The driving forces behind the falling labor share and persistent unemployment in Japan*

Pablo Agnese†
IESE Business School and IZA

Hector Sala‡
Universitat Autònoma de Barcelona and IZA

March 14 2011

Abstract

Like in most advanced countries the labor income share in Japan has been falling since the mid 1970s. However, in contrast to other advanced economies, Japan has experienced an exceptional recessive period during the 1990s and 2000s in which the rate of unemployment rose to a historical maximum of 5.5% in 2002, to persist above 4% in subsequent years. In this paper we examine the main causes behind the paths followed by the labor income share and the unemployment rate during the post-1997 crisis period (1997-2002) and the transition years that followed (2002-2009). We do so by estimating a multi-equation macro model that allows us to look separately at the various components of this particular labor market –wages, output and employment–. Our main finding is that the fall in the labor share can be attributed to the changes that took place within the labor relations system –the weakening of unions mainly– and that the surge in unemployment can be altogether ascribed to the government intervention –by way of the distorting effects of the increasing public debt.

JEL Classification: E25, J50, E24.

Keywords: Labor income share, unemployment rate, labor-management relations, labor market, Japan.

*Hector Sala is grateful to the Ministry of Science and Innovation for financial support through grant ECO2009-07636.

†Avda. Pearson 21, 08034 Barcelona, Spain; tel: +34-93.253.42.00 (4544); email: pagnese@iese.edu.

‡Departament d'Economia Aplicada, Universitat Autònoma de Barcelona, Edifici B, 08193 Bellaterra, Spain; tel: +34-93.581.27.79; email: hector.sala@uab.es.

1 Introduction

The puzzling performance of Japan in the last decades is the object of growing attention in the literature. In this paper we are concerned with two salient features of this performance: the structural fall in the labor income share (LIS hereafter) and the persistently high unemployment rates, for Japanese standards, since the mid 1990s. Our goal is to examine the causes behind the evolution of these two variables in the post-1997 Asian crisis (1997-2002) and the subsequent "half-way" recovery (2002-2009).

This paper should be regarded as a companion to Agnese and Sala (2009), where a labor market model was estimated and used to identify the main macroeconomic determinants of labor demand and labor supply, assessing their relative contributions to the unemployment upsurge in 1991-2002. Here we take a step forward and provide a more complete characterization of the supply-side of the economy by endogenizing real wages –so as to account for the bargaining process between labor and management–, and output –so as to be able to model labor productivity–. We will thus work with a multi-equation system containing equations for employment, the labor force, real wages, and output.

The estimated labor demand and labor force equations are updated versions of those presented in Agnese and Sala (2009). The wage equation is consistent with the predictions of standard wage-bargaining models, and the output equation is a regression of real output on capital, labor, oil prices, and technology. In view of the standard framework in which our analysis is developed, we abstain from theoretical considerations and focus on its empirical outcome.[1]

One fundamental feature of our four-equation model is that both the LIS and the unemployment rate are endogenous. The contribution of this paper is to make use of this feature and provide an in-depth analysis of the driving forces behind these two variables. Most literature tries to explain the decline in the LIS or the increase in the unemployment rate trajectories by taking them as single variables. Here, we take a disaggregated approach in which we model their different components –employment, labor force, real wages and labor productivity, the latter by way of output and employment– and examine the most relevant driving forces behind their paths.

It is important to state that our measure of the LIS conforms to the standard definition of total compensation per employee over value added, but is not adjusted for self-employment income. This is not an infrequent practice in the literature (see, for example, Checchi and García-Peñalosa, 2010) and, furthermore, it does not distort the

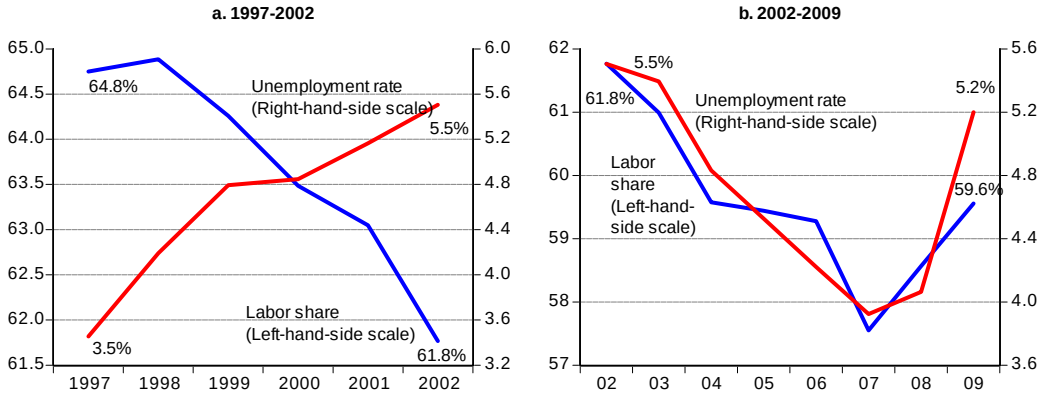
[1] Microfoundations of the labor demand, labor force and wage equations of the sort we have estimated can be found in Karanassou *et al.* (2007). A complete survey of the analytical framework in which our multi-equation analysis is developed is provided in Karanassou *et al.* (2010). Furthermore, our first task was to verify that the results obtained in Agnese and Sala (2009) hold in the context of this updated model. They do and we refer to them in Section 2.2.

evolution of the LIS.[2] Moreover, as explained below, we will control for the influence of self-employment in the employment and wage equations.[3]

The LIS in Japan has experienced a downward trajectory since the mid 1970s (see Figure 2a in Section 2 below), as also seen in many other advanced economies. What is remarkable in this evolution is that this fall has taken place along a continuous deceleration in the growth rate of productivity (see Hayashi and Prescott, 2002) and a parallel deceleration in the growth rate of real wages. In the first half of the 1970s wages were still growing at a higher rate than productivity; since then, they have systematically grown at a lower rate. This has had consequences in terms of growing income inequality (Moriguchi, 2010) and has been reflected in the falling LIS –that is, in lower real unit labor costs or wider wage-productivity gaps–. In addition, and for the first time, the unemployment rate went over the barrier of the 3% in the second half of the 1990s and, despite the mild recovery of the early 2000s, it has quickly returned close to its historical maximum of 5.5% reached in the aftermath of the lost decade.

An interesting feature of our selected periods of analysis is the opposite relationship displayed by the LIS and the unemployment rate (Figure 1). The correlation coefficient in 1997-2002 is -0.72, whereas in 2002-2009 is 0.90. One of the strengths of our dynamic multi-equation analysis is the possibility of examining the driving forces behind these two crucial macro variables with no constraints regarding the assumptions about their (causal) relationship.

Figure 1. Labor income share and unemployment in Japan.



[2]See Karanassou and Sala (2010) where the LIS in Japan is adjusted for the incomes of the self-employed and nevertheless follows the same trajectory as in here (the only difference between the two is a parallel shift). Besides, our measure of the LIS, which is based on OECD data, coincides with the adjusted wage-share published in the European Comission official database (http://ec.europa.eu/economy_finance/db_indicators/ameco/index_en.htm).

[3]In particular, the ratio of family workers over total employment –one of the two main components of self-employment– is significant in explaining higher levels of employment and lower levels of wages. The net effect of these counterbalancing influences, which can be understood as implicitly shifting outwards the labor demand and wage-setting schedules - is determined in our empirical analysis.

The LIS in Japan has already deserved some attention in other contexts (Iiduka, 2006; Nishizaki and Sugo, 2001; Takeuchi, 2005), and several factors have been brought up as having a potential decreasing effect. For instance, an insufficient employment level jointly with an upturn in the equilibrium return on capital is mentioned by Iiduka (2006). Takeuchi (2005), in turn, refers to the changes in the relative price of labor to capital, the decreased mobility in the labor market, and the lowered elasticity of substitution between production factors by firms, all enabling a more elastic management of the capital-labor ratio.

To explain the evolution of the real wages relative to labor productivity, Miura (2008) refers to Maier's (1987) notion of the 'politics of productivity'. There it is suggested that a system of labor relations based on a fair distribution of shares among capital and labor was implemented in Japan during the first stages of rapid growth. A system that would sideline class struggle, stimulate consumption, and thereby enhance productive efficiency so as to feed capital accumulation and fasten economic growth. Such a system lasted until 1975, when the politics of productivity began to fall from that year "when private-sector unions began to curb wage increases in exchange for employment protection" [Miura (2008), p. 168)]. This is precisely the turning point in the trajectory of the LIS (see Figure 2a).

In this paper we estimate a multi-equation macro model which is then used to conduct a series of counterfactual simulations to assess how much the trajectory of the exogenous variables have contributed to the evolution of the LIS and the unemployment rate. As noted before, our two periods of analysis are 1997-2002 and 2002-2009 and cover the post-1997 Asian crisis years, the subsequent "half-way" recovery, and the recent global downturn of 2008-2009.

These simulations provide answers to the following question: What would have happened had these exogenous variables kept their values of 1997 and 2002? The comparison of the endogenous variables' trajectories in the presence and absence of a particular explanatory variable will give us information of the contribution to those trajectories. These are counterfactual experiments and should be understood as dynamic accounting exercises. By no means should this be taken as an assessment of what would have actually happened had this or that variable behaved differently than it actually did, in which case we would run afoul of the Lucas Critique.

Although our model is rich in explanatory variables, not all of them have been relevant in shaping the recent evolution of the LIS and unemployment. We can group the central ones in two main sets representative of the labor relations system and the public intervention. A third set, less relevant in our analysis, includes growth factors such as the capital stock and technology.

Regarding the first group, "changes of labor relations in Japan are characterized as the

decreasing rate of union membership, losing influence of Shunto or the spring wage offensive in industry-wide wage determination, and increasing number of non-regular workers such as temporary, part-time, and contract employees. It seems that the important choice has also been made at this level. That is, the nature of labor-relations in Japan is changing from collective labor–management relations to individual-based labor-management relations. This is also associated with the individualization and diversifications of employment practices" [Sekiguchi (2005), p. 99].

Our set of variables in the labor relations group includes union power, hours worked (per employee per year), and the rate of family workers over total employment. In the absence of long-time series accurately reflecting the complex phenomenon of irregular work, we interpret the downward path in both the working hours and the share of self-employment –for which we have methodologically consistent long-time series– as good proxies. They are notably significant in both our estimations and simulations. The variables in the government intervention group are social security benefits, direct taxes, and government debt.

Our paper brings to light two important results on Japan and its labor market. First, the recent changes in the labor relations system are the central driving force behind the fall in the LIS, both in the after-crisis period of 1997-2002, and later in the less troubled times of 2002-2009. Second, public intervention is the main driving force behind the increase of unemployment in both periods. Let us now preview the main results, first on the LIS and next on the unemployment rate.

In 1997-2002 the changes in the labor relations system account for a decrease of 3.6 percentage points (p.p.) in the LIS. Given that the actual fall was 3 p.p. (from 64.8% to 61.8%), this should be seen as the central driving force. The critical variables in this case are unions, most especially, and also hours worked. Public intervention and growth factors had almost no influence and cancel out. In 2002-2009 the labor relations system accounts for a decrease of 3.7 p.p., which is to be compared with the actual fall of 2.2 p.p. (from 61.8% to 59.6%). This time, however, public intervention –mainly through expansive social security benefits– contributed with 1 p.p. to the increase in the LIS.

Akimoto and Sonoda (2009) place the progressive change in union behavior and the labor relations system in the context of several major changes such as (i) demographic changes; (ii) economic changes (from a high growth to a stagnated economy); (iii) a structural economic shift towards service industries; (iv) globalization; and (v) socio-cultural changes leading from a 'mutual help' system based on public welfare programs, to a 'self-help' system where unions start taking the role of welfare providers (not receivers). In turn, Miura (2008) identifies the year of 1995 as the turning point in the Japanese industrial relations, when the Nikkeiren (Japan Federation of Employer's Association) pushed for a new Japanese management model, and a new government agency, 'the deregulation

subcommittee', was created. Our results show that, from the second half of the 1990s onwards, the deunionization process has had more influence in the already falling LIS. All in all, the result of this process along with the emergence of irregular work have given place to the growing inability of workers to secure wage rates according to the productivity growth.

The strong link between the labor relations system and the LIS in Japan stems from its idiosyncratic labor market. This close connection may have been hidden by the fact that more than 90% of Japanese unions are enterprise unions and the fact that Japan usually receives a low score on the standard measures of centralization on wage bargaining. However, as shown by Sakamoto (2004), wage settlements are highly coordinated and have made wage restraint relatively easy. "Japan did not suffer the latter [unemployment] because its system of decentralized but coordinated wage determination made it possible for employers and unions to achieve nationwide diffusion of wage restraint without confronting low-paid workers' demands for higher or solidaristic wages" [Sakamoto (2004), p. 423]. What our paper uncovers in this context is not only the expression of this restraint in terms of a lower LIS, but the main channel through which this has taken place: the overall and progressive change in the system of labor relations which, in our model, is captured through the variables reflecting the decline in union power and the emergence of irregular work.

For the unemployment rate the story seems to be more straightforward. Following our simulations the surge in unemployment can be explained exclusively by the government intervention in both periods (with the government debt playing a major role). In particular, during 1997-2002 the joint contribution of this set of variables was slightly more than 2 p.p., of a total increase in unemployment of exactly 2 p.p. During 2002-2009 the contribution of government intervention is nearly 2.4 p.p., while the unemployment rate moved from 5.5% in 2002 to 5.2% 2009. In contrast, the contribution of the labor relations system for 1997-2002, which was small and negative, and the contribution of the growth variables, which was small and positive, cancel out each other. This result is repeated in 2002-2009, yet both effects are of a somewhat larger size.

Economic agents in general and policy makers in particular face today the difficult task of managing an unprecedented situation of falling labor income shares, persistent unemployment, and a small degree of maneuvering in public decision making. Our results bring to light the complex interaction of these phenomena and call for a fine-tuning policy in contrast to the generic policy measures very often recommended in macroeconomic analyses.

The paper is structured in two main sections. Section 2 presents our data, our multi-equation macro model for the Japanese economy, and the model diagnosis. Section 3 uses this model to disentangle the main causes behind the paths recently followed by the labor

income share and the unemployment rate in Japan. Section 4 concludes.

2 A macro model of the Japanese economy

2.1 Data and methodology

We use time-series macro data running from 1970 to 2009 obtained from the following sources: the OECD Economic Outlook; the Ministry of Finance of Japan; the Statistics and Information Department of the Minister's Secretariat at the Ministry of Health, Labour and Welfare, Japan; the Ministry of Internal Affairs and Communications, Japan; and the IMF International Financial Statistics (IFS). The definitions of the variables entering the chosen specifications of the equations are provided in Table 1.

Table 1. Definitions of variables and sources.

			Source:
n	:	total employment (log)	(1)
l	:	total labor force (log)	(1)
u	:	unemployment rate ($\simeq l - n$)	(1)
w	:	total real compensation per employee (log)	(1)
y	:	real GDP (log)	(1)
pr	:	real labor productivity ($= y - n$)	(1)
lis	:	labor income share $[= w - (y - n)]$	(1)
b	:	social security benefits (% of GDP)	(1)
τ^d	:	direct taxes (% of GDP)	(1)
τ^{db}	:	direct taxes on business (% of GDP)	(1)
gd	:	government debt (% of GDP)	(1)
h	:	hours worked (per year per employed worker)	(1)
k	:	real capital stock (log)	(1)
z	:	working-age population (log)	(1)
fi	:	firms' long-term indebtedness $\left(= \frac{\text{long-term borrowings and bonds}}{\text{assets}}\right)$	(2)
ro	:	unions, rate of organization $\left(= \frac{\text{membership}}{\text{employees}}\right)$	(3)
fa	:	rate of family workers (as % of workers)	(4)
oil	:	real oil prices, yens per barrel (log)	(5)
d^{97}	:	dummy (value 0 up to 1997, 1 afterwards)	
u^{d97}	:	$u * d^{97}$	
t	:	time trend	
Δ	=	difference operator	

Sources: (1) OECD, Economic Outlook; (2) Ministry of Finance of Japan; (3) Ministry of Health, Labour and Welfare, Japan; (4) Labor Force Survey, Historical Data, Ministry of Internal Affairs and Communications, Japan; (5) IMF-IFS.

Regarding the econometric strategy we proceed as follows. First, we estimate each of the equations individually (we use Eviews and Microfit). Second, we estimate the selected specifications as a system. The resulting estimated multi-equation structural model is the

one presented in Tables 2 to 5, and is used in the following simulation analysis. Third, we reparameterize the estimated equations as error correction models (ECM) to obtain the cointegrating vectors among the $I(1)$ variables (including standard errors for the long-run coefficients to check their significance in the long-run). Finally, we estimate these cointegrating relationships using Johansen's procedure to check whether the long-run relationships according to Johansen's method conform with those obtained through the estimation of the multi-equation structural model. Given that the four estimated equations include growing variables, this is the right procedure to ensure a correct econometric outcome.

Although we start from the labor demand and labor force specifications presented in Agnese and Sala (2009), variations in the data (due to new data points and methodological changes) lead us to select updated specifications with slight changes in the explanatory variables (see below). All equations pass the standard battery of misspecification tests, such as heteroskedasticity (HET) and conditional heteroskedasticity ($ARCH$) tests; a Lagrange multiplier test for serial correlation (SC); Ramsey's linearity test (LIN); and the Jarque-Bera test for normality (NOR). The latter is distributed as $\chi^2(2)$, the rest as $\chi^2(1)$. By means of the Cusum and Cusum^2 tests we also ensure that the estimated equations are structurally stable. The best specifications are selected on the basis of the standard selection criteria (Akaike and Schwarz Bayesian). These selected equations are then re-estimated as a system by Three-stage least squares (3SLS), so that the estimates are safe from endogeneity and cross-equation correlation problems.

To decide on the best specification of each equation we follow the Autoregressive Distributed Lagged (ARDL) or Bounds testing approach, developed in Pesaran and Shin (1999) and Pesaran *et al.* (2001). This procedure is helpful for different reasons. First of all, it yields consistent estimates, both in the short and long-run, irrespective of whether the underlying regressors are $I(1)$, $I(0)$, or fractionally integrated. This is important because the pretesting problem in the standard cointegration techniques of determining the degree of stationarity of the series can be avoided. These standard cointegration techniques are Johansen's maximum likelihood method (Johansen, 1991) and the Phillips-Hansen's procedure (Phillips and Hansen, 1990). Pesaran and Shin (1999) show that the ARDL is "directly comparable to the semi-parametric, fully-modified OLS approach of Phillips and Hansen (1990) to estimation of cointegrating relations". The second reason is that the ARDL can be reliably used in small samples to estimate and test hypotheses on the long-run coefficients. Pesaran and Shin (1999) show that the Phillips and Hansen's estimator is outperformed by the ARDL-based estimator, especially when having a relatively small sample period of analysis. They show that using the delta method or Bewley's approach, valid standard errors can be computed for the estimated long-run coefficients. Third, the ARDL yields consistent long-run estimates of the equation parameters under

potential endogeneity of some of the regressors (Harris and Sollis, 2003). It is also important to note that the estimated ARDL equations can be reparameterized and expressed in terms of an ECM which, on its own, indicates cointegration of the variables in case the error correction term is negatively signed and significant.

2.2 Estimated equations

Next we present the estimated equations. Tables 2 to 5 show their estimated coefficients when estimated as a system by 3SLS. Table 6 shows the error correction term corresponding to the reparameterized equations; the implied cointegrating vectors when using the ARDL and Johansen's methods; and the likelihood ratio (LR) test checking whether these vectors conform statistically with one another, so that the long-run relationships between the growing variables in our model are not spurious.

2.2.1 Employment

The employment equation presents a strong inertia in the firms' aggregate level of employment, as shown by its persistence coefficient (0.80). It also presents the expected negative slope, as indicated by a short-run elasticity of employment with respect to wages of -0.07 and a long-run one of -0.35 $\left(= \frac{-0.07}{1-0.80}\right)$. These elasticities imply that a 1% rise of real wages would explain an overall reduction of employment by 0.35%.

Table 2. Employment equation. 1970-2009.

	cnt	n_{t-1}	w_t	pr_t	k_t	τ_t^{tb}	$\Delta\tau_t^{tb}$	gd_t	fi_t	Δl_t	fa_{t-1}
n_t =	1.76	0.80	−0.07	0.07	0.06	−0.25	0.32	−0.03	−0.06	1.03	0.15
	[0.000]	[0.000]	[0.000]	[*]	[0.000]	[0.000]	[0.000]	[0.000]	[0.006]	[0.000]	[0.000]

$s.e. = 0.001;\ LL = 217.95$

Structural stability tests (5% signif.):
Cusum: ✓; Cusum^2 : ✓
Misspecification tests (5% critical value):
SC[$\chi^2(1)$]=1.11 [0.291]; LIN[$\chi^2(1)$]=1.04 [0.308]; NOR[$\chi^2(2)$]=1.20 [0.548]; HET[$\chi^2(1)$]=1.13 [0.288]; ARCH[$\chi^2(1)$]=0.00 [0.974].

Note: * restricted coefficient so that the coefficient on w equals the coefficient of pr (with the opposite sign).

Since the coefficients associated to the labor productivity and real wages are rather similar, a Wald test is run to see if they can be restricted to have the same value (and opposite sign). We fail to reject this restriction and thus conclude that both coefficients are statistically equal, suggesting that it is predominantly the LIS what determines employment. Karanassou and Sala (2010) obtain the same result in a slightly different context,

adding to the robustness of this particular feature for the labor demand in Japan. Together with the labor productivity, the capital stock (k) is yet another important driver behind the employment decisions made by firms, with short and long-run elasticities of 0.06 and 0.30.

As for the direct taxation on firms' profits, the variable exerts a negative influence on employment. The estimated semielasticity indicates that a 1 percentage point (p.p.) increase in this variable would explain a drop of 0.25 p.p. in employment in the short-run and 1.25 p.p. in the long-run. About this, Kuttner and Posen (2001) estimate the effects of fiscal policies for Japan using a structural VAR and find that a tax cut was an effective measure for stimulating the economy in the 1990s.

The public and private sectors are deeply intertwined in Japan. To account for this we should consider variables that reflect the intervention of government into the employment decisions of Japanese firms. On this, Phelps (1994) considers government expenditures and public debt as relevant determinants of the labor market performance. However, the direct effect of Keynesian fiscal policy (government expenditures) is not significant here, so is taken out of the equation. As for the government debt (gd), it comes up with a negative and significant coefficient that represents the Japanese "burden of the debt" and the implied opportunity cost for the private sector.[4] This opportunity cost refers to the job destruction and jobs that fail to open due to central planning mismanagement (e.g. the "zombie firms" hypothesis examined in Ahearne and Shinada, 2005, and Caballero *et al.*, 2008). Short and long-run semi-elasticities are, respectively, -0.03 and -0.15.

Our labor demand equation entertains three additional variables. First, the firms' indebtedness variable (fi) which, as studied in Ogawa (2003), serves to evaluate the consequences of financial distress on employment (in particular, Ogawa examines several channels through which this variable affects the labor demand negatively). Here, our model produces short and long-run semi-elasticities of -0.06 and -0.30. Second, the change in the available labor supply for firms (Δl), which provides with a source of interactions between the labor demand and supply (the unemployment rate in the labor force equation is the other source). This can also be seen as a matching effect, since job matches depend more on new entrants to the labor force than on its actual level. Accordingly, the more the new applicants, the greater the number of matches. The value of 1.03 for this coefficient implies that a 1% rise in Δl is fully translated into employment. This variable does not entail a long-run elasticity of employment with respect to the labor force since it is only expressed in differences. Finally, since employment is part of the labor income share, we control for the rate of self-employment work. In particular, we find the family workers

[4] The government spending and direct taxes on firms are generally in tight relation with the government debt of countries. However, the steep growth in the latter and its above-than-average extent for Japan during a great part of the period under analysis have little or nothing to do with the evolution of the first two variables.

segment of self-employees (fa) as the most significant one, with a short-run positive impact of 0.15 and a long-run one of 0.75.

This equation is an updated version of the one estimated in Agnese and Sala (2009), where more details are provided. The same applies to the labor force equation.

2.2.2 Labor force

Our labor force equation is very much in line to what is usually found in the literature. The adjustment coefficient (0.80) reflects the persistence in the households' behavior regarding labor supply decisions. Further, as shown by the real wages short and long-run elasticities of 0.04 and 0.20, the labor force is positively sloped.

Table 3. Labor force equation. 1970-2009.

	cnt	l_{t-1}	w_t	Δw_{t-1}	u_t	Δu_t	u_t^{d97}	Δro_t	Δro_{t-1}	r_t	Δr_t
l_t =	−0.65	0.80	0.04	0.09	−0.97	0.29	0.32	−0.63	0.50	0.11	−0.09
	[0.000]	[0.000]	[0.000]	[0.030]	[0.000]	[0.045]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

	Δr_{t-1}	z_t	Δz_t
	−0.09	0.20	−0.67
	[0.000]	[*]	[0.001]

$s.e. = 0.003;\ LL = 188.88$

Structural stability tests (5% signif.):
Cusum: ✓; Cusum^2 : ✓
Misspecification tests (5% signif.):
SC[$\chi^2(1)$]=1.72 [0.189]; LIN[$\chi^2(1)$]=2.03 [0.155]; NOR[$\chi^2(2)$]=0.04 [0.979]; HET[$\chi^2(1)$]=2.36 [0.124]; ARCH[$\chi^2(1)$]=0.07 [0.797].

Note: * restricted coefficient so that the long-run elasticity of l with respect to z is unity.

A discouragement effect is picked up by the coefficient of the unemployment variable (-0.97), but this is mitigated after 1997, as indicated by the dummy u^{d97} (from 1997 onwards the coefficient of u is -0.65=-0.97+0.32). Apparently, higher unemployment rates discourage people in their search for new jobs and opportunities, leading to a reduced sensitiveness of the labor force to the growing unemployment problem. This stabilization in the participation rate is more pronounced after the East Asian crisis of 1997.

We also introduce the rate of organization of unions as an institutional variable that might deter individuals from entering the labor market, yet it enters the labor force equation only in differences. Moreover, higher real interest rates foster labor participation on account of credit/liquidity constraints in a situation of household indebtedness.

Finally, the working-age population takes account of the important demographic influences on the Japanese labor market. For our data, and through a Wald test, we cannot reject the hypothesis of a unit long-run elasticity between labor force and working-age population. The equation is thus restricted accordingly.

2.2.3 Real wages

Real wages are determined by standard variables such as labor productivity, unemployment, direct taxes, social security benefits, and union power. We also control for the amount of hours worked and the rate of family workers.

The coefficient of the lagged endogenous variable (0.43) is not as large as in the previous equations of the system, implying that current wage decisions are not as much dependent on past decisions than employment and participation in the labor market.

As expected, the long-run elasticity of wages with respect to productivity is one implying that all productivity increases are eventually translated into wage increases (the Wald test could not reject this hypothesis, which was then imposed, and the equation accordingly reestimated). The unemployment rate exerts the expected negative influence on wages but enters the equation as a difference, implying that it is not the level, but the change, what really matters. This is not surprising for a country which is historically characterized by low levels of unemployment.

Table 4. Real wage equation. 1970-2009.

		cnt	w_{t-1}	Δw_{t-1}	pr_t	Δpr_{t-1}	Δu_t	τ_t^d	b_t	ro_t	Δro_t	h_t
w_t	=	2.09	0.43	−0.19	0.57	−0.19	−0.84	0.58	0.44	2.0	−1.84	−0.38
		[0.032]	[0.000]	[0.029]	[*]	[0.026]	[0.037]	[0.002]	[0.008]	[0.000]	[0.000]	[0.007]

	fa_{t-1}
$s.e. = 0.006;\ LL = 152.52$	−0.49
	[0.114]

Structural stability tests (5% signif.):
Cusum: ✓; Cusum^2 : ✓
Misspecification tests (5% signif.):
SC[$\chi^2(1)$]=0.30 [0.583]; LIN[$\chi^2(1)$]=0.62 [0.431]; NOR[$\chi^2(2)$]=1.46 [0.482]; HET[$\chi^2(1)$]=1.73 [0.189]; ARCH[$\chi^2(1)$]=0.05 [0.827].

Note: * restricted coefficient so that the long-run elasticity of w with respect to pr is unity.

As for the labor market institutions –or wage-push factors– it is important to stop on their definitions. First, the direct taxes are defined as % of GDP. Second, as Fitoussi *et al.* (2001) we use the social security benefits, which are a wider measure of the often used unemployment benefits. This allows us to control for the fact that the Japanese "government facilitates wage restraint by providing workers with welfare benefits that serve as the social wage, and also by socializing the risks of unemployment with public unemployment and unemployment benefits" [Sakamoto (2004), p. 441]. Third, to proxy the power of unions there is (i) the measure constructed by Fuess (2001), which is the share of the actual raise in wages over the raise demanded by unions; and (ii) the rate of organization, defined as the ratio between membership and total employees. Even

though Fuess's (2001) measure is an interesting proxy, it covers the span 1960-1999, making it unfitting for our study. Nevertheless, in view of the dominant role exerted by the rate of organization in explaining the LIS movements, we hold Fuess conclusion that there is a misleading preconception arguing that "labor unions in Japan are relatively docile, meekly submitting to managerial objectives" [Fuess (2001), p. 12]. Regarding the estimated coefficients of direct taxes, benefits, and union power, all show the expected positive sign short-run semi-elasticities; these are, respectively, 0.58, 0.44 and 2.0.

Finally, the amount of hours worked and the rate of family workers allow us to control for the influence of these two specific features of the Japanese economy. It is one of the economies where the amount of hours worked has decreased the most since the 1960s in parallel with the reduction of the traditionally high rate of self-employment. As explained below in detail, these two variables help us to capture the emergence of irregular work, for which we do not have enough long time series, and its negative impact on wages in Japan.

2.2.4 Output

More than aiming at the estimation of the Japanese aggregate production function, our target is to obtain a reasonable characterization of the determinants of output. First of all, because the capital stock series provided by the OECD Economic Outlook do not consider residential capital stock. Second, because we lack an appropriate global series for energy consumption or, on its absence, on energy prices, which we have proxied by the real oil price. Finally, because we follow the common practice of capturing technological change through a linear time-trend.

Table 5. Output equation. 1970-2009.

		cnt	y_{t-1}	n_t	Δn_t	k_t	oil_t	t
y_t	=	3.05	0.56	0.34	2.46	0.16	−0.01	0.28
		[0.118]	[0.000]	[0.114]	[0.000]	[0.000]	[0.046]	[0.006]

$s.e. = 0.013;\ LL = 119.80$

Structural stability tests (5% signif.):
Cusum: ✓; Cusum^2 : ✓
Misspecification tests (5% signif.):
SC[$\chi^2(1)$]=0.22 [0.641]; LIN[$\chi^2(1)$]=0.04 [0.842]; NOR[$\chi^2(2)$]=0.07 [0.967]; HET[$\chi^2(1)$]=2.50 [0.114]; ARCH[$\chi^2(1)$]=0.02 [0.880].

Note: * restricted coefficient so that the constant returns to scale hypothesis holds.

With these caveats in mind we regress the real output on the two standard production factors, capital and labor, the oil prices, and a linear trend. We find the coefficient of

labor (0.34) to be about twice the one on capital stock (0.16), and a long-run elasticity of substitution higher than one resulting from the addition of the two long-run coefficients on the production factors being, respectively, 0.77 $\left(=\frac{0.34}{1-0.56}\right)$ and 0.36 $\left(=\frac{0.16}{1-0.56}\right)$. Oil prices exert the expected negative influence on output, while the effect of technological progress is estimated to be 0.28 in the short-run and 0.64 in the long-run.

Summing up, we obtain a good approximation of the output through its standard determinants and we value the fact that this allows us to endogenize y and obtain the full picture to study the different components of the LIS (recall its definition in Table 1 as $w-(y-n)$). Irrespective of the form taken by the production function, it is useful to note that, from a theoretical point of view, a situation of imperfect competition in the product market is enough for the emergence of a time-varying LIS (for a discussion on these issues see Raurich *et al.* 2010).

2.3 Model diagnosis

To further check the validity of the estimated model we perform two controls. First, we test validity of the long-run relationships implied by our estimated cointegrating vectors by contrasting whether they conform with those that would be obtained following Johansen's procedure. Second, we check whether our model allows us to track the actual trajectories of the endogenous variables.

Regarding Johansen's procedure, the maximal eigenvalue and trace statistics indicate that the variables involved in the equations are cointegrated. We thus estimate a VAR featuring the main characteristics of the estimated equations (in terms of variables, lag order, sample period, and inclusion, or not, of trends) and obtain the cointegrating vectors (CVs) for the four equations in the model. Table 6 shows these CVs resulting from the ARDL estimated specifications, and those obtained through Johansen's method.[5] A likelihood ratio (LR) test, distributed as a $\chi^2(q)$ where q is the number of restrictions, restricts Johansen's CVs to take the corresponding ARDL values. Since none of these restrictions can be rejected at conventional critical values, it is confirmed that our estimates deliver the correct long-run relationships between the growing variables. Note, also, that the ECM coefficients turn out negative and significant in all cases, thereby providing an extra indication of cointegration.

[5] These tests are conducted using the restricted estimates of all equations taken from their individual regressions, so they are not exactly the same as the long-run coefficients that would be drawn from the joint estimation (Tables 2 to 5). Note, also, that underlying this table there is sizable information (on the unit root tests and the whole cointegration analysis using Johansen's method), which is available upon request.

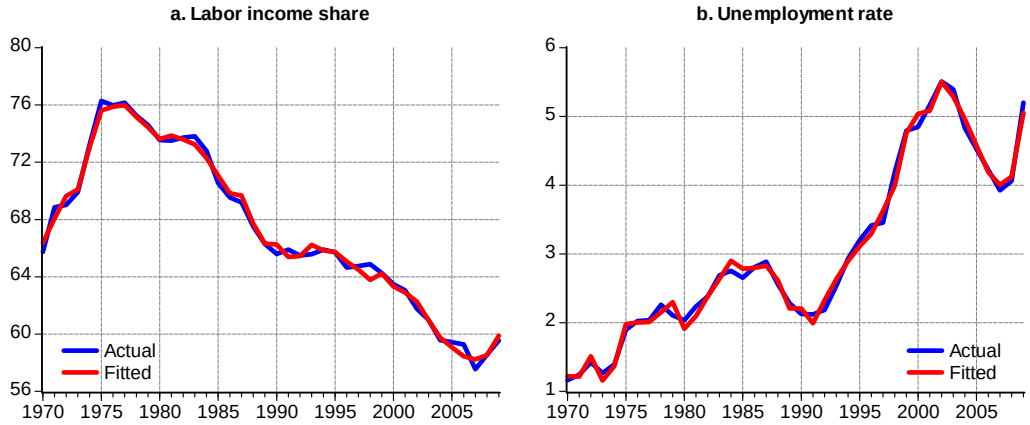
Table 6. Validity of the long-run relationships.

	ARDL		Johansen		LR test
	ecm_{t-1}	CV	r	CV	
$[LD]$		$\begin{pmatrix} n & k \end{pmatrix}$		$\begin{pmatrix} n & k \end{pmatrix}$	
	-0.20 [0.000]	$\begin{pmatrix} 1 & 0.30 \end{pmatrix}$	1	$\begin{pmatrix} 1 & 0.28 \end{pmatrix}$	0.02 [0.890]
$[LF]$		$\begin{pmatrix} l & w & z \end{pmatrix}$		$\begin{pmatrix} l & w & z \end{pmatrix}$	
	-0.20 [0.000]	$\begin{pmatrix} 1 & 0.20 & 1 \end{pmatrix}$	1	$\begin{pmatrix} 1 & 0.01 & 1.04 \end{pmatrix}$	2.37 [0.306]
$[WS]$		$\begin{pmatrix} w & pr & h \end{pmatrix}$		$\begin{pmatrix} w & pr & h \end{pmatrix}$	
	-0.57 [0.000]	$\begin{pmatrix} 1 & 1 & -0.67 \end{pmatrix}$	1	$\begin{pmatrix} 1 & 0.77 & -1.91 \end{pmatrix}$	3.82 [0.148]
$[PF]$		$\begin{pmatrix} y & n & k \end{pmatrix}$		$\begin{pmatrix} y & n & k \end{pmatrix}$	
	-0.44 [0.000]	$\begin{pmatrix} 1 & 0.34 & 0.16 \end{pmatrix}$	1	$\begin{pmatrix} 1 & 0.14 & 0.99 \end{pmatrix}$	1.71 [0.424]

Notes: CV = cointegrating vector; r = number of CVs; p-values in parentheses;
5% critical values for the LR test: $\chi^2(1) = 3.84$; $\chi^2(3) = 7.82$;
LD is labor demand, LF is labor force; WS is wage-setting; PF is production function.

The second control consists in checking that the model delivers accurate fitted values. As shown in Figure 2, our four-equation model tracks the actual evolution of the LIS and the unemployment rate at a close range. Note that the unemployment rate is generated as $(l_t - n_t) * 100$, while the LIS is computed as $\exp[w_t - (y_t - n_t)] * 100$. In this way, the presented fitted values reflect all the endogenous variables in the model and their interactions, and are representative of the overall fit of the model.

Figure 2. Actual and fitted values.



3 The driving forces of the labor share and the unemployment rate

We use the estimated macro model to compute the *dynamic contributions* of all the exogenous variables to the changes in two of the endogenous variables: the labor income share and the unemployment rate. The dynamic contribution gives us an idea of the extent to which the evolution of a particular variable (or more than one) might have affected the trajectory of an endogenous variable of interest in a selected period of analysis. We use our model to simulate two different scenarios: in the first one the exogenous variable takes its actual values, while in the second the variable is fixed at the beginning of the period. Because these two simulations only differ in one respect –the trajectory of the selected exogenous variable–, the comparison of the two predictions concerning the endogenous variable will give us information about the influence of that particular trajectory. And given that this contribution is obtained from a dynamic simulation on our selected period, which also takes into account all lagged and spillover effects contained in the model, its outcome is often referred to as dynamic contribution.[6]

To illustrate how relevant a contribution is, we plot the actual trajectory of the endogenous variable along the simulated one, had each exogenous variable under scrutiny remained fixed at its beginning-of-the-period value. Figure 3 shows the results for all exogenous variables taken together and Figures 4 to 7 show their individual contributions. We distinguish two significant periods: (i) the post-1997 Asian crisis years, going from 1997 –when the unemployment rate was 3.5%– to 2002 –when it reached a historical maximum of 5.5%–; and (ii) the "half-way" recovery and subsequent global crisis, going from 2002 up to 2009 –the unemployment rate fell to 3.9% in 2007 right before the break of the global financial crisis, just to get back to 5.2% in 2009. Simply put, running the simulations on these two periods will require for us to 'fix' the economy at 1997 and 2002, respectively (the patterns of the exogenous variables along with their fixed values at the beginning of each simulation period are shown in Appendix A).[7] Notice that the actual and simulated values of the LIS and the unemployment rate are directly retrieved from our empirical system as $(l_t - n_t) * 100$ and $\exp[w_t - (y_t - n_t)] * 100$.

Our first exercise fixes all exogenous variables at their 1997 values. Had these remained at the levels found right before the outbreak of the Asian crisis, then the LIS would have stayed roughly constant, going from 64.8% in 1997 to 65.3% in 2002 (Figure 3a). Instead, its actual trajectory went down to 61.8% in 2002. The 3.5 p.p. difference between these end-of-period values (the simulated 65.3% and the actual 61.8%) is the joint impact on the LIS of the trajectories followed by the exogenous variables. The comparison with the

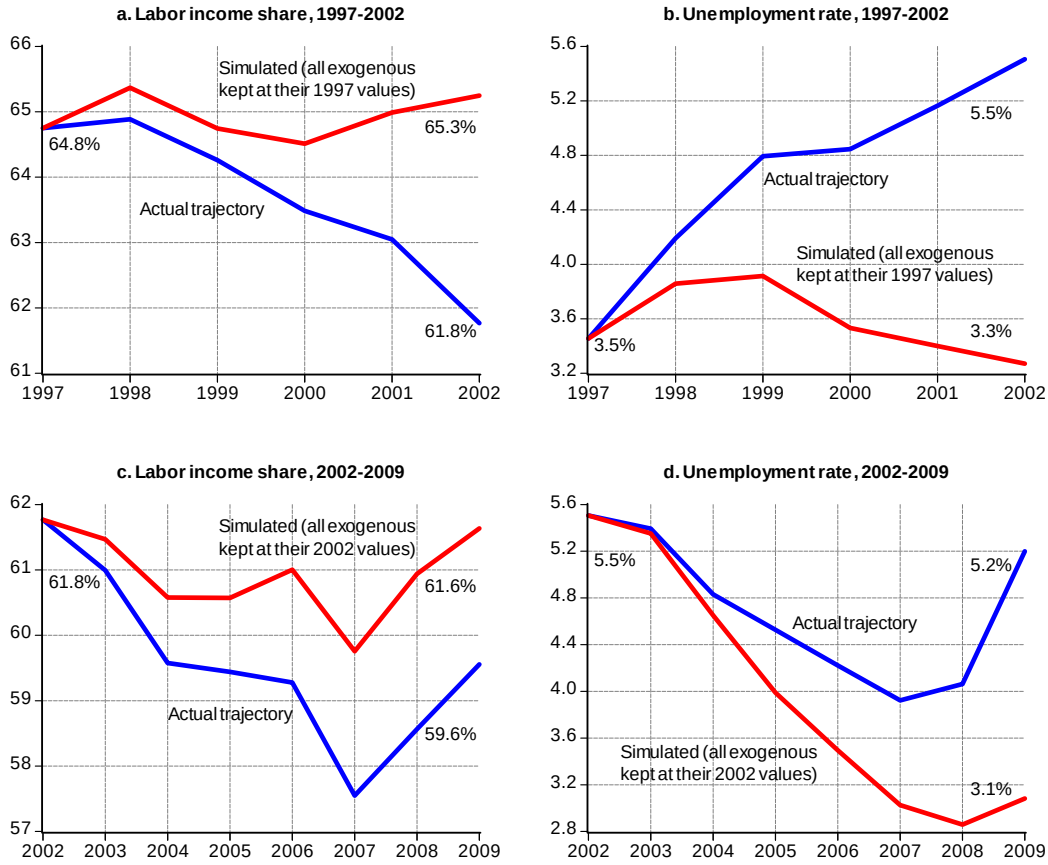
[6] Karanassou and Sala (2009) provide the analytical development of such analysis.

[7] Note that for stationary variables it is the level that is fixed, while for variables integrated of order 1 is the growth rate (this is the case of k, h, and z).

actual 3 p.p. fall (from 64.8% to 61.3%) reflects the high degree of accuracy of the model's predictions regarding the evolution of the LIS in these years. The same can be said of the unemployment rate, on which our model predicts that it would have remained unchanged had all the exogenous variables been held at their 1997 values (Figure 3b).

Our second exercise fixes the values of the exogenous at 2002. Here we find again that the LIS trajectory would have been very similar in 2009 to what it was in 2002, provided the economic conditions had been the same. However, the LIS fell from 61.8% to 59.6% (Figure 3c). On the other side, unemployment experienced a mild recovery which lasted to 2007 –when the unemployment rate dropped to 3.9%–, just to go back to previous levels at the end of the period. Contrary to this, our model predicts a much lower unemployment rate at 3.1% in 2009 if the conditions had remained as in 2002. Unfortunately, this was not the case and the unemployment rate peaked again at 5.2% (Figure 3d).

Figure 3. Joint dynamic contributions.



3.1 1997-2002

The model has thirteen exogenous variables, some of which have little influence on the evolution of the LIS and unemployment rate. Omitting these, Figures 4 and 5 go over the individual contributions to the changes in the two endogenous variables during the

period 1997-2002.[8]

Regarding the LIS analysis we observe several related phenomena. Union membership fell steadily from 22.6% to 20.2%. This more than 2 p.p. drop was the major source underlying the declining path of the LIS during those years. Had union membership not decreased at all, the LIS would have remained without change (Figure 4c). In other words, the fall in union membership has contributed to reduce the LIS by around 2.7 p.p.

An auxiliary simulation including the previous years of the lost decade (not shown here) proves the importance of this variable especially during the second part of the 1990s. This may be reflecting the ability of unions to initially cope with the adverse situation brought by the 1990s (Benson and Debroux, 2000) and the aggravated position of unions from 1995 onwards, as described by Miura (2008). In a context of weaker unions, among other things, managers respond to the economic downturn by "shifting the key wage criteria from age to seniority; and by introducing an increasingly dominant skill component into wage composition" [Benson and Debroux (2000), p. 114]. In any case, the reduction in the LIS, which would be surmountable in an expansionary context, worsens as a problem when the economy grinds to a halt like Japan during the 1990s.[9]

The pivotal role of union strength in explaining the evolution of the LIS is consistent with its traditional ability to increase labor income. According to Fuess (2001), trade unions in Japan have consistently "been able to secure its pay demands more than halfway. Furthermore, company unions have been quite willing to press for aggressive pay hikes. Frequently, unions accelerated demands from the previous year and were able to realize increased bargaining leverage" [Fuess (2001), p. 12]. In this context, the progressive deunionization witnessed in the last decades may be seen as a critical factor deterring this ability. A growing percentage of company unions are now becoming weaker as they are progressively endorsed by a smaller share of the firm manpower. At the aggregate level, being this a structural phenomenon, it leads to a continuous fall in the LIS.

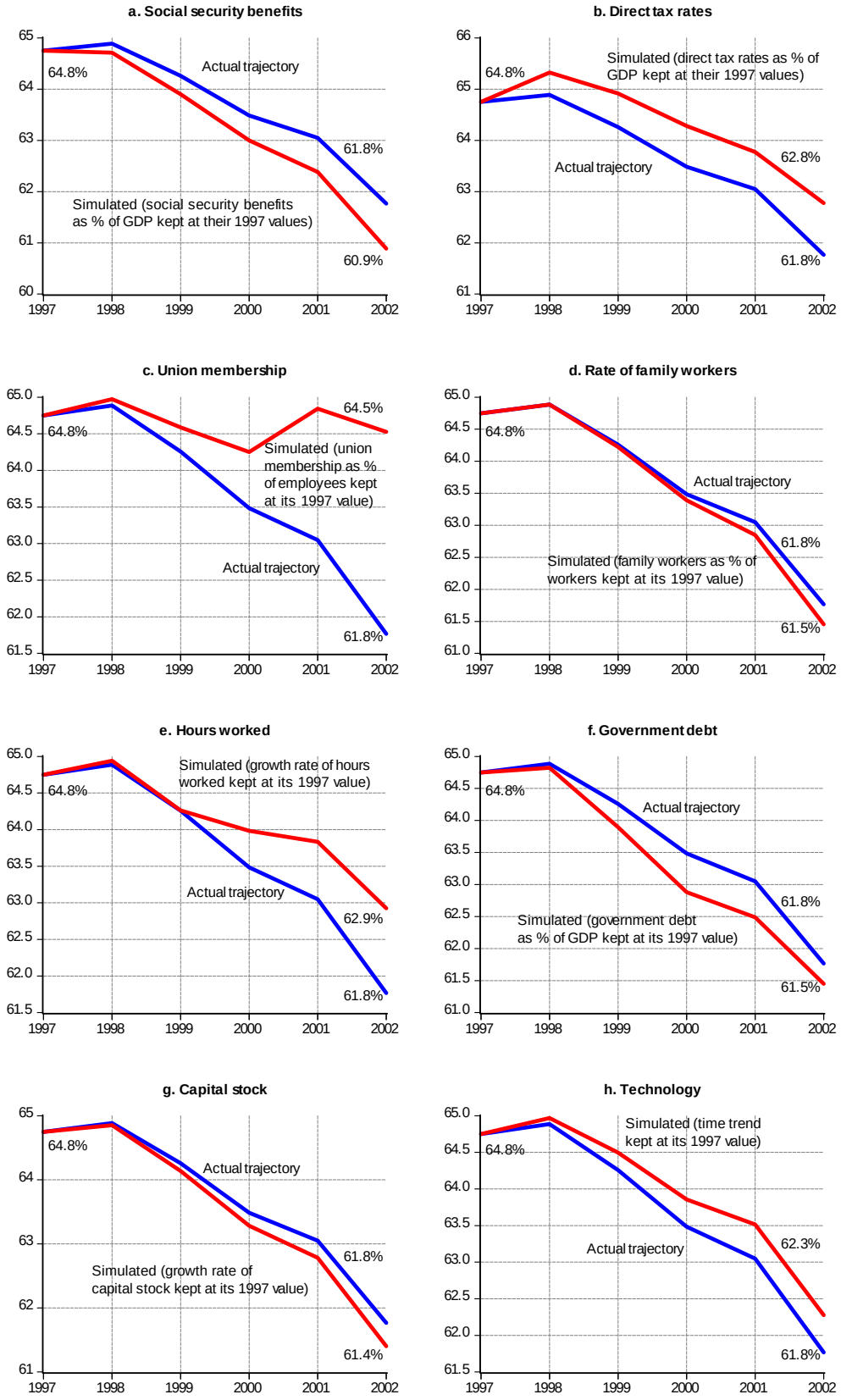
This important result is a reflection of the overall change experienced by Japan in the labor relations system during the past recent decades.[10] Among other factors which have helped in delivering such a change we must be explicit about two: first, the fall of total hours worked per worker, which is a result of the higher degree of irregular work (mainly part-timers and temporary –*arbeit*–); and second, the drop in the rate of family workers, which is one of the two main components of the Japanese self-employment rate. The pronounced decline in both these variables is a characteristic of the whole sample (1970-2009).

[8] In particular, the figures corresponding to the individual contributions of the real interest rate, oil prices, firms' indebtedness, and working-age population have been omitted.

[9] In the aftermath of the East Asian crisis of 1997, Japan's GDP growth was negative for two consecutive years (1998 and 1999) for the first time in more than twenty years.

[10] Different appraisals of this process are provided in Akimoto and Sonoda (2009), Benson and Debroux (2000), Miura (2008), Sakamoto (2004), Sekiguchi (2005), and Takeshi (2001).

Figure 4. Dynamic contributions to the labor income share trajectory, 1997-2002.



With respect to the first of these two values we can see its substantial contribution:

had the amount of working hours evolved at the same rate as in 1997, the LIS would have been 1.1. p.p. higher (Figure 4e). That is, an abrupt fall of the hours worked at a (simulated) 1.5% annual rate (Figure Ae, Appendix) would have resulted in a higher level of the LIS. As noted before, this is an expression of the increase in irregular employment, by which less hours worked would bring real wages down and create employment. In terms of the LIS –$[w-(y-n)]$– the net effect of these counterbalancing forces needs to be empirically assessed. We find that in response of working hours falling at a smaller rate, the LIS was smaller than it would have been otherwise. The contribution of the rate of family workers is not that important, and only amounts to 0.3 p.p. (Figure 4d). It can be argued that the drop in this variable has brought the self-employed workers into the ranks of wage-earners, so pushing up the LIS.

At the time the structural change on the labor market took place, the Japanese government put into effect two important measures: a gradual yet sharp increase of social security benefits and a reduction in direct tax rates. These effects contributed, respectively, with 0.9 and -1.0 p.p. to the change in the LIS during 1997-2002 (Figures 4a and 4b), and should be interpreted as two balancing entries, notwithstanding the resulting imbalance in terms of public accounts and possible debt effects. Notice that the contribution of the government debt is rather small and stands at 0.3 p.p. (Figure 4f). Its scarce relevance, however, is in stark contrast with its major role in accounting for the change in unemployment, as shown below.

In sum, higher social benefits as well as tax hikes tend to raise the LIS due to their redistributive effects.[11] Do remember that the objective of this simulation is to explain what the final scenario would have been if one of the explanatory variables had remained fixed at the 1997 value. We are not necessarily favoring a 'higher benefits and tax' policy by the Japanese government. The unemployment effects should be pondered on as well.

Other less important effects deserve to be commented too. The deceleration in capital accumulation had an expected upward influence on the labor share of almost 0.4 p.p. (Figure 4g). Accompanying this effect, the time trend, which is a measure representative of the technological change, contributed with a 0.5 p.p. reduction (Figure 4h). It should be stated that the exact counterbalancing effect of capital accumulation and technology is a particular feature of the lost decade. Although the existence of this trade-off is an interesting feature of our analysis, further research should aim at endogenizing technological change. Existing literature (Bental and Demouguin, 2010; Bentolila and Saint-Paul, 2003, for example) explains that the labor share may shift in response to changes in total factor productivity and the labour-capital ratio, which are driven by technological progress and the relative price of each production factor. Consequently, this relative price is directly

[11] When discussing the role played by the welfare regime in Japan in relation to the macroeconomic policy and wage coordination, Sakamoto (2004) argues that the government can be seen as the source for wage restraints in providing with welfare benefits that serve as some form of social wages.

affected by product and labour market policies.[12]

In the context of this variety of factors, which are indeed featured in our model, our finding needs to be understood as the short- and medium-run consequence of the deceleration in capital stock growth. In the long-run, and as a consequence of technological progress, returns to capital tend to increase and, thereby, raise the share of capital income. Hence, in seeking to maintain competitiveness, the product and labour market policies generally undertaken by governments have tended to weaken the bargaining position of labor *vis-à-vis* the firms.

Moving on to the study of the contributions to the unemployment rate, we must first note that the results presented here ought to be seen as an extension of those found in Agnese and Sala (2009). Our present analysis, however, augments the previous model by introducing the wage-setting and output equations as made explicit in the previous sections. Another difference is in the period of analysis: while the current analysis is focused on the post Asian crisis era (1997-2009), it was only the 1990s that we examined before. As the story is consistent with what we had previously found, we will only review the main conclusions.

The major cause behind the surge in unemployment during 1997-2002 is to be found in the ever-increasing government debt. The individual contribution, which even surpasses the actual change in the unemployment rate, amounts to 2.5 p.p. (Figure 5f). Of course, the Japanese government has been deeply intertwined with the private sector since the postwar era, and the distorting effects cannot be dismissed all too easily.[13] The so-called "zombie firms" hypothesis (Ahearne and Shinada, 2005; Caballero *et al.*, 2008) has usually been put forth to understand the relation between the Japanese government, the banking system and its borrowers. It suggests that inefficient insolvent borrowers (the "zombies") have benefited from poor banking practices and, thus, have been allowed to keep on functioning to the disadvantage of more productive firms which could not access the much needed credit. This is permitted and even encouraged by aggressive bail-out policies, which prevent those inefficient firms to go down and the resources to go to other more productive endeavors.

Another important driver of the unemployment rate was the declining path of capital accumulation. Had this rate remained at its 1997 value, unemployment would have been 0.5 p.p. lower (Figure 5g). On the contrary, technological change has contributed with a 0.1 reduction in the unemployment rate (Figure 5h).

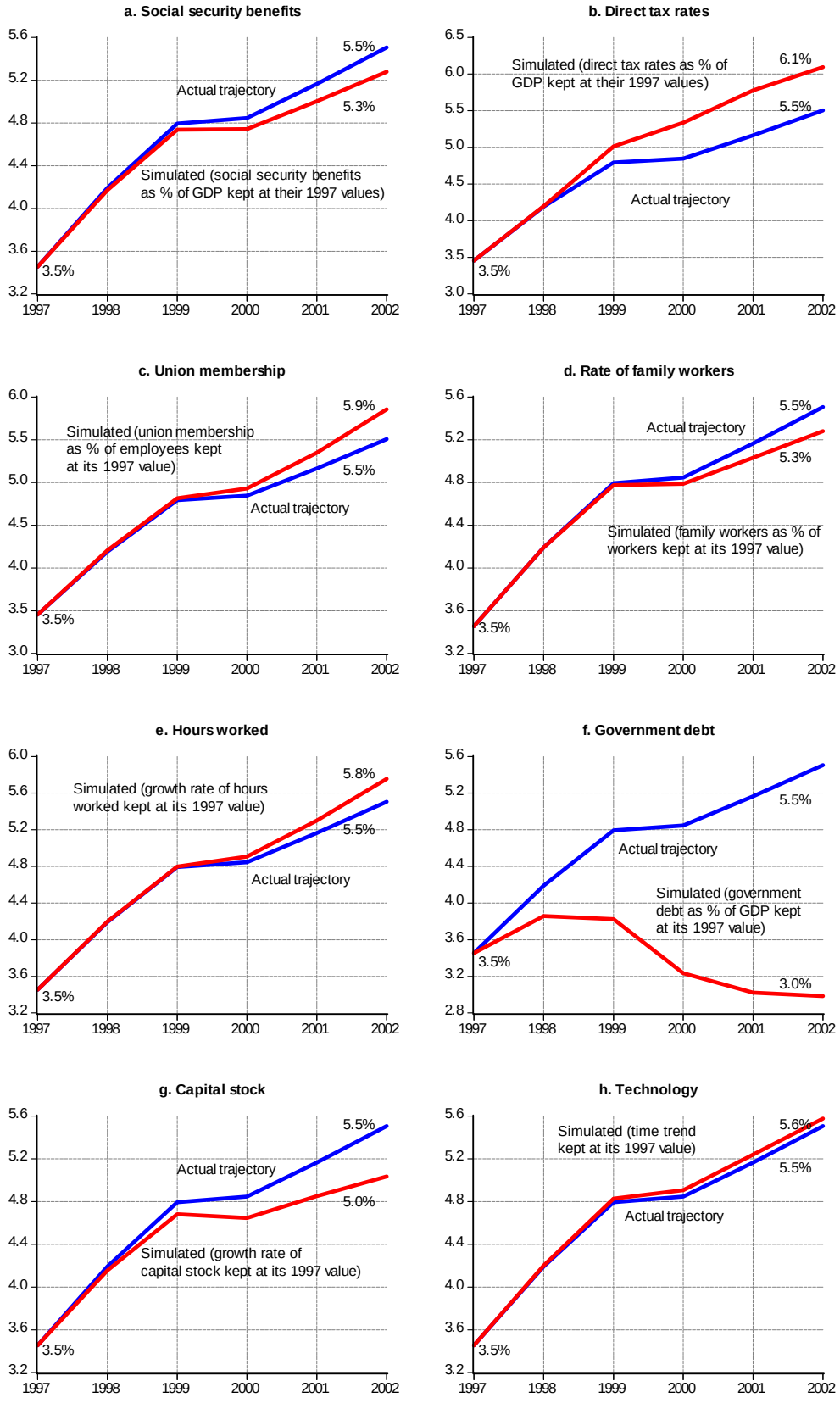
The effects of government intervention can be seen from the individual contributions of both the social security benefits and direct taxes. The increase of benefits has contributed with 0.2 p.p. while the tax cuts has ameliorated the unemployment rate by 0.6 p.p.

[12] The extent to which these changes affect factor productivity and the labour-capital ratio crucially depends on the elasticity of substitution between labour and capital (see Raurich *et al.* 2010).

[13] A parallelism can be traced to the current situation in the Euro area.

(Figures 5a and 5b).

Figure 5. Dynamic contributions to the unemployment rate trajectory, 1997-2002.



Moreover, the weakening of union power along these years contributed with a reduction of 0.4 p.p. in unemployment (Figure 5c). In general, deunionization allows for more competition and enhances labor market adjustments. But deunionization has yet another consequence as seen above, it can lead to a smaller share of the GDP being allotted to workers.

Finally, the contributions of both the number of hours worked and the rate of family workers are rather small (Figures 5d and 5e), and cancel out each other in the aggregate.

3.2 2002-2009

Our second set of simulations deals with the "half-way" recovery experienced by the Japanese economy and the falling back to similar maximums in the unemployment rate during 2009.

Deunionization is, again, and by large, the strongest force behind the changes in the LIS. In this second period union membership went further down, from 20.2% in 2002 to 18.5% in 2009 (Figure Ac in the Appendix) and its contribution attained -4.2 p.p. (Figure 6c).[14] Some channels through which the decline in union power has translated into a lower LIS are the losing influence of Shunto and the changes in corporate management strategies. Between 1998 and 2006 the wage level negotiated at the spring offensive declined (Miura, 2008) and the spring offensive itself has by now collapsed. There has been also a growing gap between the salaries of employees and directors, at the same time that dividends have rapidly risen and shareholders have increased their share of profits.

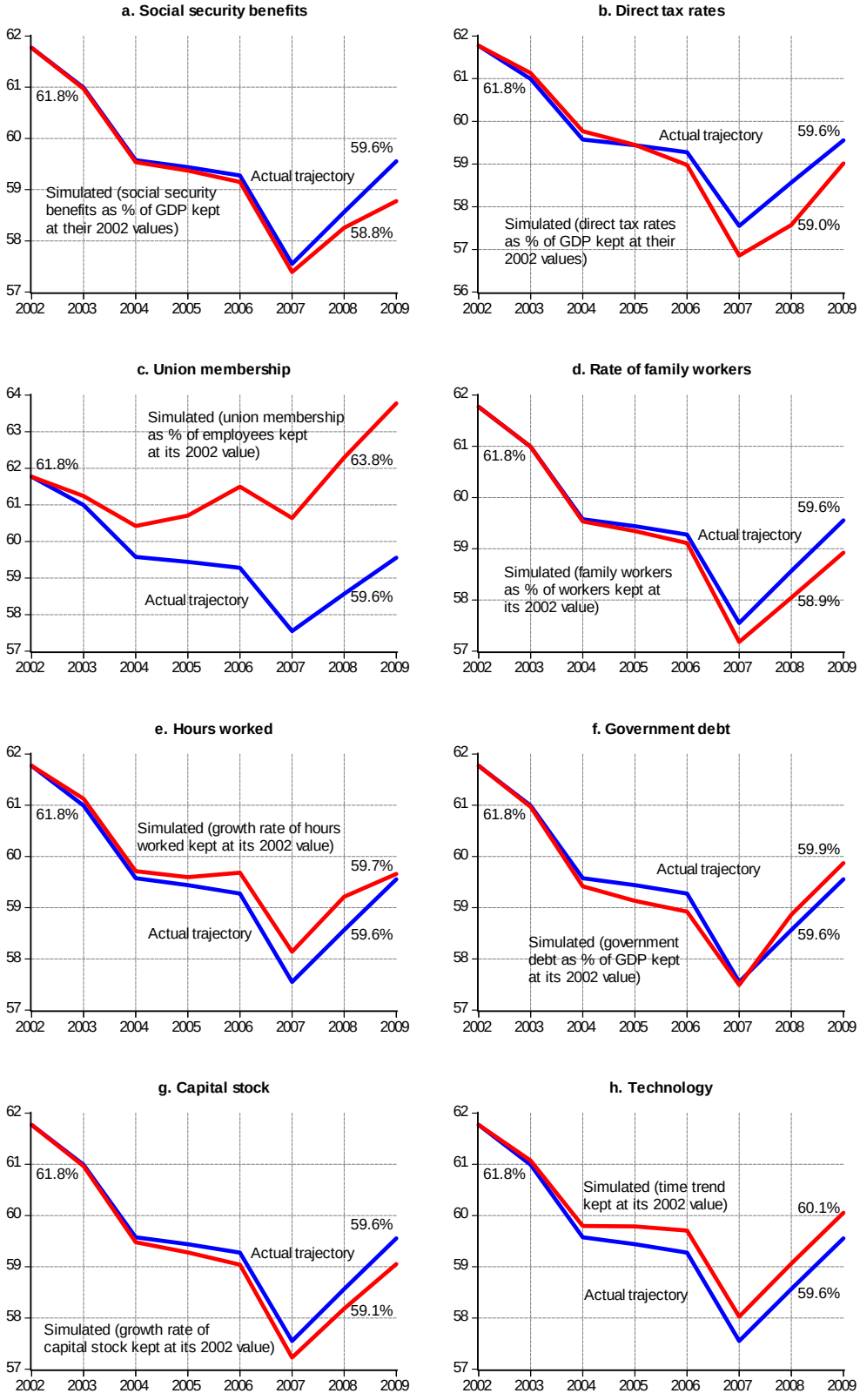
All these changes seem to confirm Takeshi's (2001) prediction on the increasingly weakened position of unions: "Although long-term stable employment practices are not likely to be changed drastically in the foreseeable future, it is highly likely that the seniority system will be further eroded, wage differentials will widen, terms of employment and working conditions will become individual-specific, and remuneration systems will be diversified. However, labor unions are falling to find ways of coping with these prospects, and are continuing to lose influence" [Takeshi (2001), p. 225]. Our paper unveils the consequences of these recent developments on the continued fall in the LIS, even when the economy showed some indications of slow recovery.

On top of these developments, there is a larger segment of irregular workers (part-time, temporary, and contract workers) with the particularity that "non-regular workers usually suffer from poor working conditions and are left unprotected and outside of the union organizations" [Sekiguchi, (2005), p. 99]. Sakamoto (2004) also remarks that low-paid irregular workers have lacked the proper channels of influence to effectively make

[14] However, the contribution through time is almost the same as before. Recall that during the 6-year period of 1997 through 2002 the contribution of labor unions was -2.7 p.p. (or -0.45 p.p. per year), whereas in the 8-year period of 2002 through 2009 it was -4.2 p.p. (or 0.53 p.p. per year).

high wage demands. Thus, not only are unions losing their strength, but now a larger segment of the labor market is beyond their covering umbrella.

Figure 6. Dynamic contributions to the labor share trajectory, 2002-2009.



It is also interesting to see the inverse relative incidence of working hours and the rate of family workers which, together with deunionization, are central features of the changes in the Japanese labor relations system. The contribution of the rate of family workers is now around 0.7 p.p. (Figure 6d), notably larger than before due to the uninterrupted fall in this variable. In contrast, the contribution of working hours is rather unimportant: -0.10 p.p. (Figure 6e). This is the net outcome of their evolution during the initial years of this period, in which hours went sharply down, and the subsequent increase in 2008-2009 (Figure Ae, Appendix).

In the years that followed the maximum of the unemployment rate (5.5% in 2002) the social benefits paid by government kept on rising. This led to a contribution to the LIS of 0.8 p.p. (Figure 6a). It is a fact well known that the Japanese economy is historically unfamiliar with the levels of unemployment experienced during the past fifteen years, and that the government has attempted to tackle the issue by way of an expansion of its welfare provisions is clearly evident. Along with that, it too has attempted to boost the economy by cutting tax rates, yet the drop of (direct) taxes was not that impressive for the period considered on this second simulation. In fact, for some years taxes began to surge, and were above the simulated value for most years (see Figure Ab in the Appendix). Accordingly, the final contribution is this time positive, 0.6 p.p. (Figure 6b).

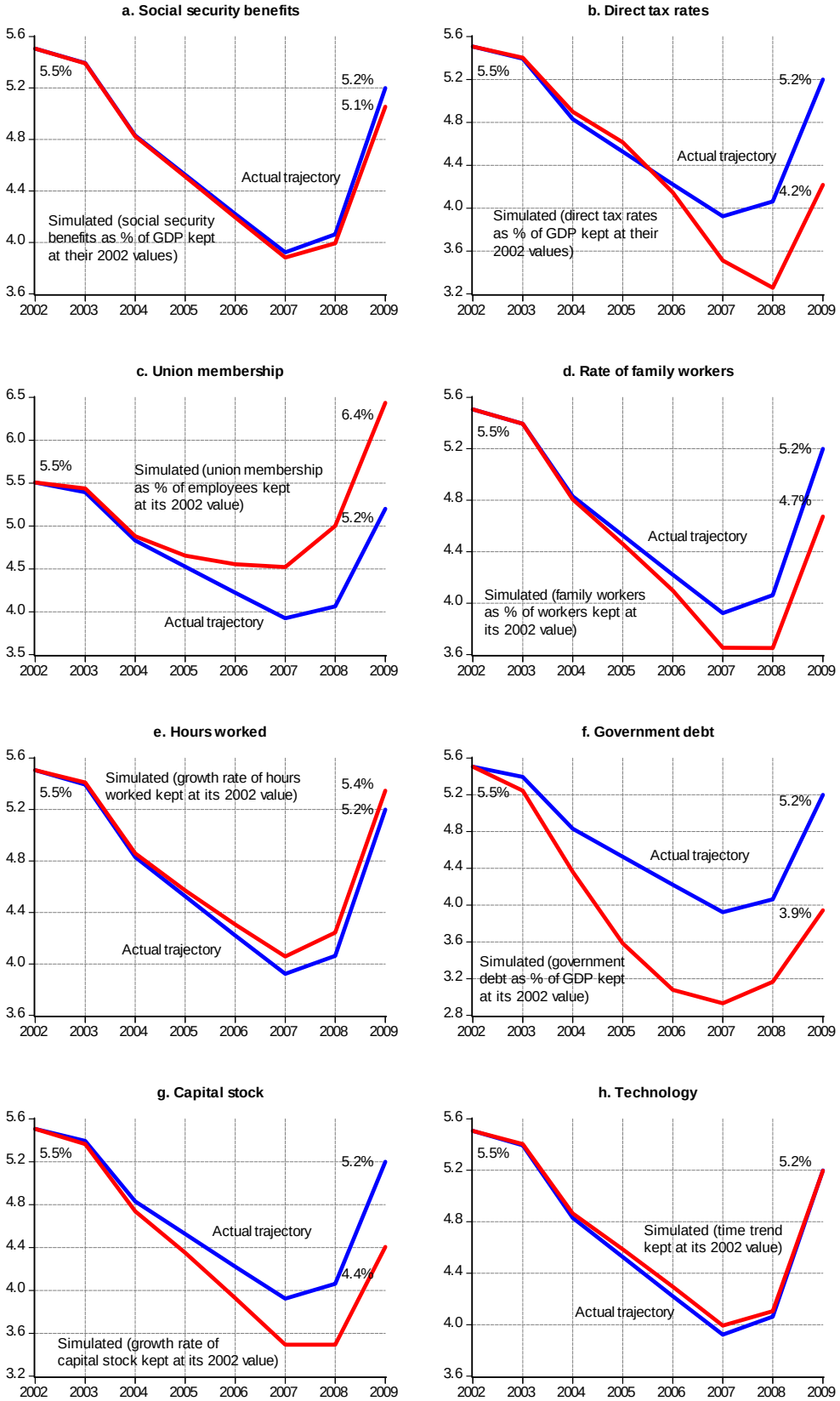
The continued plummeting of the growth rate of the capital stock, reaching even negative values during 2008-09 (Figure Ag of the Appendix), allowed a contribution of 0.5 p.p. on the LIS (Figure 6g). On the other hand, the time trend behaved in the opposite direction with a contribution of -0.5 p.p. (Figure 6h).

Let us now take a look at the contributions to the unemployment rate. Once more, the massive and escalating government debt contributes the most with 1.3 p.p. (Figure 7f), yet this magnitude is less important than before. The main offsetting force this time is the weakening of union strength, which contributed with a reduction in the unemployment rate of 1.2 p.p. (Figure 7c). In contrast, the drop in the rate of family workers contributed significantly, with 0.5 p.p. (Figure 7d), while the trajectory of working hours had a negligible influence on unemployment.

Beyond the debt problem, the direct intervention by government is also captured by the social benefits and direct taxes. Both variables have had harming effects on unemployment, contributing with 0.1 and 0.8 p.p. respectively (Figures 7a and 7b). This is the outcome of their rise for most of the 2002-2009 period (Figure Ab).

The non-stop fall of capital accumulation, a major source of the lost decade for many along with very low productivity rates (see Hayashi and Prescott, 2002, for example), has again a strong impact on the labor market. It contributes to a rise of 0.8 p.p. in the unemployment rate (as seen in Figure 7g). Lastly, technology has no relevant effect this time (Figure 7h).

Figure 7. Dynamic contributions to the unemployment rate trajectory, 2002-2009.



4 Conclusions

We have estimated a multi-equation macro model of the Japanese economy featuring a labor demand, labor force, wage-setting, and output equations. This model has allowed us to approximate the actual pattern of the LIS and the unemployment rate in recent years. One important feature of our analysis is that we incorporate self-employment and irregular work, as to account for the important changes that have taken place within the labor relations system in Japan during the past few decades.

The crucial feature of our approximation is that it places us in a convenient position to conduct the analysis of the determinants of the LIS and the unemployment rate from a disaggregated perspective. The fact that the estimated model is able to provide a faithful replication of the trajectory of the endogenous variables supports the reliability of our findings. Furthermore, our set of exogenous variables have a large explanatory power and provide almost full account of the changes recently experienced by the LIS and the unemployment rate.

In this context, we have uncovered a strong relationship between the change in the labor relations system –mainly by way of the continuous process of deunionization and the emergence of irregular work– and the structural fall experienced by the LIS. With the falling productivity growth rates observed in Japan, these phenomena have allowed for the downward adjustment of real wages that have eventually led to the drop in the LIS. Even though this is somehow offset by such public policies as higher social benefits and taxes, the government intervention is, on its own, what explains the total hike in the unemployment rate and its rebound effect seen on very recent times. Beyond the easing effect the government intervention has had on the fall of the LIS, especially during 2002-2009, its harming effects on unemployment should not be easily dismissed. The government debt, in particular, should be seen as a serious distorting feature of an economy that has been for long trapped in a lost decade.

References

[1] Agnese, P. and H. Sala (2009) "The Fading 1990s in Japan: Driving Forces behind the Unemployment Upsurge", *International Review of Economics & Finance*, Vol. 18, No. 3, pp. 428-439.

[2] Ahearne, A. and N. Shinada (2005) "Zombie Firms and Economic Stagnation in Japan", *International Economics and Economic Policy*, Vol. 2, No. 4, pp. 363-381.

[3] Akimoto, T. and Y. Sonoda (2009) "Labor Welfare in Japan: Social Change and Enterprise Unionism", *Journal of Workplace Behavioral Health*, Vol. 24, pp. 243-264.

[4] Bental, B. and D. Demouguin (2010) "Declining Labor Shares and Bargaining Power: An Institutional Explanation", *Journal of Macroeconomics*, Vol. 32, pp. 443-456.

[5] Benson, J. and P. Debroux (2000) "Japanese Trade Unions at the Crossroads: Dilemmas and Opportunities Created by Globalization", *Asia Pacific Business Review*, Vol. 6, No. 3, pp. 114-132.

[6] Bentolila, S. and G. Saint-Paul (2003) "Explaining Movements in the Labor Share", *Contributions to Macroeconomics*, Vol. 3, No. 1, Article 9.

[7] Caballero, R., T. Hoshi, and A. Kashyap (2008) "Zombie Lending and Depressed Restructuring in Japan", *The American Economic Review*, Vol. 98, No. 5, pp. 1943-77.

[8] Checchi, D. and C. García-Peñalosa (2010) "Labour Market Institutions and the Personal Distribution of Income in the OECD", *Economica*, Vol. 77, pp. 413-450.

[9] Fitoussi, J.P., D. Jestaz, E. S. Phelps, and G. Zoega (2000) "Roots of Recent Recoveries: Labour Reforms or Private Sector Forces", *Brooking Papers on Economic Activity*, Vol. 1, pp. 292–304.

[10] Fuess, S. (2001) "Union Bargaining Power: A View from Japan", *IZA Discussion Paper* #393.

[11] Harris, R. and R. Sollis (2003) *Applied Time Series Modelling and Forecasting*, Wiley, West Sussex.

[12] Hayashi, F. and E. Prescott (2002) The 1990s in Japan: A Lost Decade, *Review of Economic Dynamics*, Vol. 5, pp. 206-235.

[13] Iiduka, N. (2006) "Has Japan's labor share bottomed?", JCER Staff Report, Japan Center for Economic Research, Tokyo.

[14] Johansen, S. (1991) Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models, *Econometrica*, Vol. 59, pp. 1551-80.

[15] Karanassou, M. and H. Sala (2009) "The Rise and Fall of Spanish Unemployment: A Chain Reaction Theory Perspective", *International Papers in Political Economy*, Ch. 6, pp. 209-254, Palgrave-Macmillan.

[16] Karanassou, M. and H. Sala (2010) "The Wage-Productivity Gap Revisited: Is the Labour Share Neutral to Employment?", *Visiting Fellow Working Papers* #28, Cornell University School of Industrial and Labor Relations.

[17] Karanassou, M., H. Sala, and D. J. Snower (2007) "The Macroeconomics of the Labor Market: Three Fundamental Views", *Portuguese Economic Journal*, Vol. 6, No. 3, pp. 151-180.

[18] Karanassou, M., H. Sala, and D. J. Snower (2010) "Phillips Curves and Unemployment Dynamics: A Critique and a Holistic Perspective", *Journal of Economic Surveys*, Vol. 24, pp. 1-51.

[19] Kuttner, K. and A. Posen (2001) "The Great Recession: Lessons for macroeconomic policy from Japan", *Brooking Papers on Economic Activity*, Vol. 2, pp. 93-160.

[20] Maier, Ch. S. (1987) *In Search of Stability: Explorations in Historical Political Economy.* Cambridge: Cambridge University Press.

[21] Miura, M. (2008) "Labor Politics in Japan during 'The Lost Fifteen Years': From the Politics of Productivity to the Politics of Consumption", *Labor History*, Vol. 49, No. 2, pp. 161-176.

[22] Moriguchi, C. (2010): "Top Wage Incomes in Japan, 1951-2005", *The Journal of the Japanese and International Economies*, Vol. 32, No. 1, pp. 492-496.

[23] Nishizaki, K. and T. Sugo (2001) "On Japan's Labor Share", *Working Paper Series 01-8*, Research and Statistics Department, Bank of Japan.

[24] Ogawa, K. (2003) "Financial Distress and Employment: the Japanese Case in the 90s", *NBER Working Papers*, #9646.

[25] Pesaran, M. H. and Y. Shin (1999) "An Autoregressive Distributed-Lag Modelling Approach to Cointegration Analysis" in *Econometrics and Economic Theory in the Twentieth Century: The Ragnar Frisch Centennial Symposium*, edited by Strom, S., Cambridge University Press, pp. 371-413.

[26] Pesaran, M. H., Y. Shin, and R.J. Smith (2001) "Bounds Testing Approaches to the Analysis of Level Relationships", *Journal of Applied Econometrics*, Vol. 16, pp. 289-326.

[27] Phelps, E. S. (1994) *Structural Booms: The Modern Equilibrium Theory of Unemployment, Interest and Assets*, Harvard University Press, Cambridge MA.

[28] Phillips, P. and B. Hansen (1990) "Statistical Inference in Instrumental Variables Regression with I(1) Processes", *Review of Economic Studies*, Vol. 57, pp. 99-125.

[29] Raurich, X., H. Sala, and V. Sorolla (2010) "Factor Shares, the Price Markup, and the Elasticity of Substitution between Capital and Labor", *Visiting Fellow Working Papers* #29, Cornell University School of Industrial and Labor Relations.

[30] Sakamoto, T. (2004) "Japan's Political Economy in Comparative Perspective: Macroeconomic Policy and Wage Coordination", *European Journal of Political Research*, Vol. 43, pp. 421-447.

[31] Sekiguchi, T. (2005) "The Strategic Choice Model and Industrial Relations in Japan", *Osaka Keidai Ronshu*, Vol. 56, No. 4, pp. 91-101.

[32] Takeshi, I. (2001) "From Industrial Relations to Investor Relations? Persistence and Change in Japanese Corporate Governance, Employment Practices and Industrial Relations", *Social Science Japan Journal*, Vol. 4, No. 2, pp. 225-241.

[33] Takeuchi, F. (2005) "Causes of decline in Labor's Share in Japan", *JCER Researcher Report* #53, Japan Center for Economic Research, Tokyo.

Figure A. Actual and simulated trajectories of the exogenous variables, 1997-2009.