External factors in emerging market recoveries: An empirical investigation

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Abstract

We estimate conditional duration models to analyse recovery processes in emerging market economies. Our reduced form specification is parsimonious, as we focus on exogenous factors, such as the effect of growth in the US, EU, and Japan on the prospects for recovery in emerging market economies experiencing recessions. The model confirms the importance of external factors in recovery processes. However, the short-run effect of Japanese growth on recovery prospects is unconventional: weak economic conditions in Japan turn out to facilitate recoveries.

JEL classification: C1; E3; F4

Keywords: Emerging markets; Recessions; Duration

1. Introduction

Part of this paper's motivation lies with the 1997–98 emerging market crisis and the recovery that followed, as it presented some characteristics that seemed new. The depth of the Asian crisis and its contagion across a number of countries have been the subject of numerous papers (see, for instance, Corsetti et al. (1998a–c) on the build-up of the crisis, and Claessens and Forbes (2001) on contagion). This corpus has enhanced our understanding of the build up to a crisis and its subsequent unfolding. However, as Bordo et al. (2001) point out, current knowledge on recoveries from crises is still piecemeal. From a long-run perspective, it does not appear that recent crises have been exceptional in their depth. For example, Bordo and Murshid (2000) examine financial crises and their contagion prior to World War II, and one of their findings is that the severity of the Asian crisis and its contagion are not unusual by historical standards.

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Increased data availability, both along the geographical and time dimensions, has made possible the study of business cycle fluctuations in emerging market economies (EMEs). Agénor et al. (2000) show that the 12 developing countries forming their sample experience short-term fluctuations that can be considered as business cycles. In addition, these cycles present similarities with those found in industrialised countries. Hoffmeister and Roldós (1997) develop a structural vector autoregression model to study macroeconomic fluctuations in Asia and Latin America. They report that business cycles are broadly similar in Asia and Latin America, but that the latter region is more sensitive to external shocks, a result in line with other findings. As a general rule, external factors, such as demand and interest rate shocks, are significant determinants of output fluctuations in developing countries (Fernandez-Arias, 1996; Chuhan et al., 1998).

The possibility of studying business cycles in EMEs coupled with the evidence of long-run regularities on the frequency of crises naturally leads to additional research questions. While a substantial amount of research has been undertaken on the root causes of crises in EMEs and channels of contagion, the related issue of recoveries has remained largely unanswered. Recovery processes have received little attention, save for specific regional studies (e.g., Park and Lee, 2001). Apart from an analysis of IMF inspired plans (Corbo and Fischer, 1995; Dicks-Mireaux et al., 2000), we do not know of general analyses of emerging market recoveries.

This paper aims to contribute to the burgeoning literature on macroeconomic fluctuations in developing countries by focusing on recession *cum* recovery cycles. Our main contribution is to quantify the impact of international economic conditions on the recovery prospects of developing countries that experience recessions. Our approach departs from previous studies in that we focus exclusively on external factors. The latter are beyond the control of agents in developing countries, and can therefore be considered as exogenous. We hope to contribute to an understanding of emerging market recoveries, while shying away from providing (ex-post) explanations for the onset of crises. To this end, we analyse recoveries from recessions in 22 EMEs since the late 1950s to 1997, and attempt to identify general recovery patterns.

The theoretical underpinnings of our estimations are the predictions of a Mundell–Fleming model of small open economies under different exchange rate and balance of payment regimes. The focus is on the influence of real factors that are exogenous to EMEs. We explicitly recognise that all policy responses on the part of EMEs' public authorities are endogenous to an incipient recovery. In addition, we assume that the same "tools" are available to policy makers across emerging market economies. Thus, the standard "technology to engineer a recovery" is freely available for all countries in our sample. This assumption is probably close to the mark, given the high degree of homogeneity of macro policies characteristic of stabilisation plans (see Corbo and Fischer, 1995). Consequently, we capture the effect of these endogenous policies through the inclusion of the crisis' duration as a regressor. The advantage of this approach is that it allows us to obtain direct estimates of the effect of exogenous factors using standard econometric techniques.

Our paper belongs to the literature that focuses on real transmission channels. Perhaps the paper closest to ours is that of Diwan and Hoekman (1999) who have examined

how trade patterns influenced the unfolding of the crisis in Asia. While we address a different set of issues and the respective data sets are different, our results complement their findings. In the same line, Abeysinghe and Forbes (2001) analyse trade linkages and output multiplier effects for Asian economies. Their results confirm the importance of real transmission channels.

The remainder of this paper proceeds as follows. Section 2 sketches the underlying theoretical framework, and describes how we have defined recessions for the emerging market economies of Asia and Latin America. Section 3 presents the econometric specification and explains how the variables were constructed. Section 4 contains the results and their interpretation. Section 5 provides some concluding comments.

2. Recession cum recovery cycles in EMEs

We think of emerging market economies as small and open, and that, in the short-run, they behave according to a Mundell–Fleming framework. We do not require to make any specific assumptions pertaining to the exchange rate (fixed, flexible, or crawling peg), or balance of payments regime. In all these cases, a recovery in the external sector driven by (exogenous) foreign demand increases national income in the short to medium term.[1] Our analytical framework is keynesian, and focuses on "export led recoveries".[2]

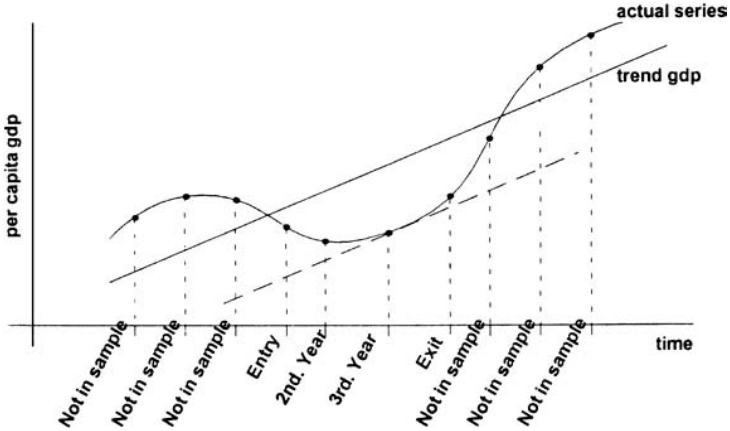
The aim is to assess the extent to which external factors such as growth in large economies affect recoveries. To this end, we estimate a parsimonious reduced form. Endogeneity problems prevent the use of variables that are known to affect recoveries. For instance, country specific risk premia, financial flows, or trade policy variables are all endogenous to an incipient recovery. These policy-dependent variables, could, in principle, be instrumentalised. In practice, the task is too complex. The diversity of recessions and policy variables we are dealing with imply that valid and well performing instruments are simply not available.

2.1. Definition of recessions and recoveries

If quarterly data on GDP were available for a sufficient number of countries, and covered a long-time period, then defining recessions and recoveries would be relatively straightforward. Unfortunately, this is not the case (see Agénor et al., 2000, for a discussion on data limitations). Our main results are thus obtained with annual data. However, for a subset of countries, it proved possible to construct quarterly series of economic activity using indicators of industrial activity, and we re-estimated our model for this sub-sample.

[1] We performed exogeneity tests to check that growth in the US, Japan and the EU is indeed exogenous for developing countries taken individually. We performed the same tests for the Asian and Latin American regions. In both cases, we could not reject strong exogeneity.

[2] Positive technology shocks may also affect the prospects of recoveries. While not denying the importance of this effect, we do not attempt to measure its magnitude.



Graph 1. Identification of recession *cum* recovery cycles.

For annual data, the main sources are the Penn World Tables on real GDP growth till 1992, and IMF statistics thereafter. Our series run from the late 1950s till 1997. We have gathered data on 22 emerging market economies, both from Asia and Latin America, and Turkey.[3] We constructed the series on GDP growth in the large economies (US, EU, and Japan) from the same sources and Eurostat.[4] For a subset of countries, we were able to construct quarterly indicators of industrial activity as a proxy for quarterly GDP growth. The latter were obtained from the United Nations' Monthly Bulletin of Statistics.

The way we define a recession is the following: an economy is deemed to enter into a recessionary cycle if it fulfils two conditions.[5] The latter are that GDP is found to be below its *trend level*, and that the growth rate is also found to be below its *local trend growth rate*. The two conditions are thus that the economy's output is below potential, *and* that the economy grows below potential. A recovery takes place when the economy grows at a rate greater that its local trend growth (i.e., the gap between actual and potential output is being closed). Graph 1 illustrates how we have identified recession *cum* recovery cycles.

Formally, our population is made up of emerging market economies that are in recession or are recovering. Let y_t be real GDP of an emerging market economy at period t. Define an economy in recession when the following conditions hold:

$$y_t < y_t^{\mathrm{LT}} \quad \text{and} \quad \Delta y_t \leqslant \Delta y_t^{\mathrm{LT}}, \tag{2.1}$$

[3] The countries are: Argentina, Bolivia, Brasil, Chile, China, Colombia, Costa Rica, Ecuador, India, Indonesia, Hong Kong, Korea, Malaysia, Mexico, Paraguay, Peru, the Philippines, Singapore, Thailand, Turquey, Uruguay, and Venezuela.

[4] We defined "Europe" as the fifteen countries currently forming the EU. Including all Western European economies did not result in any significant differences.

[5] We discuss alternative definitions in the next section.

where the superscript LT stands for local trend and Δy_t is the real GDP growth rate. The first period of recovery is identified as

$$\Delta y_t > \Delta y_t^{\mathrm{LT}} \tag{2.2}$$

subject to the restriction that the economy was in recession at time $t-1$. We can thus define a variable "recession *cum* recovery cycle" as

$$r_t = 1 \text{ if the economy is in a recovery at time, } t$$

$$r_t = 0 \text{ if the economy is in a recession at time } t. \tag{2.3}$$

2.2. Detrending procedures

The most common procedure involves applying the Hodrick–Prescott (HP) (1980) filter to the GDP series. The smoothness of the resulting trend can be determined by choosing the value of the so-called smoothing parameter. When applied to quarterly US data, it has become customary to use a smoothing parameter of 1600. As Pedersen (2001) points out, choosing 1600 in quarterly series in effect removes the majority of low-frequency movements (around 32 quarters or 8 years) leaving fluctuations at the higher frequencies almost unaltered. Lower values for the smoothing parameters ensures that lower-frequency movements remain in the trend. Thus, in order to obtain the same business cycle with annual US data, the smoothing parameter must be smaller.

Ravn and Uhlig (2002) argue that the smoothing parameter should move with the fourth power of the frequency of observations and thus recommend a smoothing parameter of 6.25. Furthermore, using Monte Carlo techniques on a statistical model which fits US business cycle data, they find that a value of 8.84 reproduces closely the results that obtain with quarterly data and a smoothing parameter of 1600. Dolado et al. (1993) propose a linear adjustment and employ 400, while Backus and Kehoe (1992) and the European Central Bank (2000) apply 100 (see Maravall and del Río, 2001, for a discussion). All these results pertain to developed economy business cycles, and it remains an open question whether the same conclusions apply to developing countries. In particular, as annual data from developing economies show more volatility in low frequencies than US data, a low value like 7 may lead to a more volatile trend. In the results that we report below, we used smoothing parameters of 100 and 400 for annual data and 1600 for quarterly data. As shown below, our results are robust to the choice of smoothing parameter.

The use of the HP filter to identify recessions and their recoveries in order to estimate durations is potentially problematic. The HP filter is two-sided so that future observations are used when we define our recession *cum* recovery cycles. As a consequence, recessions may end "per construction" and their duration could potentially be an artifact of the filter.

Dealing with the "two-sidedness" of existing filters is much trickier than the choice of the smoothing parameter. A tentative possibility would be to estimate the HP trend at any period using data up to that period. This procedure is not adequate because of the well-known endpoint problems found when applying the HP filter at both ends of the sample. In principle, it is possible to define one-sided indicators that only use

past information to identify recessions and recoveries. For instance, a recession could be defined as growth dipping below 25% of average growth of the previous 5 years, and recovery when growth returns above 75% of the previous 5 years.[6] Notwithstanding efficiency concerns, this may be adequate for a smooth cycle and stable trend growth; it is clearly inadequate for the countries forming our sample.[7] By the same token, defining entry into recession as 1 year of negative growth does not make sense either, as some countries (e.g. South Korea) almost never experience such a situation during the sample period. It is of course possible to make ad-hoc country adjustments to obtain "reasonable" episodes of recessions, but this did not seem appropriate given that our results are easily modified by such adjustments. Since all the results are potentially sensitive to the definition of recession *cum* recovery cycles, we want to stick to a "mechanical" approach that does not require subjective assessments. Finally, one could apply the NBER's methodology to define recessions and recoveries (Hall et al., 2001). Unfortunately, we have not been able to implement this (first-best) option as the necessary information is not available for the countries forming our sample.

Our central results have been obtained by applying the ARIMA model-based method of decomposition proposed by Goméz and Maravall (1997). The TRAMO-SEATS method addresses many of the issues outlined above.[8] First, it is easily adapted to annual data, and it can deal with missing values (a useful characteristic for our smaller sample built with quarterly data). Furthermore, the decomposition of the series is implemented in the frequency domain. The spectrum is partitioned into additive spectra by using the canonical condition on the trend on the one hand, and the seasonal and cyclical components on the other. Thus, the recession cum recoveries are uniquely identified by the canonical condition and the use of the whole sample simply guarantees the efficient estimation of the components. Third, TRAMO-SEATS has been shown to have many desirable properties.[9]

Our results are robust to the choice of detrending method. This is so in spite of the fact that the three distinct methods that we apply yield definitions of recessions *cum* recovery cycles that are not identical. For example, 20% of the years are not classified equally along the three different methods using annual data (HP with smoothing parameter 100 and 400, and SEATS). Standard tests of association between the resulting dichotomous variables rejected the null hypothesis of equality of distributions.

[6] With US data, this roughly corresponds to defining a recession as two quarters of negative growth. That is, for the post-War period, recessions (defined as two quarters of negative growth) have occurred, on average, when annual growth dipped below 22% of the average of the previous 5 years.

[7] For instance, applying this definition to some Latin American countries generates absurd results. During the boom years of the second half of the 1970s, some of these countries achieved very high growth rates, that were not to be seen again. Applying the definition mentioned in the text would result in some countries entering recession during the early 1980s and still be in that situation today. By the same token, countries experiencing accelerating trend growth such as China would never enter a recession (and the reverse applies to countries whose trend growth has decelerated).

[8] TRAMO-SEATS stands for: Time Series Regression with ARIMA Noise, Missing Observations, and Outliers (TRAMO), and Signal Extraction in ARIMA Time Series (SEATS).

[9] Eurostat tested TRAMO-SEATS by applying it to more than 17,000 high-frequency time-series. The experience proved very conclusive, so that Eurostat now uses TRAMO-SEATS for seasonally adjusting many of the time series it collects.

3. Specification

3.1. Econometric specification

We attempt to assess the effect of external factors such as growth in the three large economies on the recovery prospects of Asian and Latin American countries. We estimate probit discrete duration models by maximum likelihood.[10]

We define the random variable T as the time that the economy is in recession, and call this variable the duration. Each emerging market economy enters in recession at the end of time $T = 0$. The probability that an economy that has been in recession during $t - 1$ periods and recovers during period t is given by

$$\begin{aligned} h(t, b(t), x(t)) &= \Pr(T = t \mid T \geqslant t, b(t), x(t)) \\ &= \Phi[b(t) + \beta' x(t)], \end{aligned} \tag{3.1}$$

where $x(t)$ is the vector of exogenous conditioning variables. The term $b(t)$ is a parametric specification that captures duration dependence:

$$b(t) = b_0 + b_1 t^{-1}. \tag{3.2}$$

A plausible interpretation, if $b_1 < 0$, is that policy makers in EMEs are able to promote the recovery by implementing freely available policy tools such as a devaluation and budget stabilisation. This "technology" is routinely implemented when the economy enters recession and, as a result, the hazard function shifts upwards as duration increases. Finally, Φ is the normal distribution. Note that this formulation can be viewed as a sequence of dichotomous binary choices for the countries still in recession in each moment in time, subject to restrictions across equations (Kiefer, 1987). Thus, the model can be estimated using r_t as the dependent variable in a standard Probit ML estimation:

$$\Pr(r_t = 1 | t, x(t), r_{t-1} = 0) = \Phi[b(t) + \beta' x(t)]. \tag{3.3}$$

Our dependent variable takes value zero when the economy enters in a recession and remains in that situation, and value one the year the recovery cycle begins. Subsequent recovery/expansion years are not included in our sample.

3.2. Variable definition

The independent variables are, first, the current growth rates of the US, EU, and Japan interacted with the historical average exports shares from each emerging market economy to each of these three blocks. We then multiplied this variable by the 10-year average degree of openness of each emerging market economy. This regressor is thus made up of the product of three data, defined below.

[10] In a previous version of the paper, we also estimated a linear probability model and two continuous time specifications (Cox and Weibull). The results are qualitatively identical, and not reported for the sake of space. They are available in the working paper version (Mora and Siotis, 2000).

Openness is specified as the ratio of imports plus exports over total GDP. In order to deal with possible problems of endogeneity, we took the average by decades for each country. [11] I.e.

$$Open_{j,D(t)} = Mean_{D(t)}\left(\frac{X_{jt} + M_{jt}}{GDP_{jt}}\right), \tag{3.4}$$

where X_{jt} and M_{jt}, respectively, denote exports and imports, $D(t) =$ 1960s, 1970s, 1980s, and 1990s, and $j =$ our 22 emerging market economies.

We have data on bilateral trade flows from 1978 to 1997. The share in exports of each block is very stable across time for all emerging market economies. We thus used the 1978–97 average for the entire sample. Apart from solving the problem of data availability, this choice also alleviates possible problems of endogeneity (see footnote 11). Thus, export flows from emerging market economies to each of the three large blocks are defined as

$$Exports_{j,i} = \frac{X_{j,i}}{X_{j,\mathrm{US}} + X_{j,\mathrm{EU}} + X_{j,\mathrm{Japan}}}, \tag{3.5}$$

where $i = US$, EU, and $Japan$.

Thus, the regressor measuring the effect of growth in the three large economies on emerging market recovery prospects is constructed as

$$\Delta GDP_{i,t} = \Delta gdp_{i,t} * Exports_{j,i} * Open_{j,D(t)}, \tag{3.6}$$

where t denotes time and $\Delta gdp_{i,t}$ is the growth rate in the three large blocks at time t. In the tables, these regressors are, respectively, denoted ΔGDP_{US}, ΔGDP_{EU}, and $\Delta GDP_{\mathrm{Jap}}$.

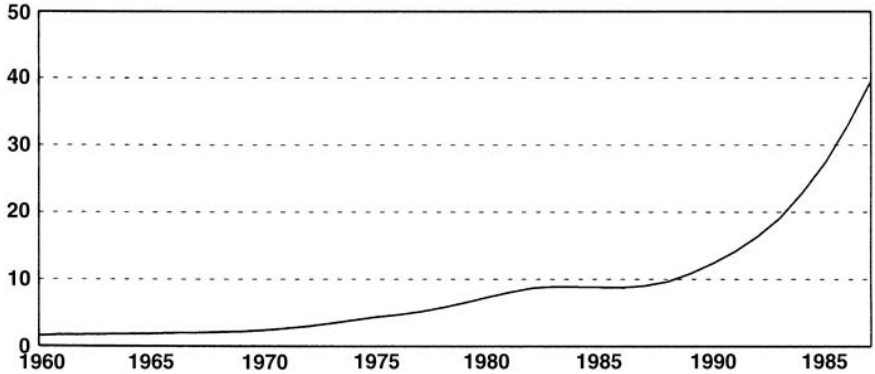
We introduced the changes in the terms-of-trade of country j, assuming that each individual economy acts as a price taker in world markets. The latter is denoted as Δtot and is defined as

$$\Delta tot_{j,t} = \Delta\left(\frac{\text{Export index price}}{\text{Import index price}}\right)_{j,t}. \tag{3.7}$$

Both the denominator and the numerator are expressed in the same currency; this implies that we use an index of real relative prices. For some emerging market economies, data is lacking on import and export prices. In the latter cases, we used the regional index (Asia or Latin America).

To account for exogenous monetary shocks, we constructed real short term interest rates in Yens, Deutsche Marks, and US dollars. These three variables were constructed by subtracting the GDP deflator to the (annualised) three month interest rates. Both series were retrieved from IMF publications. In the final specification, we only included US rates, as the Japanese and German rates did not prove significant. Apart from possible issues of multicolinearity, this probably reflects the overwhelming proportion

[11] In the medium and long term, this variable is exogenous, as it is determined by the fundamentals of the economy (size, preferences, resource base, location, etc.). However, in the short term, this variable may be influenced by policy choices (exchange rate or trade policies). Taking averages by decades thus alleviates the potential issue of endogeneity.



Graph 2. Evolution of the Globalisation Index.

of borrowing in US dollars on the part of the economies in our sample during the time period under consideration.

The process of economic globalisation has been held—partly—responsible for the increasing virulence of recessions in EMEs. It is however difficult to provide a clear-cut definition of what globalisation consists of. Nonetheless, most economists would agree that globalisation features a deepening of multilateral trading relations as well as the progressive integration of new economies into the world economy. As globalisation is a multifaceted and complex phenomenon, no readily available indicator exists that can be used as a proxy. In addition, common use of several alternative indicators is likely to lead to serious multicolinearity problems since globalization proxies are highly correlated. A solution to this measurement problem is to construct a composite indicator. We have gathered data on the value of world trade (expressed in deflated US dollars), the average tariff reductions stemming from successive GATT/WTO negotiations, the total number of GATT/WTO members, and IMF lending and aggregate Foreign Direct Investment (FDI) flows to our 22 emerging market economies. All five series are available since the late 1950s, save for FDI for which we had to use interpolation techniques. We applied a dynamic factor analysis to these five series in order to obtain a composite indicator of globalisation, as in Quah and Sargent (1993). The series and the composite index of globalisation, denoted *GLOB*, are presented in the appendix. A cursory glance at Graph 2 indicates that this phenomenon, as measured by our index, has been a fairly constant and steady process. However, the series clearly identifies a slowdown in the 1980s, and an acceleration during the 1990s.

In addition, we specified the inverse of the duration of the recession. This regressor is defined as

$$DUR^{-1} = \frac{1}{\sum(\#\text{ years of recession})}. \tag{3.8}$$

As discussed in the previous section, this variable accounts for the effect of endogenous policy responses during a recession. Overall, it shows the fact that, all else equal, the probability of bouncing back is higher the longer the country has been in recession.

Table 1
Descriptive statistics, annual data[a,b]

Variable	# of obs.	Mean	Std. Dev.	Minimum	Maximum
ΔGDP_{US}	372	0.61	0.71	−1.64	4.12
ΔGDP_{EU}	372	0.42	0.39	−0.49	1.93
$\Delta GDP_{\mathrm{JAP}}$	372	0.33	0.51	−0.12	3.90
r^{US}	372	1.91	1.95	−3.60	5.70
Δtot	372	−0.38	14.48	−75.00	57.68
DUR^{-1}	372	0.65	0.29	0.08	1
$GLOB$	372	8.08	7.97	1.55	39.53

[a] $\Delta GDP_{i,t} = \Delta gdp_{i,t} * Exports_{j,i,t} * Open_{j,D}$ where $Open_{j,D} = Mean_D((X_j + M_j)/GDP_j)$ and $Exports_{j,i} = X_{j,i}/(X_{j,\mathrm{US}} + X_{j,\mathrm{EU}} + X_{j,\mathrm{Jap}})$.

[b] Sixty-four per cent of the crises lasted less than 2 years and 86% less than 3 years. Data used for SEATS estimation. See details in Table 2.

Our last independent variables are dummies to account for possible country fixed effects that may affect the speed of recovery. A simple way of addressing this problem is introducing $n - 1$ country dummies. The drawback is that in our exercise, the structure of our database results in multicolinearity problems, thus substantially decreasing the accuracy of the estimates. Therefore, we attempted to group countries by objective criteria such as size, geographic area, levels of development (e.g., "Tigers" vs. "Dragons"), or membership to regional blocks (ASEAN, Mercosur). None of these aggregation procedures proved satisfactory in the sense that dummies did not seem to improve the accuracy of the estimates, and most of these dummies were not significant. This should come as no surprise, as the fixed effects we are trying to unearth are likely to be very idiosyncratic. Instead, we ran our probit regression without a constant and with n country dummies. We then took the point estimates of these dummies and grouped them according to standard clustering procedures. Applying a square distance criteria, we obtained 3 clusters.[12] Thus, this procedure for generating our dummies groups the economies according to the speed with which they bounce back. We called these dummies *slow* and *fast*, with the third cluster forming the reference group. The latter, which contains economies recovering at "intermediate" speed, represents one third of the countries in our sample.[13]

Our central results do not include these fixed effects. Rather, we only present the SEATS-TRAMO specification with and without these fixed effects. The purpose is to illustrate that the introduction of fixed effects improves the precision of the estimates, but does not alter the results in any significant manner. Furthermore, leaving-out these fixed effects ensures that direct comparison across specifications is possible.

The descriptive statistics for our independent variables are presented in Table 1.

[12] We experimented with alternative clustering procedures and number of groups. The results are qualitatively the same for different clustering techniques or number of clusters.

[13] The "slow" group is made up of Bolivia, Chile, Ecuador, Hong Kong, Malaysia, Paraguay, Peru, the Philippines, Turkey, Uruguay and Venezuela, while the"fast" group is made up of Brasil, Colombia, Korea and Singapore. The remaining economies form the reference group.

Our sample runs from the late 1950s to 1997 in 17 out of the 22 countries, the exception being some Asian countries for which no data was available before the mid-1960s. Two endpoint years at the beginning and the end of the sample were dropped for three reasons. First, it was guaranteed that no crisis was censored either at the beginning or the end of the sample, simplifying the estimation procedure. Second, the potential endpoint problems in the implementation of HP filtering are minimised simply by dropping these extreme observations (see Pedersen, 2001). Finally, part of this paper's motivation lies with the 1997–98 emerging market crisis and the recovery that followed. We thus wanted to compare estimates obtained from previous episodes of recessions with recent events that are not included in our sample.

4. Results

4.1. Estimates obtained with annual data

The estimations, presented in Table 2, indicate that growth in Europe and the US positively affect emerging market recoveries.

The positive signs for these two variables accords well with the theoretical predictions of a Mundell–Fleming model. Although the point estimate for the effect of Europe is larger than that of the US, we cannot reject equality of the two coefficients in a statistical sense.

The real dollar interest rate appears with the expected sign and is clearly significant in all but in one specification, where it is significant at the 14% confidence level. The positive sign for the globalisation index indicates that structural change in the world economy enhances the speed of recovery. This probably reflects the fact that increasing world economic integration has fastened the pace of transmission mechanisms across the economies of our sample. The last variable, changes in the terms of trade, appears as significant and with the expected sign, showing that an increase in export prices relative to import prices increases the probability of coming out of a recession in our sample of EMEs. Finally, as can be seen from a comparison of the two SEATS specifications, the *slow*/*fast* dummies increase the precision of the point estimates, but does not change any of the main results.

The result for Japanese growth is surprising. The significant negative sign indicates that, in the short run, weak Japanese growth facilitates emerging market recoveries. This finding emerged from all the specifications we estimated.[14] The most plausible explanation is that both Japan and EMEs generally rely on the export sector to bounce back from a recession. A large share of these exports go to the US and Europe. In terms of composition, there is an overlap between the exports of EMEs and those of Japan. Thus, it would seem that, in the short term, Japan and these economies are direct competitors on export markets. Diwan and Hoekman (1999, p. 10) detect this

[14] Note that this finding is not driven by the choice of smoothing parameter in the HP specification. With annual data, Japanese growth also appears with a significantly negative sign if 7 or 1600 are chosen as smoothing parameters.

Table 2
Probit estimates, annual data[a]

	SEATS	HP-100	HP-400	SEATS FE[b]
DUR^{-1}	−4.36	−4.9	−3.85	−4.98
	(0.000)	(0.000)	(0.000)	(0.000)
ΔGDP_{US}	0.32	0.23	0.3	0.26
	(0.009)	(0.078)	(0.017)	(0.037)
ΔGDP_{EU}	0.45	0.63	0.53	1
	(0.045)	(0.013)	(0.027)	(0.000)
ΔGDP_{JAP}	−0.43	−0.28	−0.42	−0.55
	(0.005)	(0.049)	(0.001)	(0.001)
r_{US}	−0.117	−0.057	−0.148	−0.138
	(0.021)	(0.237)	(0.003)	(0.009)
Δtot	0.013	0.013	0.014	0.011
	(0.059)	(0.025)	(0.008)	(0.110)
GLOB	0.019	0.024	0.029	0.023
	(0.094)	(0.050)	(0.024)	(0.070)
Slow				−0.644
				(0.003)
Fast				0.674
				(0.012)
Constant	2.02	1.95	1.5	2.47
	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	372	411	393	372
χ^2	174	145	165	172
R^{2c}	41.1	42.2	35.1	45.6

[a] *p*-values in parenthesis.
[b] SEATS specification with fixed effects.
[c] R^2 is the (scaled) value of the likelihood function whereby 100 corresponds to a perfect prediction and 0 to a model which only includes a constant.

phenomenon in their data (which only pertains to Asia). Analysing the evolution of Japan's export performance and that of EMEs in Asia, these authors conclude that: "Japanese export growth tends to be negatively related to export growth in the rest of Asia", and further: "the results corroborate the hypothesis of rising competition between Japan and the higher-end producers in the region, especially in the recent years".[15] Abeysinghe and Forbes (2001) also detect a similar phenomenon in their data.[16]

There are various (non-competing) explanations for this finding. For instance, a strong yen weakens export industries in Japan, which in turn gives more room for

[15] Note that this "direct competition effect" may work its way through indirectly. For instance Japan may put pressure on Korea, Hong Kong and Singapore, who in turn put pressure on producers lower down the quality ladder.

[16] In their analysis of trade output multiplier effects, these authors report that "the negative and statistically significant correlations in Table 1 are counter-intuitive" (p. 13). As a possible explanation, they suggest that "there are a wide variety of potential omitted variables, such as competition in third markets (...)" (p. 14).

Table 3
Seats Estimation results for Asia and Latin America, annual data[a]

	Asia	Latin America
DUR^{-1}	−4.22	−4.58
	(0.000)	(0.000)
ΔGDP_{US}	0.76	0.23
	(0.008)	(0.102)
ΔGDP_{EU}	0.4	0.5
	(0.330)	(0.100)
ΔGDP_{JAP}	−0.66	−0.72
	(0.001)	(0.312)
r_{US}	−0.048	−0.158
	(0.508)	(0.028)
Δtot	0.025	0.011
	(0.024)	(0.186)
GLOB	−0.026	0.025
	(0.379)	(0.053)
Constant	2.09	2.32
	(0.000)	(0.000)
Obs.	146	226
χ^2	73.8	118.6
R^{2b}	41.7	43.3

[a] p-values in parenthesis.
[b] R^2 is the (scaled) value of the likelihood function whereby 100 corresponds to a perfect prediction and 0 to a model which only includes a constant.

expansion in the external sector of EMEs.[17] This argument would indicate that we ought to introduce the bilateral exchange rate vis-à-vis the Yen. However, this avenue is not open to us, as the exchange rate is clearly an endogenous policy variable, whose main effect is captured by our duration variable.

Since Asian EMEs have a production structure closer to that of Japan compared to that of Latin American countries, we would expect the (short-term) effect of Japanese growth to be stronger with respect to the former. This is what we find in our data when we split the sample by geographic area. The results are presented in Table 3.

We find that the effect of Japanese growth is negative and highly significant in the case of Asia. An implication of this finding is that Asian countries that mainly export to Japan are likely to experience more difficulties in recovering from recessions when the Japanese economy's performance is weak. This is because they are both exposed

[17] Though Diwan and Hoekman (1999) focus on the build-up to the Asian crisis (and not recoveries), their focus on transmission mechanisms in the real economy is similar to ours. These authors note that during the period 1995–97 "The recent depreciation of the yen will have been good for users of Japanese-produced inputs, but will reduce the incentive for outward FDI (foreign direct investment), reduce Japanese demand for imports and increase the export competitiveness of Japanese firms that produce similar goods to those of East Asian firms". The conditions in 1999 have been exactly the opposite: a strong Yen and weak Japanese growth. By way of consequence, the above quote applies in our context. In addition, there are a number of sectoral case studies that analyse the "direct competition effect" (see for instance, Yoon, 1992).

Table 4
Hazard rates[a,b]

	SEATS	HP100	H400	SEATS FE
ΔGDP_{US}	1.068	1.063	1.075	1.059
ΔGDP_{EU}	1.134	1.211	1.167	1.289
ΔGDP_{JAP}	0.939	0.956	0.945	0.930
r_{US}	0.864	0.927	0.823	0.834
Δtot	1.016	1.018	1.018	1.014
GLOB	1.002	1.002	1.002	1.002

[a]Hazard rates measure the variation in the probability of recovery when one of the independent variables increases by one percentage point. It is defined as $(h(t,x,z+1)/h(t,x,z)-1)*100$ where $h(t,x,z) = \Pr(t|T>t,x,z)x$ are all remaining independent variables. Rates are computed at average values.
[b]See Table 2 for the models' specifications.

to the direct competition effect as well as low demand on their main export markets.[18] In the case of Latin America, the sign of the Japanese coefficient is also negative, but not significantly different from zero. Splitting the sample reduces the number of observations, and consequently, the degree of precision of our estimates. This is indeed the case for most of our regressors in both specifications, save for Japanese growth in the Asian regression. It is also interesting to note that the point estimate for real interest rates is higher and more precisely estimated for Latin America, possibly reflecting the latter's historical reliance on international capital markets.[19]

A comment is nonetheless in order: the "Japan" effect is a short-term one. Thus, the sign of the Japanese variable has to be interpreted for what it is: a short-run, contemporaneous effect, and certainly not as evidence that international trade is a zero sum game. We also present the hazard rates corresponding to our results in Table 4. Hazard rates for the growth variables indicate how the probability of recovery is affected by an extra percentage point in the growth rate of each of our three economic blocks. If, all else equal, the US economy grows 1% more, the probability of recovery increases by 6.8% for the "standard" emerging market economy in the SEATS specification. Similarity in the hazard rates suggests that our approach is robust to different model specifications.

4.2. Quarterly estimates

Quarterly data are hard to obtain for emerging market economies for a sufficiently long period. We have nonetheless managed to obtain quarterly observations during a shorter time period that only covers a subset of countries. The latter are Argentina, Chile, Brazil, India, South Korea, and Mexico. Quarterly GDP growth data is not available, so that we had to use indices of industrial production instead. Data on

[18] We are grateful to a referee for pointing this out.
[19] However, equality of the coefficients in the two regressions could not be rejected when we performed a χ^2 test.

Table 5
Probit estimates, quarterly data[a]

	SEATS	HP 1600
DUR^{-1}	−7.59	−4.88
	(0.000)	(0.000)
ΔGDP_{US}	0.36	0.47
	(0.136)	(0.064)
ΔGDP_{EU}	0.92	1.9
	(0.218)	(0.013)
ΔGDP_{JAP}	−0.7	−0.84
	(0.061)	(0.047)
r_{US}	−0.009	0.022
	(0.847)	(0.634)
Δtot	0.013	0.018
	(0.443)	(0.246)
GLOB	0.011	0.018
	(0.267)	(0.101)
Constant	(0.635)	−0.696
	(0.197)	(0.164)
Obs.	289	257
χ^2	21.8	32
R^{2b}	31	24.8

[a] p-values in parenthesis.
[b] R^2 is the (scaled) value of the likelihood function whereby 100 corresponds to a perfect prediction and 0 to a model which only includes a constant.

quarterly US interest rates is readily available, and so is quarterly GDP growth in the US, Japan, and Europe. With respect to changes in terms of trade, we could only gather quarterly data for the period 1960–90. We thus ended-up with a much narrower sample in terms of countries and time period, that it is partially "compensated" by the higher frequency of the data. We applied the TRAMO-SEATS procedure to estimate some missing data points (for industrial production and changes in the terms of trade) and obtain seasonally adjusted data. A full description of how we constructed this quarterly sample is given in the appendix.

In Table 5, we report the results pertaining to SEATS-TRAMO estimation, and those obtained with the Hodrick–Prescott filter and a smoothing parameter of 1600.

Despite the lower quality of quarterly data, the thrust of our previous results re-emerges with this sub-sample. Growth in both the US and Europe positively affect recovery prospects in emerging market economies, while the reverse applies for Japan. We take this as evidence that our central results are not an artefact of the use of annual data.

4.3. Predictive capacity

We are surprised by our results, particularly those pertaining to Japan, but confident that the estimates are robust. We thus attempted to check the validity of our estimates

by confronting them with our results with recent events. As our results somewhat depart from conventional wisdom, this may provide corroborating evidence. As mentioned above, we did not include the Asian crisis in our sample. The reduced number (in a statistical sense) of countries that were affected by the 1997–98 Asian crisis does not permit an adequate econometric analysis. However, it is possible to gauge whether our model's results fit with the recent experience.

At least three characteristics of the Asian crisis stand out: its depth, contagion to Latin America, and swift recovery in Asia. Indeed, the speed at which most Asian and some Latin American economies bounced back surprised observers at the time.[20] Our results can shed some light on the speed of recovery from the Asian crisis. The US was still growing fast, the EUs performance was good (by its own historical standards), and Japan was in recession. Real interest rates were going down, while the terms of trade were on average slightly decreasing.

In order to carry out-of-sample predictions, we had to extend our dataset. For GDP growth we used the latest International Monetary Fund's *World Economic Outlook* published statistics on realised growth for 1998, 1999, and 2000 and forecasts for 2001 and 2002. We used ARIMA modelling to obtain forecasts for Δtot and r_{US} whilst we kept *GLOB* at the 1997 levels. After applying our definition of recessions and recoveries to this new data, we identified the economies which entered in recession in 1998 and 1999.[21] We then used our estimated regional models from Table 3 parameters to assess the proportion of recoveries. The results, together with 2 standard-error confidence intervals are presented in Table 6.[22]

According to our results, this constellation should have favoured rapid recovery from the crisis, which is what occurred in Asia. It is also worth noting that all Asian countries quickly bounced back, save for Indonesia, which is the only country whose main export outlet is Japan.[23] However, the model's predictive capacity is somewhat disappointing in the case of Latin American countries.[24]

It may be argued that rapid recovery from the Asian crisis was in large part due to substantial IMF lending. We are not able to gauge the importance of IMF lending, as this variable is determined endogenously, at least in part. Moreover, there is no

[20] See, for instance, "Frozen miracle: A survey of East-Asian economies", *The Economist*, March 7, 1998, followed by "Asia's astonishing bounce-back", *The Economist*, August 21, 1999.

[21] Although the financial crisis began in the late summer of 1997, its effect on annual real growth was felt as of 1998. All Asian economies with the exception of China, India and Singapore entered recession in 1998. For Latin America, only Costa Rica and Mexico avoided the crisis. Peru, Paraguay, Ecuador and Colombia entered in 1998 and the rest in 1999.

[22] The small number of observations together with the low frequency of the data result in large confidence intervals.

[23] For the entire sample, the share of exports going to Japan is positively correlated with the average duration of recessions (correlation coefficient of 0.38). This result is strengthened if we focus on Asian countries: the correlation between export share to Japan and recessions' duration is positive, and stands at 0.43.

[24] *Ex-post*, there are some possible explanations for this failure. Colombia has been plagued by civil war. Ecuador was the first country to default on its Brady debt, an event followed by a military coup-d'état and the dollarisation of the economy. As for Argentina, policy makers' obstination to maintain the peso's parity with the US dollar contrasts with the large devaluation of the Brazilian real.

Table 6
Out-of-sample hazards for the Asian crisis[a,b]

	Second year	Third year
Frequency	0.41	0.60
Asian EMEs[c]		
Frequency	0.57	0.67
SEATS	0.67	0.81
	(0.49:0.80)	(0.65:0.90)
CONSTANT	0.38	0.38
	(0.30:0.46)	(0.30:0.46)
Latin American EMEs[d]		
Frequency	0.30	0.57
SEATS	0.89	0.97
	(0.59:0.98)	(0.81:0.99)
CONSTANT	0.42	0.42
	(0.36:0.49)	(0.36:0.49)

[a]Hazards measure the probability of exit given that the economy was in recession in the previous year. Frequencies are computed applying the definitions of recessions to the IMF's forecasts and detrending using the SEATS programme. SEATS out-of-sample hazards are average forecast probabilities generated by the regional models without the variables which were not significant. "CONSTANT" out-of-sample hazards were obtained by fitting a constant discrete probit duration model.

[b]Two standard-error confidence intervals are shown in parenthesis.

[c]Philippines, Indonesia, Korea, Hong Kong, Malaysia, Thailand, Turkey.

[d]Argentina, Bolivia, Brasil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela.

evidence that IMF activism was greater during the Asian crisis compared to other episodes.[25] In any event, the extent of IMF activism in the form of increased lending in EMEs is accounted for in the globalisation index.

5. Conclusion

In this paper, we have focused exclusively on the external factors that may influence recoveries in emerging market economies. All the coefficients appear with the expected sign. The exception is the short-run effect of Japanese growth which appears with a negative sign. This finding is surprising but looks robust, as it obtains irrespective of the specification. This result suggests that a short-run "direct competition effect" may be working between Japan and the emerging market economies forming our sample, particularly Asian ones. Further investigation along the lines identified by

[25] Data from the IMF does not indicate that lending during the Asian crisis was substantially higher compared to other periods such as the early 1980s. This holds irrespective of whether lending is measured as a percentage of the GDP of recipients countries, total resources made available by the Fund, or the growth rate of disbursements.

Diwan and Hoekman (1999) on the trade/Foreign Direct Investment/growth nexus is thus warranted.

Last, we provide evidence on the performance of our model's predictions with respect to the Asian crisis. The latter exercise is particularly demanding, as the unfolding of events has been unique by historical standards: a regional crisis engulfing the "Dragons" and "Tigers", that spreads to Latin America, coupled with strong US growth and recession in Japan. This variable constellation has not been observed since World War II. Our estimations are consistent with the observed fast recovery of the Asian countries, but overpredicts the path of recoveries in Latin American countries.

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Appendix A.

A.1. Quarterly data

We have gathered quarterly data for Argentina, Chile, Brazil, India, South Korea, and Mexico from 1960 to 1999. The data comes from the United Nations' Monthly Statistical Bulletin. As quarterly GDP growth data is not available for this period, we had to use indices of industrial production instead. For Chile, manufacturing production growth was used in those periods for which industrial production was not available. Real US interest rates are the 3 months Treasury Bill rates deflated by the US GDP deflator calculated at market prices. With respect to changes in terms of trade, we could only gather quarterly data for the period 1978–90 for all six countries and annual data since 1960. We used the data provided by Agénor, McDermott, and Prasad available at: http://www1.worldbank.org/wbiep/macro-program/agenor/excel/macdata.xls.

We also estimated the globalisation index for quarterly data. As in the annual version, we obtained our estimates using data on trade, IMF lending, foreign direct investment (FDI), the number of GATT members, and average tariffs. Quarterly data on trade and IMF lending were obtained from the IMF's *International Financial Statistics.* For the number of GATT countries and average tariffs, we imposed changes to occur in the first quarter. Data on FDI flows was obtained from UNCTAD (1991, 1998). Finally, as quarterly FDI data is not available, we simply applied smoothing techniques to the annual data.

We applied the TRAMO-SEATS procedure to estimate by ML methods some missing data points (for industrial production and changes in the terms of trade) and

obtain seasonally adjusted data. The methodology followed is described in Goméz and Maravall (1994).

In order to have definitions of recessions *cum* recovery cycles that are fully comparable in our annual and quarterly sample, we proceeded in the following way. First, we computed moving sums with three lags of the EME industrial production indices. Then we applied the SEATS detrending method to this "annualised" data set and applied the definitions we used with annual data. Finally, we checked that the majority of the resulting crises *cum* recovery cycles that we found with the annual data were also found with the quarterly data. Clearly, the advantage of the quarterly sample is its higher frequency. Computing moving sums, which are nothing but moving averages scaled by a factor of four, is a way to identify recoveries which are truly persistent. Also, this procedure reduces the—extreme—volatility of the quarterly series.

A.2. Globalisation indicators

We have gathered data on the value of world trade (expressed in deflated US dollars), the average tariff reductions stemming from successive GATT/WTO negotiations, the total number of GATT/WTO members, IMF lending, and FDI flows to our 22 emerging market economies. Save for FDI, all five series are available since 1958 (we used interpolation techniques to expand the FDI series). We applied a dynamic factor analysis to these five series in order to obtain a composite indicator of globalisation, as in Quah and Sargent (1993). All series show trendy behaviour and a very high cross-correlation.

The general dynamic factor model can be expressed as an observed segment of a random field, x_{it} (the observed series) that satisfies the relation

$$x_{it} = a_i(L) * u_t + \epsilon_{it} \quad \text{with } i = 1, 2, \ldots, N,$$

where u_t is a scalar unobserved nonstationary process common to all elements, $a_i(L)$ are lag polynomials, and ϵ_{it} is a disturbance term with the usual properties. Our final empirical specification included one lag in the transference polynomials $a_i(L)$, and a random walk with a drift model for the common unobserved trend u_{it}. The model is estimated using the EM (Expectation/Maximisation) algorithm. Convergence, defined by a change of the expected likelihood function smaller than 0.01%, was achieved after 62 iterations. The estimated series u_t shows trendy behavior, but also large swings in the growth rates. Graph 2 presents the evolution of our globalization index.

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