Unemployment in Japan: a look at the 'lost decade'*

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Abstract

The 'lost decade' in Japan was a period of steep surge in unemployment. It started in 1991 with the unemployment rate at 2.1%, and ended in 2002 when it reached a historical maximum of 5.5%. To assess the main causes of this rise we take a macroeconomic perspective and estimate a reduced-form unemployment model. This model, containing a rich set of variables, yields an interesting picture. The fall of private investment played the main role, while private consumption and the boost in government spending partially offset this recessive effect. In turn, the initial rise in participation rates and the East Asian crisis after 1997 added new burdens to the labor market. We conclude that a crucial issue in the medium-run is to avoid the consequences of the prolonged decline in investment in terms of reduced productivity growth and a weaker international trade performance.

Keywords: Unemployment, reduced-form models, investment, economic policy, East Asian crisis.

JEL Classification: E24, F16, J01.

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1 Introduction

The early 1990s saw the end of an extraordinary long expansion in Japan and the start of a prolonged slump lasting until 2002. This recessive period is known as the "lost decade" and prompted a renewed interest for this economy.[1] Since studies about the Japanese labor market have lagged behind, in this paper we take a look at the causes of unemployment in Japan in this critical period, when the rate of unemployment rose from 2.1% in 1991 to a historical maximum of 5.5% in 2002.

Our analysis is based on the estimation of an eclectic model containing a rich set of explanatory variables and providing a close fit of the actual unemployment rate trajectory in Japan. This model is taken as a benchmark to conduct counterfactual simulations and explore to what extent each of this large amount of variables account for the unemployment rise during the lost decade.

Mainstream accounts of the causes of unemployment rely on the estimation of reduced-form unemployment models and focus on particular candidates. In Phelps and Zoega (2001), the last contribution from the Structuralist theory of unemployment (Phelps, 1994), financial wealth is claimed to be critical in explaining the long swings in unemployment among the OECD countries. In the NAIRU[2] approach (Layard, Nickell and Jackman, 1991) the focus is on the role played by some fundamental shocks and a set of unemployment-prone labor market institutions (see also Blanchard and Wolfers, 2000), but it is evolving to a pure institutionalist view. For example, in a recent contribution, Nickell, Nunziata and Ochel (2005) claim that 55% of the long-term unemployment shifts in the OECD are explained simply by changes in labor market institutions. In contrast to these mainstream theories, the chain reaction theory (Karanassou, Sala and Snower, 2008b) argues that growing variables such as capital accumulation, productivity or working-age population are the main driving forces behind labor market performance.[3]

Our estimation of a reduced-form unemployment model is eclectic in the sense that it considers variables that have been found crucial to explain unemployment in different theoretical frameworks.[4] In this way we let them compete so as to come up with a global assessment of the causes of the slump (for example, we go beyond the NAIRU/Institutionalist focus on the role of wage-push factors as key sources of unemployment). The chosen specification of the model (i) contains a large number

[1] See Krugman (1998), Kuttner and Posen (2001), Hayashi and Prescott (2002), and the comprehensive analysis in the book by Ito, Patrick and Weinstein (2005).

[2] Non-Accelerating Inflation Rate of Unemployment.

[3] For the earlier contributions from this perspective see Karanassou and Snower (1993, 1997 and 1998). Karanassou, Sala and Snower (2007, 2008b) provide overall appraisals of this approach.

[4] Theoretical arguments justifying the presence of these variables are provided in the context of these different analytical frameworks. We refer the reader to the above mentioned references and focus our analysis on the empirical issues.

of explanatory variables which we group into four sets: demand-side, supply-side, foreign and demographic variables; and (ii) provides a close replica of the actual unemployment path (see figure 1 below).

In mainstream theories of the labor market, the equilibrium unemployment rate, whether it is called the Natural Rate of Unemployment (NRU) or the NAIRU, is the key analytical concept. However, we do not attempt to estimate such an equilibrium rate for a twofold reason. First, because the chain reaction theory has shown how this concept is curtailed given the plausible presence of adjustment costs and growing variables as determinants of labor market outcomes (Karanassou, Sala and Snower, 2007, 2008b). Second, because of its scarce relevance for Japan, as noted in Nishizaki (1997) and Hirose and Kamada (2002). These authors point out the difficulties in obtaining a precise estimation that explains why the NRU has been kept aside from the policy debate. Consequently, our empirical analysis is based on the estimation of the dynamic contributions of each exogenous variable to the evolution of unemployment. These dynamic contributions are an analytical tool developed by the chain reaction theory as the alternative to the estimation of an equilibrium rate of unemployment.

To estimate these dynamic contributions we take our estimated model as a benchmark and conduct a simulation analysis as follows. First we assume a virtual alternative path of the explanatory variables where the actual value is fixed at its level previous to the downturn (in 1991) throughout the selected period of interest (which lasts until 2002 when unemployment reached a maximum of 5.5%). Then we simulate the model under the actual and simulated trajectories of each exogenous variable. Finally we compare the resulting simulations to gain a measure of the contribution of each variable to the unemployment upsurge (see figures 2 to 5).

Our findings stress the major role played by private investment during the relenting 1990s in Japan. In particular, our simulations suggest that it accounts for a 5.4 percentage points (p.p.) increase in unemployment. On the other hand, private consumption and government spending helped in avoiding a more severe downturn by, respectively, -1.2 and -2.9 p.p. Hence, the offsetting effect led by these two variables failed to be total. Adding up these effects, we find the overall demand-side effects contributed to unemployment by 1.3 p.p. This is in contrast with the scarce contribution of the supply-side variables, which cancel out and play a secondary role. A foreign effect, accounting for a 1 p.p. increase in unemployment, is somehow perceived due to the financial turmoil undergone by the region. Also relevant is the importance of demographics, which accounts for a 0.6 p.p. increase.

The remaining of the paper is structured as follows. Section 2 presents the framework embodying our empirical analysis. Section 3 deals with the econometric issues and describes the estimated model. Section 4, in turn, explains the unemployment

rise in the fading 1990s through a simulation exercise. Section 5 concludes.

2 Analytical framework

Our empirical analysis considers aspects of three main conceptions of the labor market: the Structuralist theory of unemployment (Phelps, 1994), the NAIRU/Institutionalist framework (Layard, Nickell and Jackman, 1991), and the chain reaction theory (Karanassou, Sala and Snower, 2008b).

In mainstream theories such as the first two, the equilibrium rate of unemployment is the crucial concept no matter whether it is called the NRU or the NAIRU. In both cases most unemployment movements are assigned to the equilibrium unemployment rate to which actual unemployment tends to converge. As a consequence, explanations of the unemployment path simply look for the reasons that make the equilibrium unemployment rate move through time. This narrows the scope when searching for possible candidates and limits the policy measures to those that can eventually affect the equilibrium.

The chain reaction theory is an alternative approach. It builds on the observation that labor market decisions are often associated with significant adjustment costs so that these decisions depend on the past situation of the labor market. In this light, the standard assumption that in the short run labor is variable and capital is fixed cannot be sustained, and the common distinction between the "short run" and the "long run" becomes irretrievably blurred (see Karanassou, Sala and Snower, 2007). For this reason and because of frictional growth (the interaction of those adjustment costs with growing variables) the equilibrium rate of unemployment is dismissed as the central concept in labor market analysis (see Karanassou, Sala and Snower, 2008b).

In the particular case of Japan this concept seems indeed to be noncritical. In a basic setup (Blanchard, 2006), the NAIRU u^* can be computed as $u^* = u_t + \frac{1}{a}\Delta\pi_t$ (u being unemployment and π inflation), which is the reverse of the standard expression $\pi_t = \pi_{t-1} - a\,(u_t - u^*)$. This means that in the absence of inflation acceleration the actual unemployment rate and the NAIRU are rather close to each other. This was indeed the case in Japan during the lost decade, when the average annual rate of inflation was -0.27 with a standard deviation of 0.70 percentage points (years 1990-2002). In view of this stability, examining unemployment movements restricts to explain the equilibrium rate of unemployment itself, and this is not of our interest. Moreover, Nishizaki (1997) and Hirose and Kamada (2002) present estimations of Japan's NAIRU and acknowledge the difficulties of such estimations in terms of the precision and stability of the estimates.

As an alternative to the estimation of the equilibrium rate of unemployment, the

chain reaction theory relies on the estimation of dynamic contributions (which are explained in detail in Section 4). Therefore, in view of the above drawbacks on the notion and estimation of the equilibrium unemployment, our exercise below offers the computation of the dynamic contributions of key explanatory variables to evaluate to which extent their trajectories are responsible for the surge in unemployment during 1991-2002. This is the appropriate route accounting for the driving forces behind the unemployment upturn during the 'lost decade' and, for this to be a rich exercise, we need to consider a wide set of variables. Ultimately, this is the reason why our empirical assessment is deliberately chosen to be eclectic in the sense that it considers elements and variables proposed by the three main viewpoints in the analysis of the labor market.

Structuralists, NAIRU/Institutionalists, and chain reaction theory proponents suggest a wide set of candidates to explain the evolution of unemployment. They also provide the corresponding theoretical microfoundations to justify their inclusion in a reduced-form unemployment model.[5] This set of candidates is well-known from the existing literature and includes the following. First, labor market institutions, such as unions, benefits and tax variables. Second, variables capturing shocks, such as oil prices and interest rates.[6] Third, financial wealth, a key variable to understand the long shifts in unemployment among OECD countries according to the Structuralist theory (Phelps and Zoega, 2001). Fourth, demand-side variables, such as public spending and private consumption, which Phelps (1994) and Lindbeck and Snower (1994) have shown to play a role in labor markets. Fifth, growing variables, such as capital stock and working-age population, which are central from the chain reaction theory perspective (Karanassou, Sala and Snower, 2008b). Sixth, the change in the inflation rate which is generally included in the mainstream literature to control for disturbances around the equilibrium path of unemployment.

To set up the reduced-form unemployment equation, we group this wide spectrum of candidates into demand-side (d in equation (1)), supply-side (s), external (e) and demographic (h) variables, so that the empirical model to be estimated takes the

[5] Microfoundations of these analytical frameworks are provided in Phelps (1994) for the Structuralist theory; in Layard, Nickell and Jackman (1991) for the NAIRU/Institutionalist approach; and in Henry, Karanassou and Snower (2000) and Karanassou, Sala and Snower (2007) for the chain reaction theory.

[6] Recall that mainstream theories divide movements in unemployment into high-frequency (or conjunctural) movements, which are mainly induced by the effects of temporary shocks disrupting the equilibrium, and low-frequency (or structural) movements, which arise from structural changes in the unemployment determinants, and are associated with permanent shocks (for example, changes in labour market institutions brought by labor market reforms). It thus follows that these first two groups of candidates are commonly seen as providing the core explanation of the unemployment trajectory in the OECD countries (see Blanchard and Wolfers, 2000; and Nickell, Nunziata and Ochel, 2005).

following encompassing form:

$$u_t = \alpha_1 + \alpha_{2i} \sum_{i=1}^{n} u_{t-i} + \alpha_{3i} \sum_{i=1}^{n} d_{t-i} + \alpha_{4i} \sum_{i=1}^{n} s_{t-i} + \alpha_{5i} \sum_{i=1}^{n} e_{t-i} + \alpha_{6i} \sum_{i=1}^{n} h_{t-i} + \varepsilon_t. \quad (1)$$

The α's are the estimated parameters, and $i = 1, ..., n$ determine the lag structure of each explanatory variable.

Equation (1) deserves several remarks. First, we allow a dynamic structure of the model in contrast to mainstream studies where dynamics do not play a relevant role.[7] Second, as it is standard practice, we consider the change in the inflation rate as a demand-side variable, in addition to other 'pure' demand-side variables such as private consumption. Third, financial wealth is included as a supply-side variable. Fourth, because the dependent variable is stationary, growing variables, which are central in the framework of the chain reaction theory, enter the equation through proxies or transformations.[8] In particular, the levels of capital stock, working-age population and productivity are not present, and the model, instead, features investment, the rate of participation, and productivity growth. The estimated counterpart of our reduced-form unemployment equation (1) is presented next.

3 Estimated model

3.1 Data

We use annual data from the following sources: the OECD Economic Outlook, IMF International Financial Statistics, Global Financial Data, and the Statistic Bureau of the Ministry of Internal Affairs and Communications of Japan. Table 1 defines the variables entering the final specification of the estimated model.[9]

It is important to outline the absence, in the chosen specification of the model, of some variables considered to be highly important from the perspective of the Structuralist theory. Global variables such as oil prices and the world interest rate turn out

[7] Because of the lack of time series for many labor market institutions, the use of five-year indices to proxy for these "relatively invariant" institutions has become common practice (Blanchard and Wolfers, 2000; Nickell, Nunziata and Ochel, 2005). This implies the need of taking five-year averages for the rest of the variables, thereby forcing the elimination of cyclical concerns and prompting an almost exclusive focus on equilibrium. In contrast, our analysis looks at year-to-year movements in some of these institutions as well as in other variables put forth by mainstream theories (see Section 3).

[8] Ours is not a chain reaction theory model. As explained in Karanassou, Sala and Snower (2008b) such models have three salient features: frictional growth, the estimation of multi-equation systems, and growing variables (e.g. capital accumulation) as most determinant.

[9] Some other variables were used. For example, variables related to the tax system (social security contributions, direct taxes, indirect taxes, and the fiscal wedge), real balances, interest rates, the change in inflation, financial wealth, oil prices and the long-run world interest rate.

with the wrong negative sign, whereas the change in inflation and financial wealth display the correct negative sign but are strongly nonsignificant. These findings can be justified because (i) despite the country's dependence on crude, Japan's relative closeness at the time of the oil shocks might have helped in avoiding a real damaging effect;[10] (ii) other variables included in the estimation (trade balance and competitiveness) grasp part of these external shocks; (iii) the detailed specification of the demand-side influences does not leave room for the change in inflation; and (iv) the presence of other variables in the model (investment, productivity growth) could explain the labor demand decisions of the firms more accurately than the firms' asset prices.

Table 1: Definitions of variables

			Source:
u	:	unemployment rate $\left(=\frac{\text{unemployed}}{\text{labor force}}\right)$	(1)
i	:	real investment (% of GDP)	(1)
c	:	real consumption (% of GDP)	(1)
g	:	real government expenditures (% of GDP)	(1)
fd	:	real foreign demand $\left(=\frac{\text{exports-imports}}{\text{GDP}}\right)$	(1)
um	:	union membership (% of total employment)	(2)
b	:	real social security benefits (% of GDP)	(1)
z	:	participation rate $\left(=\frac{\text{labor force}}{\text{working-age population}}\right)$	(1)
cc	:	competitiveness $\left(=\frac{\text{import prices}}{\text{domestic prices}}\right)$	(1)
θ	:	real labor productivity $\left(=\frac{\text{GDP}}{\text{total employment}}\right)$	(1)
d^{97}	:	dummy (value 0 up to 1997, 1 afterwards)	(1)
Δ	=	difference operator	
Sources:		(1): OECD, Economic Outlook; (2) Statistic Bureau (Ministry of Internal Affairs and Communications of Japan).	

A central issue while estimating reduced-form unemployment equations concerns the time-series properties of the variables. It should be noted that all the variables presented in table 1 are defined as ratios. This is important because in dealing with stationary variables alone we avoid cointegrating issues.

3.2 Econometrics of the model

We conduct unit root tests based on the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, which is more suitable for short time series and allows to test directly the null

[10] Japanese exports and imports added to 11% of GDP during the first oil shock in 1973 and to 12–13 % in the late 1970s and early 1980s, when the interest rate and second oil shocks took place. This ratio, however, reached 16% in 1990, 20% in 2000, and 25% in 2005, making the country more prone to external shocks. In particular, the East Asian crisis found Japan much more vulnerable in the 1990s than twenty years back.

hypothesis of stationarity. The alternative would be to use the DF or ADF tests, but both test the null of a unit root and very often do not provide decisive evidence on the degree of integration of the variables.

Table 2 displays the results of conducting this test on our variables of interest. When performing the KPSS on the levels of the variables without trend, the null hypothesis cannot be rejected at a 5% critical value for u, i, c, g, fd and cc. For the rest the results are not as clear-cut (e.g., productivity growth gives the closest value, 0.486, to the critical value 0.463) so we add a trend to the underlying KPSS test regression. In that case, the null hypothesis holds for g, um, $\Delta\theta$ and z, which we conclude are trend-stationary. The overall conclusion is that we are dealing with a set of $I(0)$ variables which, by definition, yields a long-run cointegrating vector. The estimated model is therefore suitable to perform our analysis on the medium-run contribution of the exogenous variables to unemployment movements.[11]

Table 2: Unit root tests

	u	i	c	g	b	um	$\Delta\theta$	fd	cc	z
KPSS	0.390	0.195	0.411	0.337	0.081	0.137	0.120	0.282	0.363	0.142
CV*	0.463	0.463	0.463	0.463	0.146	0.146	0.146	0.463	0.463	0.146
Result	$I(0)$	$I(0)$	$I(0)$	$I(0)$	$I(0)$	$I(0)$	$I(0)$	$I(0)$	$I(0)$	$I(0)$

Notation: KPSS=Kwiatkowski-Phillips-Schmidt-Shin.
*: CV = 5% critical values (the underlying KPSS test regression includes. constant or constant and trend)

The results on the selected specification of the reduced-form model are presented in table 3.[12] In the first column we show that all the explanatory variables are significant at the conventional 5% critical level.

In the second column we present the long-run elasticities, which we discuss below.

In the third, we show that it is a well-specified equation that passes the standard misspecification tests -serial correlation (SC), linearity (LIN), normality (NOR), heteroskedasticity (HET) and conditional heteroskedasticity (ARCH)-. The estimated coefficients pass the cusum and cusum$Q$ tests and are structurally stable. These tests revealed the need of including the dummy d^{97}: in its absence the cusum$Q$ failed with a sudden shift in 1997. We interpret its inclusion as the need to account for the economic turbulence brought by the collapse of the Thai baht in July 1997, which was followed by an unprecedented financial crisis in East Asia.

[11] A further proof of cointegration is the statistical significance of the coefficient on the error correction mechanism underlying the estimated model with t-statistic = -3.68 and p-value = 0.001.

[12] It is important to remark that the statistical discrepancy of the official series breaks multicollinearity among the demand-side variables (e.g., the sum of i, c, g and fd differs from 100%).

Table 3: Unemployment equation. Japan. 1962-2002
Method: Ordinary Least Squares.

Dependent variable : Δu_t		*Long − run elasticities*		*Diagnostic tests*		*Exogeneity tests*	
cnt	0.20 [0.133]	ε^{lr}_{u-cnt}	0.67 [0.172]				
u_{t-1}	−0.30 [0.001]						
i_t	−0.34 [0.017]	ε^{lr}_{u-i}	−1.11 [0.050]			$HT_i:$	−0.36 [0.194]
c_t	−0.25 [0.042]	ε^{lr}_{u-c}	−0.83 [0.082]	$SC\left[\chi^2(1)\right]$	1.73 [0.188]	$HT_c:$	−0.20 [0.433]
g_t	−0.28 [0.018]	ε^{lr}_{u-g}	−0.92 [0.057]	$LIN\left[\chi^2(1)\right]$	1.75 [0.186]	$HT_g:$	−0.20 [0.378]
b_t	0.14 [0.022]	ε^{lr}_{u-b}	0.45 [0.004]	$NOR\left[\chi^2(2)\right]$	4.58 [0.101]	$HT_b:$	0.18 [0.160]
um_t	0.09 [0.002]	ε^{lr}_{u-um}	0.28 [0.016]	$HET\left[\chi^2(1)\right]$	0.84 [0.358]	$HT_{um}:$	−0.11 [0.191]
$\Delta\theta_{t-1}$	−0.03 [0.039]	$\varepsilon^{lr}_{u-\theta}$	−0.09 [0.127]	$ARCH\left[\chi^2(1)\right]$	0.00 [0.958]	$HT_\theta:$	−
fd_t	−0.30 [0.030]	ε^{lr}_{u-fd}	−1.00 [0.068]			$HT_{fd}:$	−0.22 [0.421]
cc_t	−0.24 [0.011]	ε^{lr}_{u-cc}	−0.80 [0.020]	$Cusum_{5\%}$	✓	$HT_{cc}:$	−0.19 [0.287]
d^{97}	0.003 [0.011]	$\varepsilon^{lr}_{u-d^{97}}$	0.01 [0.003]	$CusumQ_{5\%}$	✓	$HT_{d^{97}}:$	−
z_{t-1}	0.07 [0.015]	ε^{lr}_{u-z}	0.24 [0.049]			$HT_z:$	−
R^2	0.797						
$s.e.$	0.001						
LL	225.1						

Notes: p-values in squared brackets; s.e.=standard errors; LL=Log likelihood.
Probabilities in brackets; 5% critical values: $\chi^2(1) = 3.84; \chi^2(2) = 5.99$

Finally, the fourth column shows the results of the Hausman test for potential endogeneity of the explanatory variables, discarding this possibility. The main step in performing this test is the choice of the instruments which, in our case are the lagged variables of each set of variables (for example, lagged demand-side variables when testing the possibility of endogeneity in any variable belonging to this group).

3.3 Economics of the model

3.3.1 Unemployment persistence

The dependent variable of the model can be presented in levels or in differences:

$$\begin{aligned} u_t &= \underset{[0.133]}{0.20} + \underset{[0.000]}{0.70}\, u_{t-1} + \text{ other terms} \\ \Delta u_t &= \underset{[0.133]}{0.20} - \underset{[0.001]}{0.30}\, u_{t-1} + \text{ other terms,} \end{aligned}$$

which is just a reparameterization without statistical incidence. In the first case, the coefficient on the lagged dependent variable, 0.70, indicates how persistent unemployment is. This value implies that 70% of a one-off unit shock in period t is translated to period $t+1$, 49% (=0.70^2) to period $t+2$ and so on, until more than 90% of it is absorbed in the 7th year after the disturbance occurred. In other words, in this labor market temporary shocks have long-lasting effects. In turn, in the second parametrization we are able to judge if the persistence coefficient is significant and, therefore, if we can statistically discard the possibility of a unit root. This is what allows us to reject the hypothesis of hysteresis, which does not hold (within our setting) for the Japanese unemployment rate.

3.3.2 Demand-side variables

The literature on inflation dynamics generally recognizes that inflation acceleration captures demand-side influences. In this paper we consider variables that capture directly the effects of aggregate demand on unemployment and find inflation acceleration to be nonsignificant (its p-value is 0.76 when added to the equation). This can be justified on the grounds of the works by Lindbeck and Snower (1994), who uncover several transmission channels whereby product demand changes affect employment in the long-run. Ball (1999), too, argues both theoretically and empirically that aggregate demand influences unemployment.

The aggregate demand variables here are private investment, private consumption, and public spending, all of them with the expected negative sign and long-run elasticities of, respectively, -1.11, -0.83 and -0.92. Since the variables are defined as ratios, these elasticities indicate the unemployment variation, in percentage points, in response to a 1 percentage point increase in the corresponding ratio.

It is worth mentioning the strength of the set of demand-side variables in our estimation, especially as opposed to the supply-side set. In particular, the coefficient attached to private investment underlies its large influence in explaining the unemployment rate.

3.3.3 Supply-side variables

Supply-side variables include the institutional ones: social security benefits and union membership, with long-run elasticities of 0.45 and 0.28. Efforts to include tax system-related variables -such as direct or indirect taxes, social security contributions, or the fiscal wedge as a proxy of the tax system incidence- were unsuccessful. The reason is that social security benefits are a global measure of the welfare state and, therefore,

a key counterpart to public revenues.[13] Thus, we interpret this variable as a proxy of two widely studied institutions, the unemployment protection legislation (usually proxied by unemployment benefits) and the tax system. This reasoning is endorsed by Phelps (1997b, p. 144) who points as one of the main findings of the Structuralist theory the fact that the welfare state is harmful to employment "both via the level and mix of taxes traditionally adopted to finance it, and through the inherent impact of the reduced dependency on employment it promotes".

Union membership proxies the influence of a third important institution, union power, which reflects a particular feature of the Japanese labor market. The union movement has been intrinsically attached to working life in Japan since the beginning of industrialization. It is a web of nonmaterial sanctions by which employees and society as a whole have been conditioned to accept the system as both morally good and individually satisfying (Crawcour, 1978, p. 239). However, with the transition to more flexible working conditions, and workers spending more time in leisure activities, the prominence of unions is gradually losing terrain. The Japanese employment system is becoming an innovative rather than traditional system, a process that is seen as a creative reaction to changing circumstances. As explained in Section 4, this has been important in preventing further unemployment increases in the fading 1990s.

Further, productivity growth aims to gather other supply-side forces and displays a long-run elasticity of -0.09. The steady decrease of productivity growth since the 1960s, and its poor performance in the 1990s in particular, has recently merited attention (see Hayashi and Prescott, 2002).

3.3.4 Foreign variables

It is difficult at times to identify the driving forces embodied in some explanatory variables. In particular, this is the case with real foreign demand and competitiveness, which are a quantitative and a price variable that may assemble both supply-side and demand-side influences (note that a similar case could arise from the presence of investment and productivity growth). This drawback is inherent to the approach itself, just focusing on a reduced-form single-equation model. Still at the risk of overparameterizing the model, we find it convenient to include all these variables (in any case all clearly significant) and thus enrich our analysis in economic terms.

Closely related is the issue of exogeneity. One recursive criticism about the Structuralist empirical work is the presence of potential exogeneity problems.[14] In its

[13] The correlation coefficient between social security benefits and the fiscal wedge is 0.95.

[14] See Woodford (1994), or the discussions by several authors that follow Fitoussi *et al.* (2000) and Phelps and Zoega (2001).

discussion of Phelps and Zoega (2001), Bentolila notes the difficulty in finding good instruments, which moves him to support the use of no instruments instead of trying to fool the profession with bad instruments. Since the Hausman test proves the exogeneity of the regressors, we decide to rely on the OLS estimates. According to these, foreign demand and competitiveness display both the expected negative sign with long-run elasticities of -1.0 and -0.80.

Finally, a dummy variable aims to capture the turmoil that stirred the region after the fall of the Thai Baht in 1997, when countries fell indeed into a domino effect that spread through the international markets. Japan did not come out unscathed, as proved by the performance of the dummy in our model. Given the presence of other variables like investment, productivity growth, foreign demand or competitiveness, the dummy variable comes to represent some intangible aspects of this turmoil. The sudden uncertainty in financial markets, the broken expectations of agents, and drops in the confidence of consumers and producers on the economic situation are the most important of these.

3.3.5 Demographic variables

With population growth slowing down and society aging at a rapid pace, demographic concerns are becoming an important issue in Japan. Here is the main challenge threatening the social security system in the near future. On the labor market, too, the labor force participation ratio has risen steeply since the mid-1980s accompanying the sharp rise in the unemployment rate in a clear-cut pattern.

The link between unemployment and participation rates has already received some attention in the literature. Hamada and Kurosaka (1986) find a negative sign of the unemployment coefficient in a participation rate equation, while Brunello (1990) finds it to be positive. Following the latter, our estimates yield a positive relationship between participation and unemployment rates, with a long-run coefficient of 0.07.[15] More recently, Fujiki, Nakada and Tachibanaki (2001) have shown evidence in favor of a discouraged worker effect for the male population, whereas the number of discouraged women, yet remarkably high as in the last twenty years, has stayed at the same level during the fading 1990s.

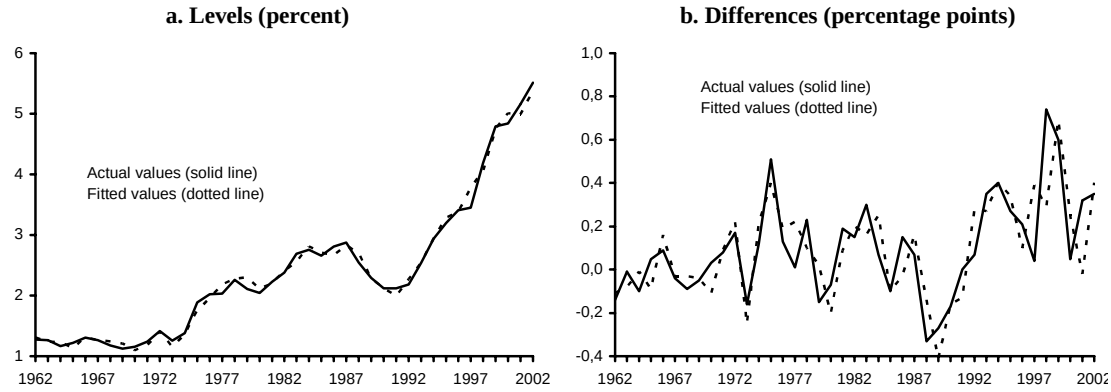
3.4 Fitted values

The estimated model provides a close fit of the unemployment trajectory in Japan. When the dependent variable is expressed in levels the R^2 reaches a value of 0.992;

[15] The fact that the labor force enters both in the participation and unemployment rates could entail endogeneity problems. We avoid these for it is the lagged term of the participation ratio instead of the current term that enters the equation.

when the model is reparameterized and expressed in changes in the unemployment rate the R^2 is 0.797. Figure 1 illustrates how precisely our model tracks the actual values.

Figure 1. Unemployment rate: actual and fitted values



To sum up, the estimated model fares well with the standard theoretical and econometric requirements, allowing us to track the movements of the Japanese unemployment rate very closely.

4 Determinants of the unemployment upsurge

To examine the main determinants of the unemployment upsurge during the 'lost decade' we estimate the dynamic contribution (to this rise) of each exogenous variable. This methodology is followed in Karanassou, Sala and Snower (2008a, 2008b), and is explained analytically in Bande and Karanassou (2008). It consists of a dynamic simulation analysis to study how a particular series would have changed (the unemployment rate in this case) had a particular variable in the model followed a different trajectory from the actual one. For example, if investment in Japan fell during the 1990s, it is interesting to ask how unemployment would have evolved in the absence of such a declining path. In this way we can study how much of the unemployment variation is attributable to each variable in the model.

Therefore, we need to select a point in time to fix the variables and generate a new (virtual) path. This choice is to some extent arbitrary, but is based on a simple and transparent criterion: the major turning points in the path of actual unemployment in recent years. In our analysis, the period of interest starts in 1991, with a 2.1% unemployment rate, and finishes in 2002, when this rate reached an unprecedented maximum of 5.5%.

Once the period is defined we fix the value of a particular variable in the starting year and simulate the model. The resulting unemployment rate is then compared

with the simulated one when the variable takes its actual values. This comparison yields a measure of the incidence of that particular variable on the unemployment trajectory. This is shown in figs. 2d, 3d, 4c and 5b, where the thin solid lines are the actual unemployment rate and the rest of the lines add, sequentially, the contributions of each exogenous variable to the evolution of unemployment. In this way we discern what would have happened if those particular variables had remained constant at their values previous to the downturn.

Another way of looking at the outcome of this exercise is to take the difference between the final values of both simulations as the *contribution* of that particular variable to unemployment movements. For example, figures 2b and 2d show that the investment downturn in the 1990s accounts for more than 5 percentage points of unemployment. Had it remained at its 1991 value, unemployment would have been null at the end of the period. Table 4 gives the exact *contributions* of each of the variables alone, and grouped in demand-side, supply-side, foreign and demographic sets. Of course, this is a *ceteris paribus* analysis, like any one based on an econometric estimation. It should thus be taken as an illustrative exercise, rather than as an evaluation of what would have actually happened.

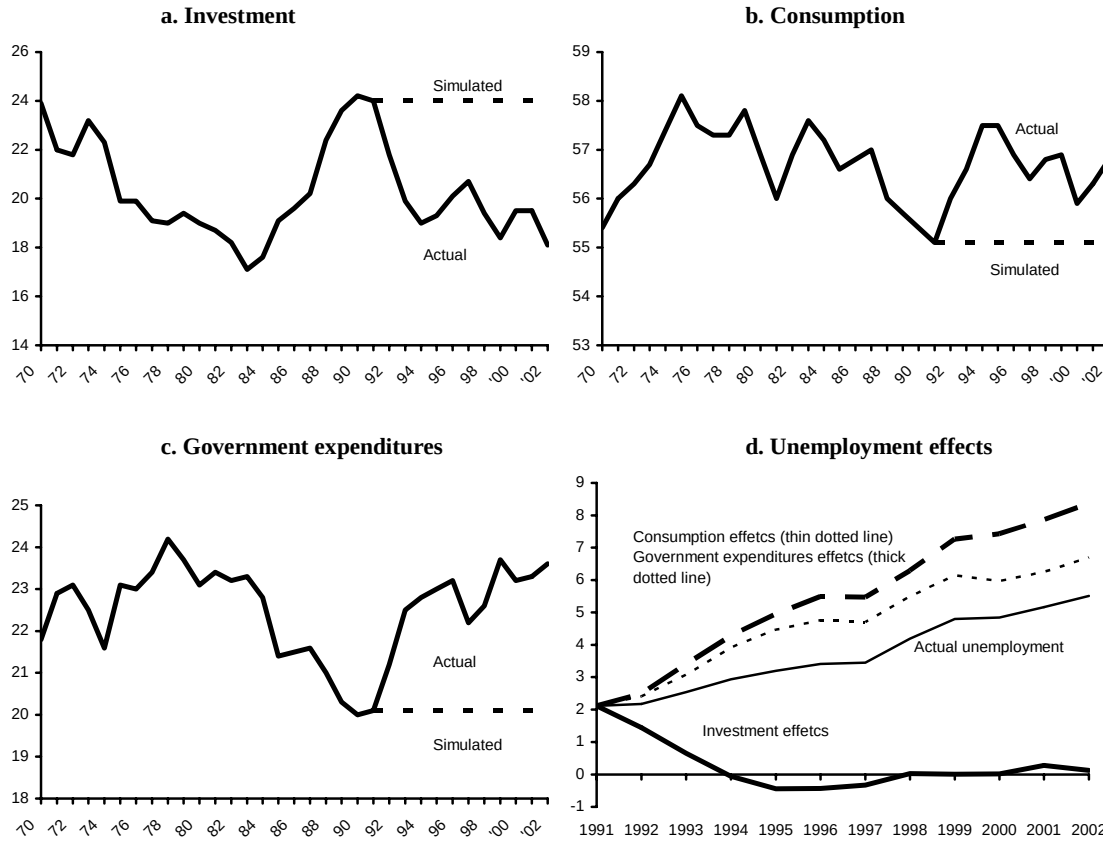
The global impact of domestic demand (figure 2) has been remarkably negative. If all demand variables, taken together, had remained fixed at their 1991 values, the unemployment rate would have been around 4 % in 2002 (instead of 5.5 % as it occurred).

A closer look suggests how powerful the private investment might turn out to be. Figure 2d shows how unemployment would have come to naught had investment stayed unchanged from its much higher value in 1991. It fell from 24 % in 1991 to 18.1 % in 2002 (figure 2a) and caused, as noted before, a 5.4 percentage points increment in the unemployment rate. On the other hand, neither private consumption nor government spending have been capable to offset the downturn in private investment, even if we consider them jointly. Indeed, the offsetting effect boosted by increments of government spending and private consumption was not enough (according to Kuttner and Posen, 2001, it was sometimes tardy and usually misguided) in preventing a declining labor market (figures 2b and 2c). The reducing effect on unemployment, *ceteris paribus*, of private consumption and government spending is, respectively, -1.2 and -2.9 percentage points. These effects, jointly with the strong opposite effect of the declining investment, add up to a total demand effect of a 1.3 percentage points increment on unemployment for 1991-2002.

The hike in the values of these variables, especially that of government spending, can be explained through changes in a society which has always been oriented to work hard, and now is seeking more leisure-oriented patterns through the government's aid

(there are new policies aimed at building more leisure resorts, museums, and theme parks, for example).[16] In fact, the Japanese government has sought to encourage this transformation in measures like adopting five-day weeks, establishing new public holidays, promoting Monday holidays and, also, promoting the shortening of the total amount of working hours per week (see Fuess, 2006).

Figure 2. Unemployment effects of the demand-side variables



The relevance placed by our analysis on the demand side agrees with the reviews by Kuttner and Posen (2001), Benson (2005), and Ito *et al.* (2005). The former authors, yet encouraging a positive view of active countercyclical demand policies to end the recession, rely more on the monetary side. This, they argue, is the result of "inflationary risks of quantitative easing" being seemingly nonexistent (p. 158). Their opinion finds a foothold in the findings of Miyao (2002), who uncovers the persistent effect of monetary policy shocks on real output in Japan for the past two decades. He also argues that the Bank of Japan's policy in the early 1990s "may not be viewed as active, exogenous monetary policy but as accommodative, endogenous responses to the stagnated real economy" (p. 389). Ito *et al.* (2005) state that "Japan's poor

[16] From this point of view, there is no reason to consider the existence of a crowding-out effect of public spending on investment. This is also in line with Kuttner and Posen (2001, p. 126).

macroeconomic performance has been largely due to inadequate aggregate demand" (p. 15).

Table 4: Variable changes and unemployment effects.

	u	i	c	g	b	um	$\Delta\theta$	fd	cc	d^{97}	z
Actual changes:											
1991	2.1	24.0	55.1	20.1	7.0	24.5	1.4	0.8	1.1	0.0	75.2
2002	5.5	18.1	56.8	23.6	10.9	20.2	1.0	1.5	1.1	1.0	77.5
Difference*	3.4	-5.9	1.7	3.5	3.9	-3.3	-0.4	0.7	0.0	1.0	2.3
Individual contributions to unemployment (percentage points):											
Δu	-	5.4	-1.2	-2.9	1.4	-0.9	0.0	-0.3	0.1	0.9	0.6

Joint contributions to unemployment (percentage points):

Demand-side variables:	1.3	Supply-side variables	0.5
Foreign variables:	0.7	Participation rate	0.6
		Total effects	**3.1**

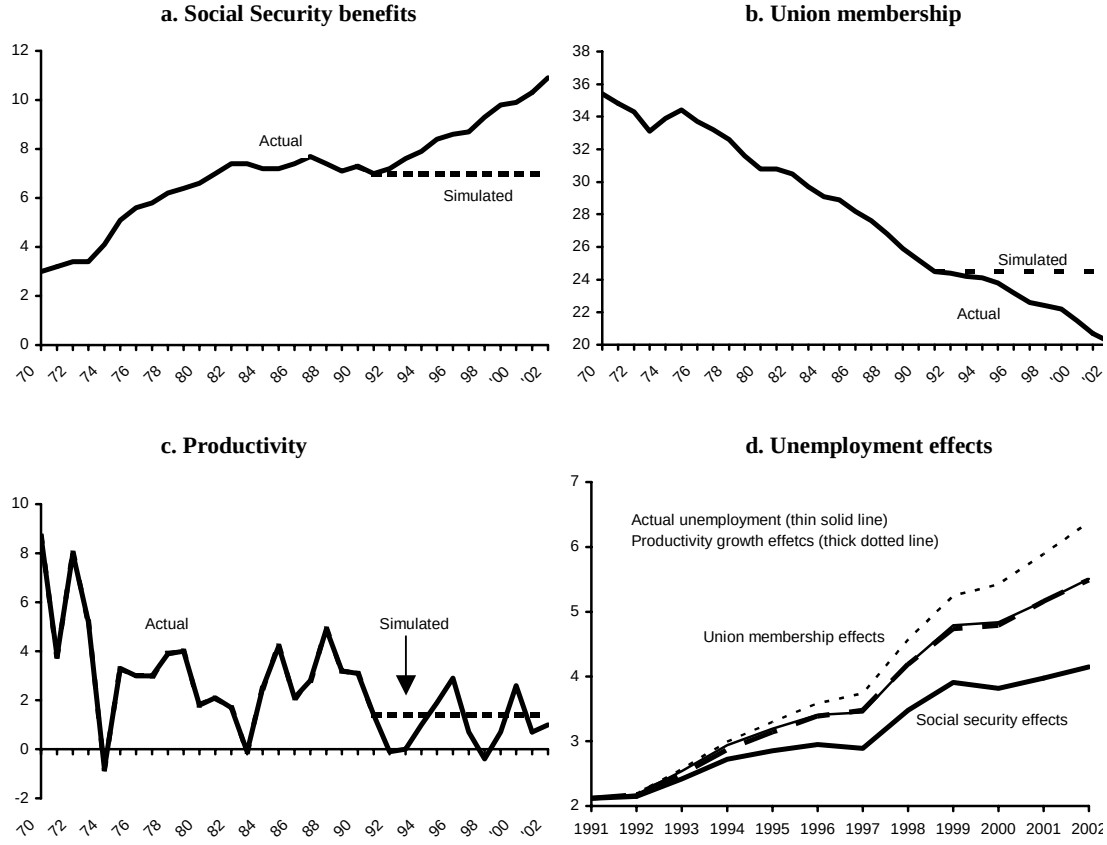
*: Expressed in percentage points.

Supply-side and institutional variables (figure 3) have had relatively little importance in settling the unemployment path, since the individual contributions have somehow canceled out. Though the final effect (a 0.5 percentage point rise in unemployment) turns out negative due to the ever increasing unemployment benefits and a weakening productivity, the declining power of labor unions has partly counterbalanced this. It is still worth pointing out the strength of unemployment benefits and union power as driving forces of unemployment. When taken alone, these effects can explain, *ceteris paribus*, a 1.4 and -0.8 percentage points change in the unemployment rate respectively.

Hamada and Kurosaka (1986) offer evidence on a direct relation between unionization and the change in wages. The role of welfare state allowances has been widely analyzed in the literature, as a feature that goes counter to employment creation -see Phelps (1994 and 1997a), in general, and Benson (2005) for Japan-. The low productivity growth rate appears in Hayashi and Prescott (2002) as the key determinant of the underperformance of the economy in the 1990s recession. Despite the zero contribution in our simulation exercise[17], its steady decrease has been common coin since the golden 1960s.

[17] This is, by no means, evidence against these authors' hypothesis. Due to its ambiguous behavior, our simulation could not detect the poor performance of this variable *within* the 1990s. To gain some further understanding on the relation between unemployment and productivity, a simulation that would cover a longer span of time should be brought into analysis. This is an interesting issue in itself and is left for future analysis.

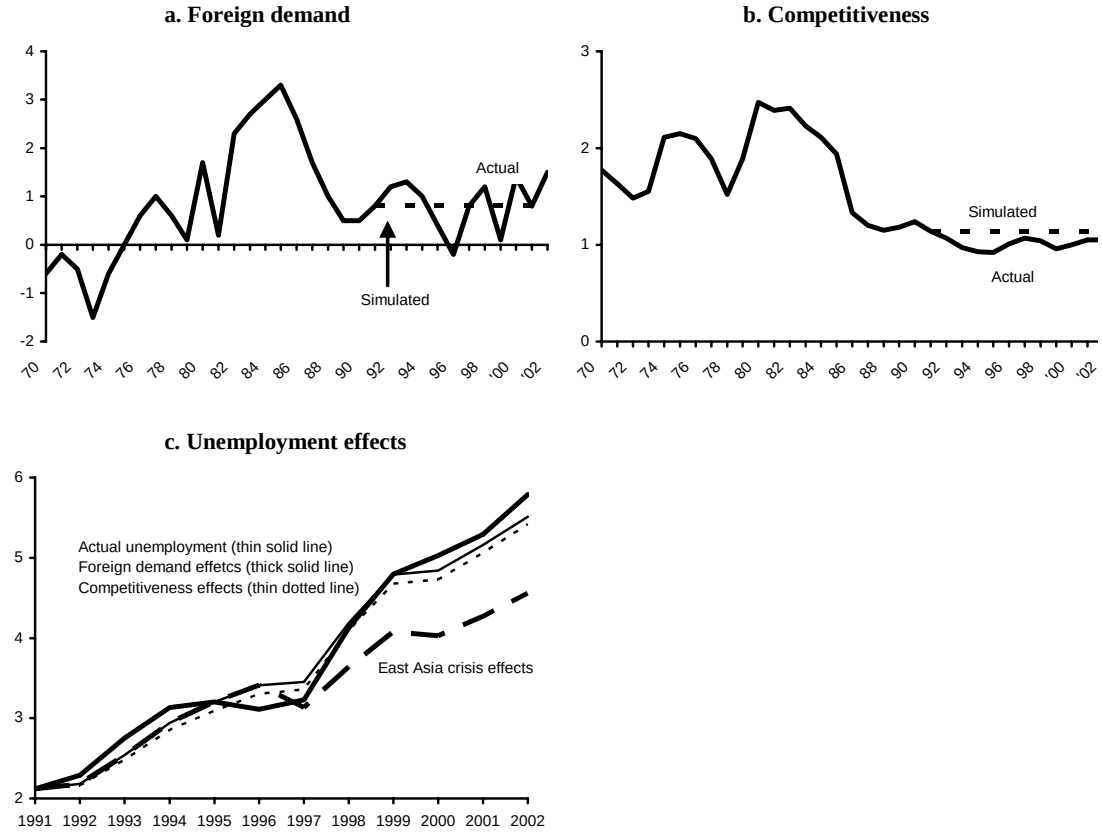
Figure 3. Unemployment effects of the supply-side variables



Though less drastically than domestic demand, the foreign sector (figure 4) has also contributed negatively to the labor market performance. The final effect is, *ceteris paribus*, a 0.7 percentage points increment in unemployment. This is justly so because the net foreign demand of goods and services, as well as the country's competitiveness, changed only slightly (figures 4a and 4b). However, when considering the effect of the East Asian Tigers crisis of 1997, we find that it has strongly influenced the labor market.

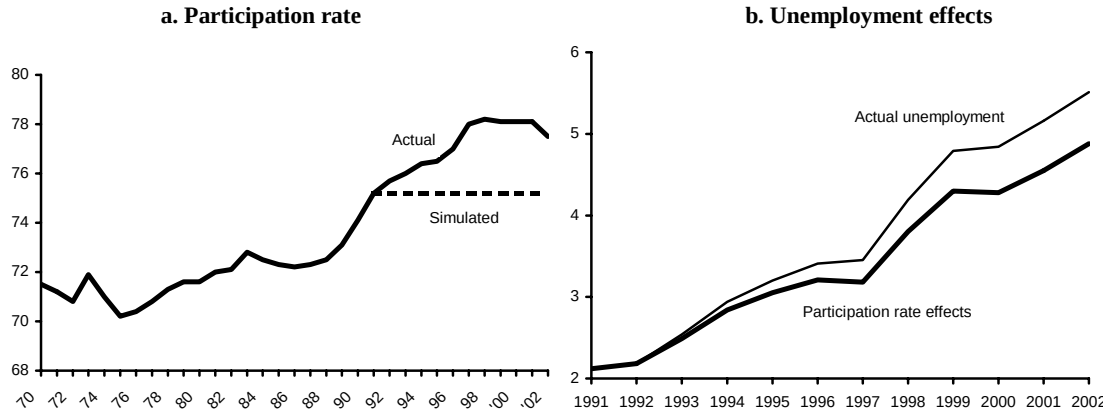
As noted before, the cusumQ test helps us identify the change in structural stability in 1997, which is solved with a dummy variable. Since none of the other variables considered reports the effects contained in this dummy (uncertainty of financial markets, unfulfilled expectations, and a drop of confidence indexes) we gather it captures the global turmoil brought by the crisis. This could have accounted for around 1 percentage point of the increment in the unemployment rate from 1997 to 2002 (figure 4c). An analysis on this line is presented in Ito *et al.* (2005).

Figure 4. Unemployment effects of the foreign variables



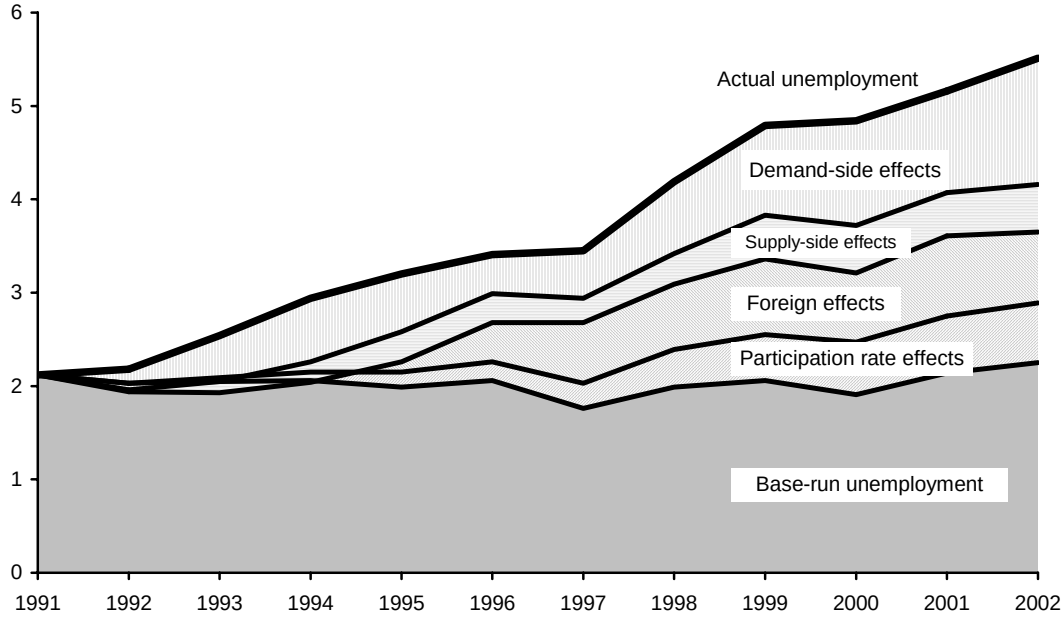
Lastly, the simulation on the labor force participation rate shows how unemployment would have remained 0.6 percentage points below the actual rate in 2002 if the participation rate had stayed low at its 1991 value (figure 5). Fujiki, Nakada and Tachibanaki (2001) analyze the Japanese labor market through structural changes that stem from changes in the labor force composition. They argue that several structural issues may arise depending on the workers' gender, age, occupation, and family background. Therefore, labor market reform should aim to create a wide variety of employment opportunities, as well as prepare the economy for an era of low birthrate and a small workforce.

Figure 5. Unemployment effects of the participation rate



Now, if we take all the individual contributions together we get a total effect of 3.1 percentage points on unemployment. This is pictured in figure 6, where the simulated trajectories of unemployment in response to the changes in each set of variables is added sequentially. In other words, if all the variables of the model had remained at their 1991 levels, the unemployment rate would have stayed almost unchanged: it would have ended up at 2.4%, instead of 5.5%, which is similar to the 2.1% actual rate in 1991; moreover, its trajectory would have been rather flat as shown by the base-run unemployment rate trajectory.

Figure 6. Determinants of the unemployment upsurge in Japan. 1991-2002



5 Conclusions

In this paper we have looked at the causes of the steep surge in unemployment in Japan during the 'lost decade'. We have estimated a reduced-form unemployment model and have identified an assorted group of determinants representative of demand-side, supply-side, foreign and demographic influences on unemployment. To understand the causes of the unemployment rise in the 1990s we have conducted a dynamic accounting exercise following a methodology developed within the chain reaction theory of unemployment. This methodology consists in measuring the *contributions* of the variables to the unemployment trajectory in a particular period, in our case running from 1991 to 2002.

We have found a strong contribution of the fall in investment to the unemployment upsurge experienced by Japan in these years. In spite of this, it seems too soon for this decline to be reflected in terms of an erosion in competitiveness and a collapse in the Japanese net foreign demand. Conversely, on labor productivity, its poor performance during the 1990s might be deemed as the natural outcome of the declining investment.

Demand-side economic policies addressed to compensate this problem, in particular expansionary monetary and fiscal policies, have enhanced consumption and public expenses but not enough to offset the impact of falling investment. On the supply side, the forces at work have reacted in opposing directions. One sign of the improved labor market flexibility is the decline in union power (measured by the evolution of union membership) that has contributed to mitigate the unemployment problem. On the contrary, the conjunctural (because of the recession) but also structural (because of the aging population) expansion in social security benefits is another important driving force behind the unemployment upsurge. Higher participation ratios (resulting in part from demographic stagnation) have also contributed to raise unemployment. Finally, the East Asian crisis in the late 1990s, defined (and captured) in some intangible way beyond competitiveness and foreign demand, seems to have posed another important burden for the labor market. Overall, we are able to explain 3.1 out of the 3.4 percentage points increase in unemployment.

As argued before, our results mesh well with those in other studies. In particular, Benson (2005) points, as core issues, to the decline in manufacturing employment on the one side, and the enhanced competition brought by globalization on the other side. The former is by no doubt a reading of the fall in investment whereas the latter has implied the opening of the Japanese economy. The development of competitive industries in the East Asian countries has increased competition and prompted the relocation of some manufacturing operations. This might be one reason behind the fall in investment, thus creating a vicious circle (lower investment-lower employment-

relocation of industries-lower investment) that could perpetuate the unemployment problem in Japan.

Our analysis favors a fast breaking of this vicious circle to regain a period of rapid investment growth. Both the payoffs and risks are high. A boost in investment would certainly contribute to tear off these tightly tied bonds that have held down the Japanese economy in recent years. On the other hand, a failure in the recovery of investment would keep the Japanese economy at a standstill, stressing its late role of follower *vis-à-vis* its more dynamic neighboring countries. According to our analysis, the investment decline poses a real threat that might eventually manifest in lower competitiveness and foreign demand deficits. Also, it could further harm the already sharp decay of labor productivity; an event that has been taking place unrelentingly since the early 1990s.

Of course, the final solution will come at last within the Japanese political layer when some consensus on where to steer the economy be reached. Our contribution presents simple and clear evidence on where to look as for the culprits of the steep unemployment rates during the 1990s.

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