purposes, the figures of the 1995 crisis are also reported in table 1.

¹⁶ It is important to underline that in Mexico there is not official business cycle turning point dates. However, the National Institute of Statistics and Geography (INEGI) has recently reported a Coincident Index that tries to capture the performance of the unobserved business cycle. For these recessions the turning point dates are: a peak in August 2000 and a trough in September 2003, and a peak in April 2008 and a trough in June 2009, respectively. These dates differ from those reported in Table 1, but they are largely consistent with those obtained when disaggregated measures of output, like industrial or manufacturing production (Mejía and Erquizio, 2012), or employment are used, like in this paper (see below).

recession started earlier in the US, 2007.12, and lasted for 18 months (6 quarters), it was highly synchronized with the Mexican recession.¹⁷

The measures of the Mexican recession depth and steepness, on the other hand, show that the 2008 recession was more severe with output falls and growth rate declines that more than doubled those of the 2001 recession. For example, the GIEA experienced an accumulated fall of 3.5% in the former and a drop of 8.1% over the latter. The corresponding figures for GDP are 2.0 and 6.6%, respectively. Meanwhile, a comparison of the figures of the two involved countries reveal that during the 2001 recession the US GDP actually did not fall at all; instead, it had an accumulated growth equal to 1.8% over the recession period (as dated by the NBER). On the contrary, over the 2008 recession the same variable presented an accumulated drop of 2.3%, a figure that barely exceeds one third of the drop of the Mexican GDP. Thus, it is evident that even if both recessions were originated in the US economy, their effects were magnified when transmitted to the Mexican economy.

Now, as mentioned above, in this paper the recessions and recoveries of the Mexican states are characterized in terms of the dynamics of formal employment not only because of its high degree of co-movement with different business cycle indicators (Mejía, 2003; Antón, 2011), but also due to availability and consistency of data. In fact, formal employment is the only measure related to economic activity available for the whole set of Mexican states and the same time period (1998-2013).

Then, formal employment is defined as the percentage of employed workers who have a job covered by market regulations and social security (pensions and benefits) or the right to a minimum wage;¹⁸ it is classified in permanent and temporary employment. It is said that a worker has a permanent employment when he has a working relationship for an indefinite time period, while he has a temporary employment when that relationship is for a specified

¹⁷ See Mejía and Erquizio (2012) for an analysis of the transmission and effects of these recessions on the Mexican economy.

¹⁸ Formal employment represents around 41% of employed population and is closely related to production with a correlation coefficient between their growth rates equal to 0.75 over the period 1998-2013. In turn, although informal employment share is significant (59% of employed population), available data (for the period 2000-2013) show that it has a low association with output: the correlation between its growth rates and those of the GIEA is equal to 0.28. Furthermore, over the last recession, while the GIEA had an accumulated decline of 8.15%, informal employment presented an accumulated growth of 2.2%. More important, data on informal employment are available at state level only for the period 2010-2014.

activity or time period. Overall, permanent workers earn higher wages, have access to training programs, enjoy annual vacations, receive a year-end bonus and have access to corporate profits, among other employee benefits. In contrast, temporary workers earn lower wages, work for definite (usually short) time periods and do not receive most of these benefits, which generates precarious jobs characterized by high instability and uncertainty.

Between 1997 and 2013, most of total employment, 88.9%, was classified as permanent, while 11% was considered as temporary. In addition, the average growth rates of permanent and total employment were equal to 2.7 and 2.2%, respectively, while the generation of temporary jobs grew at an average rate of 7.1%. Consequently, the temporary employment share in total employment increased from 6.2% in 1997 to 14% fifteen years later, which has implied a reconfiguration of the labor market against worker benefits.¹⁹ Turning point dates for the state employment cycles are identified by using the AKO methodology and fully reported in Appendix 1.²⁰ For illustrative purposes, the business cycle regimes of the national employment are depicted in Graph 1 together with the regimes of the US and the Mexican economies. The vertical black lines indicate the beginning (peaks) and ending (troughs) of US recessions as dated by the NBER, while the vertical gray ones do so for the Mexican recessions, according to the turning points reported by Mejía and Erquizio (2012). In general, the turning points suggested by these authors are very similar to those reported here, although there are some minor differences.²¹

--- Insert Graph 1 about here ---

Several aspects of the business cycle regimes of different employment measures are also depicted in Graph 1, and various aspects can be highlighted. First, the 2001 recession started earlier and lasted for longer in Mexico than in the US, as mentioned above. Second, the 2008 recession was deeper and shorter than the 2001 recession in Mexico. Third, even

¹⁹ Over the period 1997-2013 the standard deviations of the growth rates of total, permanent and temporary employment have been equal to 2.9, 2.5 and 11.7, respectively.

²⁰ Data were obtained from the web site of the Mexican Institute of Social Security (www.imss.gob.mx). The series were seasonally adjusted by using the Census X-12 ARIMA method in *EViews 8.0*.

²¹ Mejía and Erquizio (2012) apply the AKO methodology to the national manufacturing production and identify the following turning points for the analyzed recessions: a peak in August 2000 and a trough in August 2003 and a peak in April 2008 and a trough in May 2009, respectively. These dates are very close to those implied by the Coincident Index of INEGI, but differ from the ones reported in Table 1 obtained by using GDP and the GIEA as measures of output.

if there are some differences, the falls in total, temporary and permanent employment share some similarities over the course of each recession, such as duration and depth.

Graph 1 also presents the performance of employment after the troughs indicating the end of each recession. In general, it is apparent that the growth rates during the first 9 (EG9) and 12 (EG12) months over the course of the recovery as well as the required number of months to get the value at the previous peak (EGR) are greater in the case of the Great Recession, suggesting a negative relationship between the depth of the recession and the average growth rate over the early stages of the recovery. Similar conclusions can be drawn from the figures in Table 1 when comparing the monthly (quarterly) growth rates of the GIEA (GDP) over the first 9, 12 and the number of months (quarters) to get the value at the previous peak that followed the recessions of 2001 and 2008: it is evident that larger falls in output (depth) were followed by greater growth rates over the course of the subsequent recoveries. Nonetheless, a formal estimation of this relationships is required; this is the task to be done next.

3.2. Recession characteristics and recoveries: an econometric estimation

The AKO methodology is applied to identify the business cycle regimes of the 32 Mexican states employment. The resulting turning points and the characteristics of recessions as well as the average growth rates over the early stages of recoveries (EG9, EG12 and EGR) are presented in Appendix 1. A summary of the statistical properties of duration, depth and steepness of recessions and the average growth rates during recoveries is shown in Table 2.

--- Insert Table 1 about here ---

In general, it can be observed that the recession of 2008 was deeper in the average than that of 2001 and also that the average growth rates over the course of the subsequent recoveries were greater in the former case. In particular, there seems to exist a negative relationship between recession depth and steepness and the average growth rates during recoveries in the cases of total and permanent employment in the episodes of 2001 and 2008. Additionally, in the case of total employment, other statistics (such as the minimum and the median of the average growth rate) also show that the most recent recession was more severe and more heterogeneous (standard deviations) across the states, whilst the skewness

and kurtosis reflect the importance of large drops in employment (negative outliers). Furthermore, the statistics of permanent employment show the same pattern but in a more clear-cut fashion.

On the other hand, a less clear picture emerges from the dynamics of temporary employment: its larger drop (as measured by the mean, median and minimum average growth rate) during the 2001 recession (compared with that of 2008) was not followed by greater average growth rates. In addition, its volatility (as measured by its standard deviation) was larger during the 2001 recession and greater than that of total and permanent employment in both recessions. The greater heterogeneity across states during the first recession was also accompanied by larger drops, as suggested by a negative skewness and a kurtosis greater than 3.

On the contrary, this preliminary evidence suggests that longer recessions have not been associated to stronger recoveries. As a matter of fact, the longer 2001 recession was followed by lower average growth rates during the first 9 and 12 months of the recovery, while the shorter 2008 recession was linked to stronger recoveries in the average.

One aspect that calls to our attention is the fact that the average drop of temporary employment was larger during the 2001 recession than during the Great Recession. In fact, given that the former was rather a shallow recession at the national level while the latter has been the deepest recession over the last seventy five years that result seems to be quite surprising. However, it is important to consider that apart from the rigidity that characterizes the Mexican labor market, temporary employment cuts may have been the most important strategy adopted by firms to face not only the international crisis, but also the entry of China into the World Trade Organization in 2001. Therefore, apparently firms have adopted the substitution of permanent by temporary employment as a strategy to gain competitiveness since the Great Recession.

The effects of recession characteristics on growth over the subsequent recoveries are estimated by ordinary least squares on the basis of Models A and B specified in expressions (3) and (4), respectively. The results are reported in Tables 3 to 5 and the final estimated models have been tested for an adequate specification: normality (Jarque-Bera) and heteroskedasticity (Breusch-Pagan-Godfrey and White) statistic tests have been estimated

for each model; the corresponding p -values are reported in the same tables. In general, there is no evidence of specification problems, although it has been necessary to correct some models for non-normality caused by the existence of some large positive residuals (outliers) that deliver leptokurtic and positively skewed distributions. The problem was worked out by introducing dummies for the specific states associated to large residuals (greater than 3 standard deviation); the estimated coefficients of the dummy variables were always positive and statistically significant (see notes at the bottom of tables for details).²²

In general, although the explanatory power of the econometric models is highly variable, as measured by the determination coefficients \bar{R}^2 , the results show that recession depth and steepness are significantly associated to the early recoveries average growth rates of employment in the Mexican states in several cases, as implied by the theoretical models presented in section 1. Indeed, the corresponding estimates have the correct sign in most models and are statistically significant in a number of cases. Specifically, in Model A, depth contributes to explain growth rates in the early recoveries (EG9 and EG12) that followed the 2001 recession in all cases at least at 5% of significance, except in the case of EG9 of temporal employment. In turn, the contribution of depth to explain the recoveries that followed the 2008 recession is lower. In fact, its estimated coefficients are only significant in the cases of EG9 for total and temporary employment and EG12 for permanent employment (see Tables 3, 4 and 5).

A comparison of the magnitudes of the estimated statistically significant coefficients shows that temporary employment seems to be more sensitive to recession depths than the other types of employment regardless the recession in question. In turn, the recession depth effects on the employment recovery were larger after the 2008 recession only in the case of temporary employment (EG9), since in the other two cases the estimated coefficients were lower or similar. These results are not surprising at all and may be reflecting the fact that firms can adjust more easily temporary employment as a function of the business cycle phase the economy is.

²² Some states did not experienced output drops during recessions (as seen in Appendix 1), but they were not excluded to gain degrees of freedom in the estimation process. Furthermore, Models A and B were also estimated without those states; the results are largely robust and are available upon request.

On the other hand, in Model B, steepness is significant in explaining the recoveries of total employment over the three time horizons under consideration (Table 5), but only in very early recoveries (EG9) of permanent and temporary employment (Tables 3 and 4) after the first recession of this century: the estimated coefficients are negative and statistically significant. Regarding the 2008 recession, the effects of steepness are significant only in the models of EG9 and EG12 of permanent employment (Table 3), but not in the other cases, although the estimated coefficients are negative in general. Once again, a comparison of the statistically significant estimates of the steepness coefficients shows that they are greater in the model of temporary employment (-0.252) than those of the models of total and permanent employment (-0.196 and -0.154, respectively), which simply shows the higher flexibility of the former. Whilst, the coefficient of steepness in the model of EG9 following the 2008 recession is greater than the corresponding coefficient for the previous recession (-0.254 versus -0.154, respectively, as seen in Table 3), which suggest a stronger relationship over the Great Recession. Notice that the results obtained when using depth as an explanatory variable can differ from those got when steepness enters in the models given that although they may be correlated they are not actually identical.

Finally, the duration of recessions seems to play no role in the growth of state employment over the subsequent recoveries. In fact, the estimated coefficients of duration have the wrong sign in many cases, but they are not statistically significant. Therefore, in general, the severity of prior recessions, as measured by their depth and steepness, seems to play some role in explaining employment growth over the subsequent early recoveries, especially that following the 2001 recession.

Finally, the effects of other shocks seem to have played a significant role in several cases. In particular, both in Model A and Model B, the effects of the tradable goods sector growth rate are not significant (or have the unexpected sign) in most cases modelling the recoveries following the 2001 recession. Therefore, we conclude that its effects are not robust. On the contrary, in models of total and permanent employment (Tables 3 and 5), the tradable goods sector has robust positive and significant (at least at 5% of significance) effects that reflect the important role of the external demand in the recovery from the Great Recession,

which has been recognized in several papers.²³ Analogously, the fiscal policy seems to have no robust effects on the recoveries following the 2001 recession: the sign and statistical significance of the estimated coefficients vary notably across models. Yet, when depth enters the models, federal government expenditure has a significant negative relationship with total employment recovery, suggesting that the latter grew faster over the early months of the recovery where the former actual decline or grew slower. Interestingly, although the estimated coefficients were largely non significant, their sign is negative in most cases. Therefore, it can be conjectured that the fiscal policy followed by the federal government did not contribute to the recovery from the 2008 recession at states level, but the external demand was the most important driving-force.

To summarize, regarding the relationship between recessions severity and early recoveries, our results are consistent with those reported by Wynne and Balke (1992) and Balke and Wynne (1996), who find a negative relationship between recessions depth and growth over the early recoveries for the US and the G-7 countries, although we also estimate a negative association to steepness. Nonetheless, all this evidence is consistent with the idea that more severe recessions are followed by stronger recoveries and provides some support to the “bounce-back effect, the “plucking” and other models.

Conclusions

This paper has tested the “bounce-back” effect hypothesis of Friedman (1969, 1993). The basic idea is that deeper, steeper and/or longer recessions are followed by stronger recoveries due to a self-corrective response of the system to low economic activity. Thus, we have analyzed the effects of prior recessions on subsequent recoveries for total, permanent and temporary employment of the Mexican states by using the models proposed by Wynne and Balke (1992) and Balke and Wynne (1995), which have been extended to take into account the effects of the external demand and possible countercyclical fiscal policies. The effects of the two most recent international recessions (2001 and 2008-2009) are considered.

²³ See Mejía and Erquizio (2010) and references there in.

State recessions and recoveries are dated by using a classical business cycles approach, which allows us to characterize the former in terms of their steepness, depth and duration and to measure growth over the first 9 and 12 months of the subsequent recoveries as well as over the needed number of months to get the value at the prior peak of employment. Two econometric model specifications have been estimated for each type of employment including depth and duration (Model A) and steepness (Models B) as explanatory variables plus a measure of the growth of the tradable goods sector and federal government expenditure. Some models have been corrected to overcome specification problems.

Our results suggest that the severity of output drops over the recessions play a relevant role in the explanation of growth over the subsequent recoveries. In general, for both kinds of models and for all the average growth rates of recoveries (of different length), the estimated coefficients are negative and significant in practically all cases. In particular, depth seems to be more important in the employment recovery that followed the 2001 recession, but less significant over the one following the next recession. In turn, steepness played a rather similar role, except that in the case of temporary employment its effects were not significant. Duration does not have any effect.

Regarding the effects of other shocks pulling the economy out the recession, our results suggest that the fiscal policy followed by the federal government has not contributed to the recovery from the 2008 recession at states level, but the external demand was the most important driving-force. These variables had no effects on the recovery following the 2001 recession.

In general, the evidence reported in this paper is consistent with the implications of different models that try to explain the “bounce-back” effect and provides some support to the hypothesis that deeper or steeper recessions are followed by stronger recoveries in the Mexican states.

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Table 1. Characteristics of recessions and recoveries of Mexican production

GIEA						GDP					
Recession			Recovery*			Recession			Recovery*		
Depth	Steepness	Duration	EG9	EG12	EGR	Depth	Steepness	Duration	EG3T	EG4T	EGRT
1995						1995					
-10.060	-1.503	7	0.708	0.619	0.629	-8.120	-2.783	3	1.694	1.658	1.876
2001						2001					
-3.482	-0.221	16	0.329	0.205	0.211	-1.969	-0.331	6	0.563	0.476	0.615
2008						2008					
-8.152	-0.770	11	0.611	0.641	0.575	-6.658	-1.708	4	1.685	1.606	1.467

* Average growth rates. GIEA stands for the (monthly) Global Index of Economic Activity and GDP for (quarterly) Gross Domestic Product. In turn, EG9 (EG3T) and EG12 (EG4T) represent the average growth rates during the first 9 (3) and 12 (4) months (quarters) over the course of the subsequent recoveries and EGR (EGRT) is the average growth rates over the required number of months (quarters) to get de value of the previous peak. The peak dates of the recessions of 1995, 2001 and 2008 are 1994/10 (1994-IV), 2000/09 (2000-III) and 20008/06 (2008-II), respectively.

Source: Own calculations using data from INEGI.

Table 2. Characteristics of recessions and employment recoveries in the Mexican states

	2001						2008					
	Recession			Recovery*			Recession			Recovery*		
	Depth	Steepness	Duration	EG9	EG12	EGR	Depth	Steepness	Duration	EG9	EG12	EGR
Total Employment												
Mean	-4.890	-0.334	17.281	0.359	0.325	0.317	-5.546	-0.483	12.594	0.439	0.436	0.436
Median	-3.175	-0.298	13.500	0.298	0.216	0.247	-4.541	-0.449	10.000	0.424	0.419	0.377
Maximum	0.000	0.000	40.000	1.670	1.307	1.005	0.000	0.000	55.000	0.904	0.869	0.889
Minimum	-15.775	-1.793	0.000	0.094	0.031	0.072	-15.860	-0.979	0.000	0.085	0.138	0.187
Std. Dev.	4.020	0.318	12.967	0.303	0.281	0.223	4.248	0.275	11.097	0.198	0.185	0.187
Skewness	-1.097	-3.063	0.333	2.869	2.055	1.485	-0.993	-0.138	2.341	0.485	0.645	0.782
Kurtosis	3.465	14.977	1.634	12.416	7.069	4.801	3.182	2.076	9.182	2.824	3.089	2.732
Jarque-Bera	0.035	0.000	0.214	0.000	0.000	0.000	0.071	0.538	0.000	0.523	0.328	0.187
Permanent Employment												
Mean	-4.045	-0.277	16.063	0.261	0.251	0.246	-5.113	-0.390	12.281	0.361	0.340	0.398
Median	-2.219	-0.165	11.000	0.193	0.193	0.206	-3.861	-0.340	12.000	0.344	0.305	0.316
Maximum	0.000	0.000	54.000	0.649	0.578	0.635	0.000	0.000	52.000	0.722	0.735	1.401
Minimum	-16.126	-2.481	0.000	0.054	0.038	-0.015	-19.005	-0.991	0.000	0.020	0.031	0.031
Std. Dev.	4.526	0.465	15.964	0.163	0.145	0.148	4.637	0.258	9.736	0.171	0.167	0.288
Skewness	-1.130	-3.628	0.663	1.001	0.758	0.605	-1.297	-0.410	2.014	0.321	0.386	1.938
Kurtosis	3.343	17.125	2.150	2.828	2.526	2.881	4.266	2.617	9.823	2.754	2.942	6.684
Jarque-Bera	0.031	0.000	0.192	0.068	0.186	0.374	0.004	0.579	0.000	0.730	0.670	0.000
Temporary Employment												
Mean	-23.227	-1.403	23.500	1.246	1.075	1.071	-14.492	-1.258	14.813	1.221	1.254	1.431
Median	-21.644	-1.247	18.500	0.933	0.975	0.998	-14.512	-1.288	12.000	1.087	1.167	1.114
Maximum	0.000	0.000	59.000	3.157	2.517	2.554	0.000	0.000	42.000	3.227	3.227	4.625
Minimum	-52.466	-4.498	0.000	0.443	0.059	0.195	-30.345	-3.176	0.000	0.017	0.420	0.311
Std. Dev.	10.509	0.884	14.431	0.655	0.587	0.631	7.771	0.764	9.885	0.779	0.632	1.002
Skewness	-0.818	-1.469	0.513	1.020	0.402	0.916	-0.245	-0.852	0.977	0.721	1.317	1.704
Kurtosis	4.490	5.977	2.334	3.467	2.478	2.960	2.176	3.378	3.422	3.386	4.675	5.491
Jarque-Bera	0.038	0.000	0.369	0.054	0.542	0.107	0.542	0.131	0.070	0.226	0.002	0.000

* Average growth rates. See footnotes of Table 1 for the notation regarding recoveries.

Source: own calculations on the basis of data of IMSS.

Table 3. Effects of recession characteristics on permanent employment recoveries in the Mexican states

MODEL A						
	2001			2008		
	EG9	EG12	EGR	EG9	EG12	EGR
Intercept	0.220 (0.000)	0.222 (0.000)	0.252 (0.000)	0.305 (0.000)	0.245 (0.000)	0.202 (0.000)
Duration	-0.005 (0.032)	-0.004 (0.144)	0.002 (0.451)	-0.001 (0.788)	-0.004 (0.310)	0.000 (0.970)
Depth	-0.025 (0.002)	-0.018 (0.040)	0.012 (0.125)	-0.010 (0.306)	-0.019 (0.017)	-0.006 (0.299)
SB	-0.026 (0.002)	-0.019 (0.021)	-0.012 (0.108)	0.011 (0.006)	0.015 (0.000)	0.014 (0.000)
GF	0.009 (0.073)	0.008 (0.137)	0.004 (0.467)	-0.008 (0.249)	-0.011 (0.044)	-0.002 (0.650)
\bar{R}^2	0.374	0.176	0.230	0.223	0.589	0.915
Jarque-Bera	0.430	0.892	0.661	0.191	0.607	0.159
Breusch-Pagan test	0.773	0.439	0.069	0.346	0.508	0.593
Degree of freedom	27	27	26	27	26	23
MODEL B						
	2001			2008		
	EG9	EG12	EGR	EG9	EG12	EGR
Intercept	0.200 (0.000)	0.219 (0.000)	0.226 (0.000)	0.279 (0.000)	0.223 (0.000)	0.208 (0.000)
Steepness	-0.154 (0.004)	-0.061 (0.264)	-0.065 (0.238)	-0.183 (0.094)	-0.192 (0.031)	-0.096 (0.213)
SB	-0.025 (0.132)	-0.019 (0.031)	-0.013 (0.124)	0.010 (0.007)	0.014 (0.000)	0.015 (0.000)
GF	0.007 (0.132)	0.007 (0.201)	0.004 (0.464)	-0.009 (0.194)	-0.011 (0.070)	-0.003 (0.624)
\bar{R}^2	0.371	0.109	0.031	0.342	0.546	0.887
Jarque-Bera	0.435	0.927	0.814	0.385	0.774	0.378
Breusch-Pagan test	0.200	0.063	0.052	0.240	0.371	0.461
Degree of freedom	28	28	28	28	27	25

Figures in parenthesis are *p*-values. The number of observations is 32 in all models. See footnotes of Table 1 for the notation regarding recoveries. Several models include dummies for states having large residuals (outliers) that cause non-normality. The list of states for which a dummy was included by model, recession and explained variable is as follows: Model A. Recession 2001: EGR, Quintana Roo. Recession 2008: EG12, Campeche; EGR, Campeche, Colima, Nayarit and Queretaro. Model B. Recession 2008: EG9, Queretaro; EG12, Campeche; EGR, Campeche, Colima, Nayarit. Model A for EG9 after the 2001 recession includes White heteroskedasticity consistent standard errors and covariance.

Table 4. Effects of recession characteristics on temporary employment recoveries in the Mexican states

MODEL A						
	2001			2008		
	EG9	EG12	EGR	EG9	EG12	EGR
Intercept	0.486 (0.074)	0.610 (0.023)	0.706 (0.011)	0.948 (0.006)	0.947 (0.000)	1.590 (0.000)
Duration	-0.005 (0.634)	-0.012 (0.213)	0.004 (0.678)	-0.027 (0.132)	-0.011 (0.371)	-0.023 (0.250)
Depth	-0.039 (0.07)	-0.032 (0.018)	-0.008 (0.535)	-0.046 (0.067)	-0.028 (0.104)	-0.006 (0.814)
SB	-0.004 (0.927)	0.016 (0.676)	0.001 (0.978)	-0.017 (0.432)	-0.008 (0.605)	0.004 (0.858)
GF	-0.003 (0.865)	0.000 (0.988)	0.001 (0.972)	-0.001 (0.987)	-0.004 (0.854)	-0.023 (0.512)
\bar{R}^2	0.215	0.107	0.259	0.010	0.275	0.280
Jarque-Bera	0.244	0.784	0.129	0.269	0.134	0.000
Breusch-Pagan-Godfrey	0.412	0.977	0.895	0.700	0.700	0.740
Degree of freedom	27	27	25	27	26	26
MODEL B						
	2001			2008		
	EG9	EG12	EGR	EG9	EG12	EGR
Intercept	0.634 (0.000)	0.770 (0.001)	1.142 (0.000)	0.954 (0.001)	1.094 (0.000)	1.051 (0.000)
Steepness	-0.254 (0.005)	-0.183 (0.156)	0.076 (0.52)	-0.153 (0.337)	-0.045 (0.677)	-0.028 (0.788)
SB	-0.002 (0.956)	0.028 (0.438)	-0.017 (0.665)	-0.008 (0.691)	0.000 (0.989)	0.00 (0.629)
GF	0.024 (0.070)	0.015 (0.434)	0.003 (0.881)	0.002 (0.947)	-0.013 (0.507)	-0.018 (0.351)
\bar{R}^2	0.669	0.106	0.078	0.140	0.408	0.796
Jarque-Bera	0.654	0.705	0.147	0.413	0.19	0.471
Breusch-Pagan test	0.687	0.623	0.698	0.914	0.902	0.835
Degree of freedom	24	28	27	27	26	23

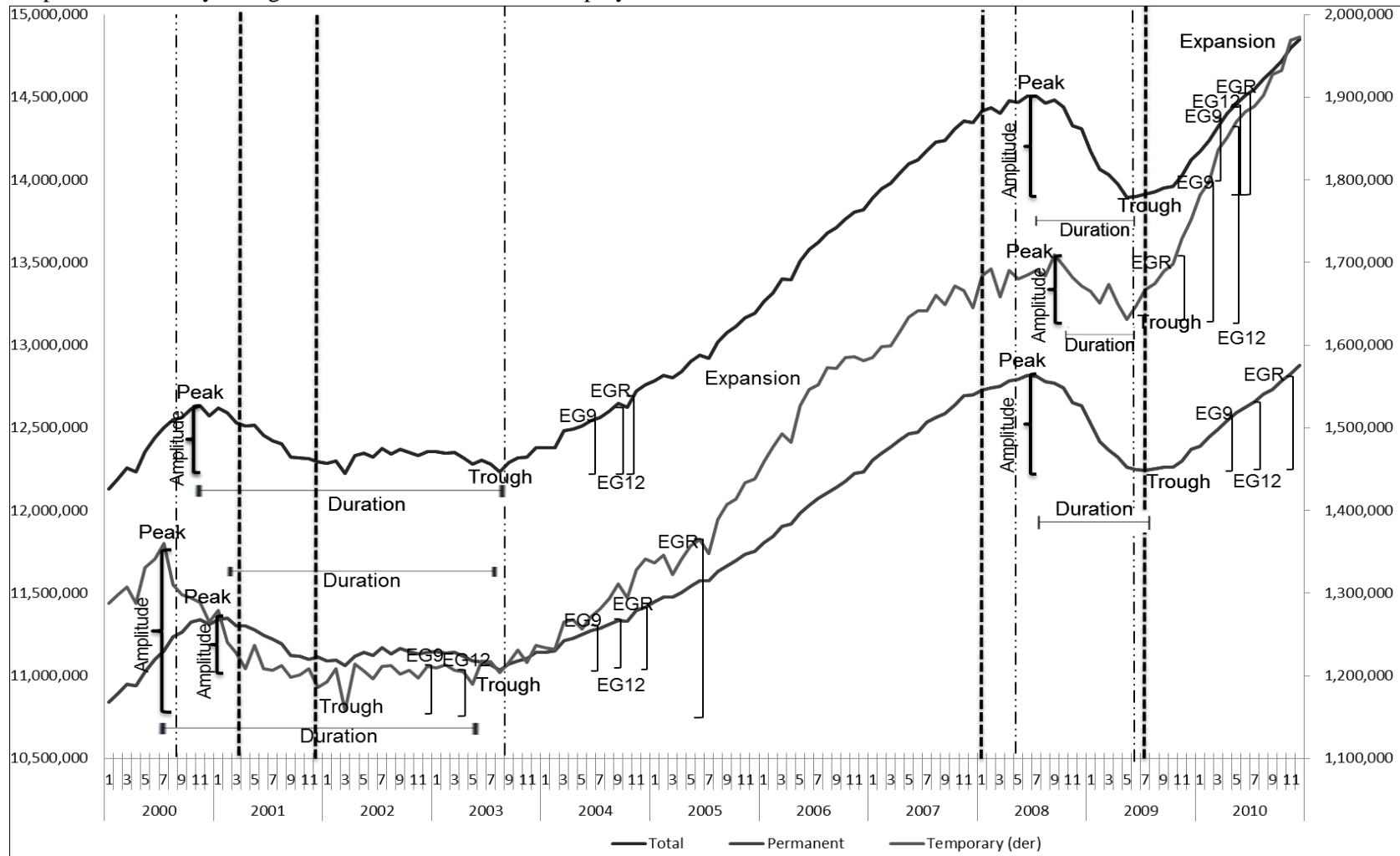
Figures in parenthesis are *p*-values. The number of observations is 32 in all models. See footnotes of Table 1 for the notation regarding recoveries. Several models include dummies for states having large residuals (outliers) that cause non-normality. The list of states for which a dummy was included by model, recession and explained variable is as follows: Model A. Recession 2001: EGR, Aguascalientes and Tabasco. Recession 2008: EG12, Tlaxcala; EGR, Colima. Model B. Recession 2001: EG9, Durango, Quintana Roo, Sinaloa and Tabasco; EGR, Aguascalientes. Recession 2008: EG9, Tlaxcala; EG12, Chihuahua and Tlaxcala; EGR, Chihuahua, Colima, Michoacan, Quintana Roo and Tlaxcala.

Table 5. Effects of recession characteristics on total employment recoveries in the Mexican states

MODEL A						
	2001			2008		
	EG9	EG12	EGR	EG9	EG12	EGR
Intercept	0.216 (0.000)	0.187 (0.000)	0.304 (0.000)	0.289 (0.000)	0.314 (0.000)	0.415 (0.000)
Duration	0.000 (0.967)	-0.000 (0.921)	-0.004 (0.211)	0.004 (0.174)	0.003 (0.268)	-0.001 (0.891)
Depth	-0.021 (0.026)	-0.022 (0.023)	-0.004 (0.688)	-0.017 (0.052)	-0.013 (0.122)	-0.007 (0.484)
SB	-0.007 (0.468)	-0.028 (0.016)	0.007 (0.554)	0.012 (0.001)	0.013 (0.001)	0.006 (0.162)
GF	-0.010 (0.088)	-0.011 (0.068)	0.003 (0.627)	-0.016 (0.019)	-0.014 (0.029)	-0.015 (0.060)
\bar{R}^2	0.807	0.753	0.613	0.438	0.413	0.199
Jarque-Bera	0.926	0.526	0.256	0.887	0.938	0.411
Breusch-Pagan test	0.144	0.314	0.425	0.922	0.653	0.533
Degree of freedom	25	24	24	27	27	26
MODEL B						
	2001			2008		
	EG9	EG12	EGR	EG9	EG12	EGR
Intercept	0.230 (0.000)	0.210 (0.000)	0.222 (0.000)	0.347 (0.000)	0.378 (0.000)	0.388 (0.000)
Steepness	-0.196 (0.020)	-0.157 (0.048)	-0.152 (0.048)	-0.151 (0.206)	-0.055 (0.592)	-0.131 (0.267)
SB	-0.008 (0.399)	-0.004 (0.704)	0.009 (0.376)	0.011 (0.009)	0.011 (0.006)	0.007 (0.073)
GF	-0.003 (0.530)	-0.002 (0.586)	-0.002 (0.624)	-0.010 (0.190)	-0.008 (0.225)	-0.015 (0.050)
\bar{R}^2	0.797	0.776	0.659	0.203	0.315	0.134
Jarque-Bera	0.372	0.580	0.266	0.717	0.277	0.447
Breusch-Pagan test	0.938	0.756	0.448	0.622	0.976	0.297
Degree of freedom	26	25	25	28	27	28

Figures in parenthesis are *p*-values. The number of observations is 32 in all models. See footnotes of Table 1 for the notation regarding recoveries. Several models include dummies for states having large residuals (outliers) that cause non-normality. The list of states for which a dummy was included by model, recession and explained variable is as follows: Model A. Recession 2001: EG9, Aguascalientes and Campeche; EG12, Aguascalientes, Campeche and Colima; EGR, Sinaloa. Recession 2008: EGR, Queretaro. Model B. Recession 2001: EG9, Aguascalientes and Campeche; EG12, Aguascalientes, Campeche and Nayarit; EGR, Sinaloa. Recession 2008: EG12, Queretaro.

Graph 1. Business cycle regimens of different Mexican employment indicators



See footnotes of Table 1 for the notation regarding recoveries.
 Source: own elaboration with information of the IMSS.

Appendix 1. Classical business cycles chronology and regime characteristics of employment in the Mexican states

Total Employment

States	2001									2008								
	Peak	Trough	Duration	Depth	Steepness	Recovery*				Peak	Trough	Duration	Depth	Steepness	Recovery*			
						EG9	EG12	EGR (**)	(#)						EG9	EG12	EGR (**)	(#)
NAC	2000/11	2003/08	32	-3.149	-0.100	0.247	0.247	0.291	(4)	2008/07	2009/05	10	-4.208	-0.429	0.273	0.333	0.334	(13)
AGS	2001/02	2002/03	13	-4.676	-0.368	1.670	1.307	0.171	(35)	2007/11	2009/06	19	-7.020	-0.382	0.511	0.436	0.319	(24)
BC	2000/11	2003/05	30	-9.092	-0.317	0.339	0.440	0.400	(24)	2008/01	2009/06	17	-11.764	-0.734	0.427	0.349	0.316	(40)
BCS	2001/08	2002/03	7	-4.677	-0.682	0.220	0.136	0.283	(22)	2008/05	2009/10	17	-14.442	-0.913	0.214	0.138	0.254	(39)
CAM	1999/08	2000/04	8	-3.167	-0.401	1.004	1.078	0.854	(4)	2009/06	2010/01	7	-4.678	-0.682	0.413	0.444	0.455	(11)
CHIS	2000/09	2001/02	5	-3.082	-0.624	0.151	0.186	0.213	(15)	2006/09	2006/12	3	-1.622	-0.544	0.173	0.151	0.227	(8)
CHIH	2000/10	2003/05	31	-15.775	-0.552	0.201	0.202	0.125	(116)	2007/08	2009/05	21	-15.860	-0.819	0.570	0.610	0.394	(44)
COA	2000/11	2003/08	33	-8.807	-0.279	0.301	0.230	0.233	(54)	2008/06	2009/06	12	-10.332	-0.905	0.797	0.818	0.798	(14)
COL	2002/04	2003/03	11	-2.852	-0.263	0.423	0.389	0.602	(6)	2008/06	2009/05	11	-2.371	-0.218	0.382	0.477	0.780	(4)
DF	2000/08	2003/08	36	-2.798	-0.079	0.196	0.176	0.177	(17)	2008/10	2009/11	13	-3.746	-0.293	0.313	0.352	0.352	(12)
DGO	2000/10	2003/08	34	-13.224	-0.416	0.510	0.449	0.170	(87)	2008/02	2009/07	17	-4.404	-0.265	0.494	0.357	0.360	(13)
GTO	2001/02	2001/09	7	-0.769	-0.110	0.114	0.186	0.262	(3)	2008/06	2009/05	11	-2.822	-0.260	0.532	0.515	0.474	(7)
GRO	2001/02	2002/04	14	-4.698	-0.343	0.164	0.113	0.264	(19)	2008/07	2012/02	43	-4.739	-0.113	0.279	0.198	0.198	(11)
HGO	2001/05	2003/08	27	-5.700	-0.217	0.419	0.242	0.170	(35)	2008/10	2009/09	11	-6.172	-0.577	0.343	0.420	0.478	(14)
JAL	2000/11	2001/11	12	-2.435	-0.205	0.131	0.150	0.112	(26)	2008/09	2009/05	8	-2.504	-0.316	0.224	0.294	0.258	(10)
MEX	2001/01	2003/08	31	-3.653	-0.120	0.094	0.135	0.147	(27)	2008/09	2009/07	10	-4.246	-0.433	0.450	0.442	0.464	(10)
MICH		2003/08 ⁺	0			0.182	0.147	0.147	(12)		2009/05 ⁺	0			0.236	0.334	0.334	(12)
MOR	2000/05	2002/11	30	-2.619	-0.088	0.197	0.191	0.207	(16)	2009/05	2010/03	7	-2.572	-0.372	0.322	0.370	0.322	(9)
NAY	2001/08	2002/05	16	-6.107	-0.393	0.413	0.791	0.709	(11)	2008/07	2009/05	10	-6.302	-0.649	0.609	0.530	0.530	(13)
NL	2000/11	2001/03	16	-2.897	-0.184	0.223	0.197	0.120	(26)	2008/09	2009/05	8	-6.042	-0.776	0.420	0.493	0.483	(13)
OAX		2003/08 ⁺	0			0.296	0.263	0.263	(12)		2009/05 ⁺	0			0.085	0.187	0.187	(12)
PUE	2000/10	2004/02	40	-8.235	-0.215	0.249	0.249	0.161	(55)	2008/09	2009/02	5	-3.135	-0.635	0.160	0.226	0.271	(13)
QRO	2001/01	2001/09	8	-3.183	-0.403	0.314	0.280	0.430	(10)	2008/09	2009/07	10	-5.356	-0.549	0.904	0.869	0.889	(7)
QROO	2001/08	2001/11	3	-5.283	-1.793	0.564	0.582	0.503	(11)	2008/09	2009/06	9	-8.476	-0.979	0.503	0.418	0.300	(30)
SLP	2002/07	2003/11	16	-2.063	-0.130	0.396	0.437	0.445	(5)	2008/05	2009/10	17	-4.833	-0.291	0.662	0.648	0.694	(8)
SIN	2003/06	2004/02	8	-1.965	-0.248	0.505	0.404	1.005	(2)	2008/11	2009/06	7	-3.986	-0.579	0.482	0.360	0.596	(7)
SON	2000/11	2003/02	27	-11.288	-0.443	0.243	0.169	0.448	(28)	2008/01	2009/07	18	-8.053	-0.465	0.694	0.651	0.584	(15)
TAB	2000/11	2001/07	8	-2.906	-0.368	0.126	0.031	0.202	(16)	2008/12	2009/05	5	-1.617	-0.326	0.281	0.320	0.514	(4)
TAM	2000/11	2003/08	33	-7.587	-0.239	0.365	0.373	0.374	(22)	2008/04	2009/07	15	-9.994	-0.699	0.398	0.411	0.238	(42)
TLAX	2000/11	2004/02	39	-12.543	-0.343	0.621	0.496	0.109	(107)	2005/01	2009/08	55	-14.861	-0.292	0.828	0.822	0.527	(31)
VER	2001/11	2002/05	6	-3.090	-0.522	0.410	0.125	0.410	(8)	2009/07	2009/09	2	-1.881	-0.945	0.540	0.436	0.718	(3)
YUC		2003/08 ⁺	0			0.147	0.072	0.072	12	2008/08	2009/05	9	-2.768	-0.311	0.328	0.326	0.328	(9)
ZAC	2003/04	2003/08	4	-1.304	-0.328	0.308	0.175	0.351	4	2008/08	2009/04	6	-0.866	-0.145	0.472	0.558	0.312	(3)

* Average growth rates. **Recovery periods. + National trough. The national trough is used to define the beginning of the recovery when the state did not experience a fall in employment. See footnotes of Table 1 for the notation regarding recoveries.

Permanent Employment

2001									2008									
States	Peak	Trough	Duration	Depth	Steepness	Recovery*			Peak	Trough	Duration	Depth	Steepness	Recovery*				
						EG9	EG12	EGR (**)						EG9	EG12	EGR (**)		
NAC	2001/02	2003/08	30	-2.790	-0.094	0.217	0.209	0.215	(15)	2008/06	2009/07	13	-4.475	-0.352	0.272	0.279	0.292	(16)
AGS	2001/02	2003/08	30	-4.824	-0.165	0.114	0.164	0.326	(18)	2008/07	2009/08	13	-6.245	-0.495	0.505	0.383	0.276	(24)
BC	2000/11	2003/08	33	-10.127	-0.323	0.627	0.578	0.428	(27)	2008/01	2009/07	18	-11.645	-0.685	0.405	0.378	0.318	(40)
BCS	2001/07	2001/11	4	-2.964	-0.749	0.227	0.201	0.152	(23)	2008/05	2010/04	23	-11.292	-0.520	0.089	0.092	0.223	(33)
CAM		2003/08 ⁺	0			0.383	0.388	0.388	(12)	2009/07	2010/02	7	-2.013	-0.290	0.632	0.563	1.401	(2)
CHIS		2003/08 ⁺	0			0.337	0.305	0.305	(12)		2009/07 ⁺	0			0.410	0.426	0.426	(12)
CHIH	2000/10	2003/08	34	-16.126	-0.516	0.174	0.146	0.090	(113)	2007/10	2009/06	20	-15.773	-0.855	0.514	0.504	0.338	(43)
COA	2000/11	2002/03	16	-5.528	-0.355	0.163	0.055	0.098	(59)	2008/06	2009/06	12	-11.259	-0.991	0.704	0.735	0.709	(17)
COL		2003/08 ⁺	0			0.490	0.404	0.404	(12)	2008/07	2008/09	2	-1.684	-0.845	0.154	0.137	0.936	(2)
DF	2000/11	2003/08	33	-3.018	-0.093	0.157	0.114	0.151	(22)	2008/07	2009/11	16	-5.220	-0.335	0.230	0.257	0.257	(22)
DGO	2000/11	2001/10	11	-11.441	-1.098	0.520	0.416	0.104	(118)	2008/01	2009/07	18	-4.505	-0.256	0.358	0.242	0.278	(17)
GTO		2003/08 ⁺	0			0.138	0.189	0.189	(12)	2008/07	2009/05	10	-2.617	-0.265	0.422	0.427	0.371	(8)
GRO	2001/04	2002/04	12	-2.271	-0.191	0.111	0.038	0.089	(27)	2008/08	2010/09	25	-3.178	-0.129	0.265	0.079	0.060	(28)
HGO	2001/03	2005/09	54	-8.325	-0.161	0.172	0.249	0.324	(27)	2008/07	2009/07	12	-5.012	-0.428	0.373	0.252	0.316	(17)
JAL	2001/02	2001/11	9	-1.596	-0.179	0.054	0.087	0.080	(25)	2008/07	2009/08	14	-2.948	-0.213	0.316	0.296	0.306	(10)
MEX	2001/02	2004/02	36	-3.851	-0.109	0.185	0.187	0.165	(25)	2008/07	2009/08	13	-5.061	-0.399	0.232	0.282	0.300	(18)
MICH		2003/08 ⁺	0			0.208	0.254	0.254	(12)		2009/07 ⁺	0			0.264	0.253	0.253	(12)
MOR	2001/08	2002/11	15	-1.186	-0.080	0.093	0.129	0.163	(10)	2008/08	2009/09	13	-2.433	-0.189	0.285	0.312	0.285	(9)
NAY	1999/02	2002/04	38	-8.480	-0.233	0.473	0.535	0.475	(19)	2008/07	2009/09	14	-3.470	-0.252	0.644	0.527	1.081	(4)
NL	2001/02	2002/03	13	-2.166	-0.168	0.142	0.117	0.078	(29)	2008/07	2009/07	12	-5.753	-0.493	0.464	0.421	0.429	(14)
OAX		2003/08 ⁺	0			0.120	0.179	0.179	(12)		2009/07 ⁺	0			0.020	0.031	0.031	(12)
PUE	2000/10	2004/02	40	-8.552	-0.223	0.175	0.174	0.109	(84)	2008/10	2009/08	10	-3.021	-0.306	0.320	0.326	0.317	(10)
QRO	2001/02	2002/01	11	-1.372	-0.126	0.169	0.198	0.366	(4)	2008/07	2009/07	12	-5.650	-0.483	0.722	0.697	0.722	(9)
QROO	2001/08	2001/10	2	-4.900	-2.481	0.649	0.418	0.635	(8)	2008/11	2009/11	12	-7.047	-0.607	0.128	0.120	0.150	(38)
SLP	2001/06	2001/09	3	-1.013	-0.339	0.214	0.246	0.187	(7)	2008/07	2009/08	13	-4.251	-0.334	0.491	0.488	0.491	(9)
SIN	2003/01	2003/08	7	-0.669	-0.096	0.160	0.178	0.239	(3)	2008/09	2009/05	8	-1.337	-0.168	0.186	0.227	0.186	(9)
SON	2000/11	2003/02	27	-8.816	-0.341	0.131	0.187	0.289	(32)	2008/04	2009/05	13	-7.826	-0.625	0.499	0.525	0.493	(17)
TAB		2003/08 ⁺	0			0.395	0.504	0.504	(12)		2009/07 ⁺	0			0.329	0.289	0.289	(12)
TAM	2001/01	2003/08	31	-5.643	-0.187	0.377	0.356	0.372	(16)	2008/04	2009/07	15	-10.040	-0.703	0.380	0.360	0.216	(42)
TLAX	2000/10	2004/03	41	-14.528	-0.382	0.507	0.492	-0.015	(106)	2005/04	2009/08	52	-19.005	-0.405	0.275	0.297	0.322	(41)
VER	2001/11	2002/05	6	-0.717	-0.120	0.249	0.188	0.319	(3)	2009/07	2009/09	2	-1.234	-0.619	0.289	0.269	0.331	(5)
YUC		2003/08 ⁺	0			0.202	0.211	0.211	(12)	2008/10	2009/06	8	-2.042	-0.258	0.270	0.249	0.279	(8)
ZAC	2003/01	2003/09	8	-1.311	-0.165	0.239	0.150	0.200	(7)	2008/10	2009/04	6	-2.057	-0.346	0.368	0.422	0.334	(7)

* Average growth rates. **Recovery periods. ⁺ National trough. The national trough is used to define the beginning of the recovery when the state did not experience a fall in employment. See footnotes of Table 1 for the notation regarding recoveries.

Temporary Employment

2001										2008								
States	Peak	Trough	Duration	Depth	Steepness	Recovery*				Peak	Trough	Duration	Depth	Steepness	Recovery*			
						EG9	EG12	EGR (**)	EG9						EG12	EGR (**)		
NAC	2000/07	2002/03	20	-14.838	-0.800	0.502	0.345	0.422	(39)	2008/09	2009/05	8	-4.593	-0.586	1.086	1.145	0.974	(6)
AGS	2001/02	2001/12	10	-8.003	-0.831	0.731	0.524	2.554	(4)	2007/07	2009/02	19	-25.636	-1.547	1.036	1.158	1.106	(27)
BC	2000/06	2001/12	18	-34.570	-2.329	1.388	1.498	1.096	(40)	2006/12	2009/11	35	-23.171	-0.750	0.030	1.389	1.121	(25)
BCS	2000/12	2002/03	15	-21.876	-1.632	0.599	0.333	0.988	(27)	2007/10	2009/09	23	-26.532	-1.332	0.573	0.855	0.474	(40)
CAM	1999/08	2000/04	8	-21.020	-2.907	2.009	1.790	0.496	(48)	2009/06	2010/08	14	-16.886	-1.312	0.503	0.726	0.804	(25)
CHIS	2000/09	2001/10	13	-30.263	-2.735	0.786	0.813	0.656	(56)	2006/07	2008/04	21	-30.345	-1.707	1.406	1.179	1.143	(32)
CHIH	2000/06	2002/03	21	-24.671	-1.340	1.166	1.085	1.352	(24)	2007/08	2009/05	21	-23.450	-1.264	2.753	2.608	2.512	(11)
COA	2000/11	2003/09	34	-23.929	-0.801	0.865	0.768	1.015	(28)	2008/07	2009/05	10	-11.454	-1.209	1.647	1.806	2.151	(6)
COL	2002/04	2003/03	11	-16.330	-1.608	0.798	0.539	0.366	(49)	2007/04	2009/05	25	-16.505	-0.719	2.445	2.171	4.625	(4)
DF	2000/07	2001/04	9	-12.266	-1.443	0.868	0.654	0.400	(35)		2009/05 ⁺	0			0.918	0.980	0.980	(12)
DGO	1999/11	2003/05	42	-18.359	-0.482	2.092	1.462	2.177	(10)	2007/11	2008/11	12	-14.797	-1.326	0.915	0.862	1.177	(14)
GTO	2000/07	2003/12	41	-17.059	-0.455	0.588	0.592	0.736	(26)	2008/04	2009/05	13	-5.362	-0.423	1.381	1.230	1.436	(6)
GRO	2000/06	2001/12	18	-23.538	-1.480	0.845	0.670	1.009	(27)	2008/05	2011/11	42	-15.163	-0.391	0.075	0.420	0.311	(14)
HGO	2000/12	2002/05	17	-20.648	-1.351	1.831	1.667	1.895	(13)	2008/10	2009/10	12	-16.461	-1.488	1.084	1.354	1.483	(13)
JAL	2000/07	2001/12	17	-17.161	-1.101	0.891	0.855	0.433	(47)	2008/02	2009/04	14	-7.186	-0.531	1.298	1.336	1.372	(6)
MEX	2000/07	2002/12	29	-18.432	-0.700	0.523	0.455	0.624	(36)	2008/09	2009/05	8	-4.084	-0.520	1.423	1.601	1.088	(4)
MICH	1998/05	1999/02	9	-14.815	-1.766	1.627	1.517	1.558	(11)	2008/04	2009/01	9	-4.711	-0.535	0.917	0.926	3.995	(2)
MOR	1999/12	2000/05	11	-24.471	-2.519	2.049	0.951	0.727	(39)	2006/10	2008/08	12	-8.549	-0.742	0.017	0.582	0.705	(13)
NAY		2002/03 ⁺	0			0.443	1.456	1.456	(12)	2006/10	2009/05	31	-27.351	-1.025	1.632	1.205	0.589	(44)
NL	1999/09	2002/03	30	-30.881	-1.224	1.392	1.193	0.742	(52)	2008/09	2009/05	8	-10.283	-1.347	0.239	0.556	1.604	(8)
OAX	1998/08	1999/10	14	-15.961	-1.234	0.847	0.661	0.195	(96)	2006/03	2006/11	8	-14.921	-2.000	1.205	1.414	1.653	(11)
PUE	2000/03	2003/05	38	-18.089	-0.524	1.173	1.078	1.007	(20)	2008/09	2009/02	5	-7.255	-1.495	0.841	1.031	0.841	(9)
QRO	2000/07	2001/07	12	-22.181	-2.068	1.328	1.726	0.759	(38)	2008/09	2009/06	5	-9.330	-1.940	0.962	1.176	1.071	(10)
QROO	1998/11	2002/05	42	-52.466	-1.755	3.157	2.517	2.185	(35)	2008/07	2009/06	11	-21.106	-2.132	2.745	2.359	2.745	(9)
SLP	2000/07	2000/12	5	-20.556	-4.498	1.440	1.402	1.234	(19)	2008/05	2009/10	17	-14.226	-0.899	1.441	1.579	1.638	(11)
SIN	1999/03	2004/02	59	-39.009	-0.835	2.327	1.590	1.185	(42)	2008/11	2009/06	7	-20.224	-3.176	2.011	1.030	0.779	(30)
SON	2000/06	2003/02	32	-29.259	-1.076	0.975	0.059	1.566	(23)	2007/01	2009/08	31	-18.420	-0.655	1.336	0.655	0.917	(23)
TAB	2000/08	2002/03	19	-21.411	-1.260	2.311	1.931	2.474	(10)	2008/06	2008/10	4	-10.147	-2.639	0.386	0.579	0.553	(25)
TAM	2000/09	2004/02	41	-25.050	-0.701	0.841	0.996	0.694	(44)	2008/05	2009/12	19	-10.458	-0.580	0.959	0.657	0.457	(25)
TLAX	1999/05	2002/11	42	-49.070	-1.594	1.786	2.004	1.056	(65)	2008/12	2009/07	7	-10.294	-1.540	3.227	3.227	3.163	(4)
VER	2000/10	2004/05	43	-26.431	-0.711	0.874	0.302	0.538	(58)	2007/08	2007/12	4	-11.770	-3.082	1.087	0.795	0.920	(15)
YUC	2000/01	2002/09	32	-30.662	-1.138	0.835	0.953	0.678	(57)	2007/10	2009/05	19	-23.082	-1.372	1.496	1.539	1.391	(21)
ZAC	2001/05	2002/07	14	-16.097	-1.246	1.155	0.556	0.958	(19)	2007/11	2008/01	2	-6.715	-3.416	1.369	1.384	1.314	(6)

* Average growth rates. **Recovery periods. ⁺ National trough. The national trough is used to define the beginning of the recovery when the state did not experience a fall in employment. See footnotes of Table 1 for the notation regarding recoveries.