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**A REGIONAL LABOUR MARKET MODEL FOR
ANALYZING THE IMPACT OF A RECESSION**

Laura Barbieri, Maurizio Baussola e Chiara Mussida

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A regional labour market model for analyzing the impact of a recession

Laura Barbieri, Maurizio Baussola, Chiara Mussida*

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Abstract

The effects of the recent economic recession have been widely discussed, particularly at the macro economic level. However, the economic downturn has been pervasive and has also determined a range of economic effects at different territorial levels. It has therefore become necessary to set up appropriate analytical tools aimed at investigating the impact of the economic downturn at the regional level, and to implement adequate policy options to mitigate such negative impacts. We propose a new macro-micro econometric framework which incorporates simultaneously both aggregate labour demand and supply, and the labour market flows determining the steady-state unemployment rate. We can thus simulate demand or supply shocks and therefore assess their impacts on labour demand and supply, and also on unemployment and labour market flows. This enables us to pinpoint the dynamic effects of such shocks and to compare the different behaviours of the regional framework and of the economy as a whole.

Keywords: regional econometric models, labour demand and supply, labour market flows, steady-state unemployment rate.

JEL classification codes: E1, E17, R2, R23

*Corresponding author. Address: Department of Economics and Social Sciences, Università Cattolica del Sacro Cuore, Via Emilia Parmense, 84, 29122 Piacenza, Italy; email: chiara.mussida@unicatt.it

1 Introduction

During recent years the demand for quantitative economic investigations to support policy makers has grown rapidly, particularly in concurrence with the latest economic downturn. The need for tools aimed at assessing the impacts of such a recession and suggesting policy options has become increasingly pervasive. In addition, the European economic and monetary integration process has increased the economic relevance of regional economies, thus calling for analytical instruments aimed at supporting the decision-making process.

This paper develops and implements a regional macroeconomic model of Lombardy's labour market in which both labour demand and supply are endogenously determined, and unemployment is therefore determined by their interaction. We also offer a model simulation exercise aimed at assessing the responsiveness of the regional labour market compared with the national one to exogenous demand or supply shocks.

The decision to analyze the regional context of Lombardy was primarily driven by this region's economic relevance. Lombardy is one of the most economically and demographically important Italian regions, and is representative of the richest regions in both Europe and Italy (others in Italy including Tuscany and Emilia Romagna).¹

We integrate a macro-level analysis with microeconomic estimates, which together provide a detailed and complete vision of the labour market, also useful when designing relevant policy intervention. The overall analysis allows us to assess the impact of change in specific economic variables, e.g. shocks due to the economic downturn, and therefore the simulation of the main economic indicators both at the regional and the national level.

The paper is organized as follows: Section 2 presents the model specification, both for the macroeconomic model and the microeconomic block, together with their connection. Section 3 describes the data and Section 4 describes the results and offers a policy exercise; Section 5 concludes.

¹One sixth of the total Italian population lives in Lombardy, and it is one of the richest regions in Europe, with a per capita gross domestic product that is 30 percent higher than that for the rest of Italy.

2 Model specification and estimation

model is made up of two blocks. Equations and identities pertaining to each block are explained below. More specifically, subsection 2.1 describes the structure of the macroeconometric labour market model used to estimate labour demand and supply for the Italian region of Lombardy and for Italy as a whole. The second subsection instead outlines the relevant features of the microeconomic model for the estimates used to implement a specific module of the macroeconomic model. Finally, the link between microeconomic and macroeconomic model estimates is explained in subsection 2.3. Relevant variables for the labour market model used in the following are listed in Appendix A.

2.1 The Macroeconometric Labour Market Model

The macroeconomic model used to analyze the national (Italian) and the regional (Lombard) labour markets is based on the insights provided by Baussola (2007) and their development by Barbieri (2010). It incorporates both aggregate labour demand and supply, and is specified by adopting an Error Correction Mechanism (ECM). Such a model seems to provide a convenient dynamic formulation, being able to take short-run dynamics and long-run relationships into account.²

For sake of manageability and usefulness in policy analysis, sectoral value added, wages and prices are taken as exogenous, whilst labour demand and supply are both defined by two stochastic equations. Moreover, to avoid methodological complications, no simultaneity mechanisms are provided in the model and the only connections between endogenous variables are indirectly obtained through identities.

The equations belonging to the macro-block are specified as follows:

Stochastic equations:

$$EEIND = g_1\{VAIND, WIND, DEFIND, LH\} \quad (1)$$

²As highlighted in Barbieri (2010) such a specification also has some relevant advantages, e.g. a significant reduction in multicollinearity effects and estimates which are interpreted more intuitively.

$$EESER = g_2\{VASER, WSER, DEFSE, LH\} \quad (2)$$

$$SE = g_3\{PROFSE, UR, YU\} \quad (3)$$

$$PR = g_4\{SE/POP, EE/POP, IMMIG\} \quad (4)$$

Identities:

$$TE_t = EEIND_t + EESER_t + EEOTH_t + SE_t \quad (5)$$

$$TEI_t = \gamma_t TE_t \quad (6)$$

$$EE_t = EEIND_t + EESER_t + EEOTH_t \quad (7)$$

$$LF_t = PR_t * POP_t \quad (8)$$

$$UR_t = (LF_t - TEI_t) / LF_t * 100 \quad (9)$$

$$PROFSE_t = PROF_t / SE_t \quad (10)$$

$$\begin{aligned} PROF_t = & (VAIND95_t * DEFIND_t + VASER95_t * DEFSE_t + \\ & + VAOTH95_t * DEFOTH_t) - (WIND_t * EEIND_t + WSER_t * EESER_t \\ & + WOTH_t * EEOTH_t) - INTAX_t \end{aligned} \quad (11)$$

The demand side of the model includes an equation describing the employees in industry $EEIND$ –equation (1)– and an equation describing employees in private service sector $EESER$ –equation (2).³ Employees by sector are expressed in terms of the labour input and cost (by inverting a standard Cobb-Douglas production function) plus an additional variable explicitly representing labour hoarding (obviously the adjustments of labour inputs to short-run fluctuations in output are also captured by the short-run dynamics inserted into the error correction specification).

The labour force participation rate PR and the self-employment SE –equation (4) and (3), respectively– are considered as labour supply decisions.

The labour force participation rate depends on the employment rates ($EERATE$ and $SERATE$) as well as on a migration variable. This latter tries to capture the phenomenon of immigration from foreign

³Industry and private services, the two driving sectors of the Italian economy, are included separately in our dataset, whilst the "leftover" sectors (i.e. agriculture, construction and public sector) are jointly included as a third special sector. Although agriculture should be considered a driving sector for the Italian economy, the lack of relevant data means we are unable to model it conveniently.

countries. Self-employment is explained by percapita earnings, and the youth unemployment rate by following the neo-classical assumption that labour supply depends on opportunity costs (labour/leisure choice).

Note that unemployment is endogenously determined in the model by specific identities (5)-(9).

Appendix B presents the estimation results of the four stochastic equations for both Lombardy and Italy.

As far as labour demand in industry is concerned, regional and national results are very similar in terms of the significance, sign and magnitude of the coefficients. Short-run dynamics of employment are not significant, while in the long run, both specifications show a higher impact of value added on employment. The impacts of labour cost and labour hoarding are also relevant, confirming the competitiveness of the Italian industrial sector and its propensity to achieve and pursue efficiency. The reaction of employment to value added changes in private services is instead significant only in the long run, at both the national and regional level.

Looking at the long run, the main difference between the two markets examined lies in the relevance of the labour hoarding impact. At the national level the effect is smaller than at the regional one (the coefficient for Italy is -0.277, compared to -0.650 for Lombardy), whilst the impact of labour cost and product price is very similar in the two cases.

We can explain this difference by means of the specific regional characteristics of the sector under consideration. The private service activities, for example, are predominant in Lombardy (larger size with respect to Italy), and the labour cost fluctuations can easily be absorbed by expanding the business dimension and therefore by exploiting the available expansion opportunities.

The labour supply estimates are significantly affected by the discouragement effect. This is given by the relevant impacts of the employment variables (self-employment and employees) on the participation rate. These effects are stronger in the national context, both in the short run and in the long run dynamics. Migration is relevant only in Lombardy, although with a very limited impact.⁴

As far as the self-employment estimate is concerned, in Lombardy the earning variable is significant only in the short run, whilst the proportion of young unemployed people is relevant both in the short and in the long run. In Italy, the earning variable is significant, whilst the proportion of young unemployed people is relevant only in the short

⁴It should be noted that during only a few years of the overall period analysed has Italy been characterized by large and increasing immigration flows from foreign countries.

run.

2.2 The Microeconomic Labour Market Block

The micro-econometric block used to simulate the Italian labour market model is specified as follows:

Micro-Level identities:

$$DIFFUR_t = UR_t - USS_t \quad (12)$$

$$USS_t = \frac{e_t}{e_t + ue_t + un_t * pne_t} * 100 \quad (13)$$

$$e_t = eu_t + (1 - pne_t) * en_t \quad (14)$$

$$pne_t = \frac{ne_t}{ne_t + nu_t} \quad (15)$$

$$num_eu_t = \exp\left(\alpha_t^{[eu]} + \beta_t^{[eu]}UR_t\right) \quad (16)$$

$$num_en_t = \exp\left(\alpha_t^{[en]} + \beta_t^{[en]}UR_t\right) \quad (17)$$

$$num_ne_t = \exp\left(\alpha_t^{[ne]} + \beta_t^{[ne]}UR_t\right) \quad (18)$$

$$num_nu_t = \exp\left(\alpha_t^{[nu]} + \beta_t^{[nu]}UR_t\right) \quad (19)$$

$$eu_t = \frac{num_eu_t}{num_eu_t + num_en_t + 1} \quad (20)$$

$$nu_t = \frac{num_nu_t}{num_ne_t + num_nu_t + 1} \quad (21)$$

The labour market transition probabilities⁵ given in the above equations in lower case are estimated by using a microeconomic approach.

The literature emphasizes the fact that multi-state stochastic models provide a useful framework for the analysis of data from longitudinal studies when scholars' interest lies in the dynamic aspects of

⁵We refer to the transitions between the labour market states of (E)mployment, (U)nemployment and (N)on Labour Force. We have six transitions between these conditions. The outflows from employment to unemployment (eu) and non labour force (en); the outflows from unemployment to employment (ue), and non labour force (un); the outflows from non labour force to employment (ne) and unemployment (nu).

the process under investigation.⁶ When individuals are continuously observed over time, transitions between states are observed and parametric, nonparametric, and semi-parametric methods may be used to investigate their behaviour (such as in Andersen et al. (1993)). In contrast, when the subjects are seen at discrete time points - such as in panel data - exact transition times are not observed and all that is known is the state occupied at each assessment of the related survey. Such data are often analysed using Markov Chains models.⁷

The features of the data employed in the present work, explained in Section 3, allow us to use a Markov Chain approach. Estimated transition probabilities are averages of heterogeneous individual transition probabilities that are likely to depend on individual characteristics as well as on the general conditions of the labour market.

Let $h = 1, \dots, n$ be the indexes for the h -th individual in the sample; in this section we deal with the conditional individual transition probabilities

$$p_{ij,t(h)} = Pr = (X_{t,h} = j | X_{t-1,h} = i, z_{t,h}), \quad (22)$$

where $X_{t,h}$ is the random variable describing the state of individual h at time t , while $z_{t,h}$ is a vector including individual level covariates and economic indicators of the conditions of the labour market. Since we adopt a three-state representation of the labour market (states of employment, unemployment and inactivity), it is logical to choose a Multinomial Logit model (MNL). This class of models extends ordinary logit regression from dichotomous to polychotomous dependent variables.

We specify a separate model for each labour market state and the related transition probabilities,⁸ i.e. we divide the sample into three sub-samples, according to state in the labour market at the beginning of the reference period. For notational convenience we number the three states we consider from 0 to 2. The model for the transition

⁶For a detailed investigation of the employability of such models, see Cook et al. (2002).

⁷Aeschimann et al. (1999) explain and make use of a Markov chain approach to describe the evolution of labour market transition probabilities in the Swiss labour market.

⁸For example, for the state of (E)mployment we have the permanence rate (ee) in the condition and two outflows, the transition from employment to unemployment (eu) and the transition from employment to inactivity (en). The same criteria applies for the state of (U)nemployment and (N)on labour force or inactivity.

probabilities can be written as follows:

$$P_{ij,h} = \frac{\exp z_t^h \beta_j}{\sum_{l=0}^2 \exp(z_t^h \beta_l)}, \quad (23)$$

for $h \in (i, t - l)$. According to Theil normalisation, we set $\beta_0 = 0$. Conventionally we will assume permanence in the initial state as the baseline category. Model parameters are estimated using Maximum Likelihood.⁹

We consider only the transition from the beginning to the end of the observation period. Each observation period is one year.¹⁰

2.3 Linking the Micro and the Macro Blocks

The unemployment rate is endogenously determined by the interaction of the labour force and total employment (identity (9)). We also introduce the *steady-state* unemployment rate and the difference between the latter and the unemployment rate (identity 12). The former is introduced by exploiting the precision of specific microeconomic estimates.

The *steady-state* unemployment rate is expressed as a function of some relevant labour market transition probabilities. This is possible by introducing a restrictive hypothesis, i.e. a *steady-state* hypothesis, which assumes that both the employment and the unemployment stocks remain stable, as changes in employment equal changes in unemployment (determined by inflows and outflows in these states). This hypothesis is quite restrictive when referred to long periods of time. In the following we refer to short time periods (we analyse one year at a time), and therefore the results do not seem to be affected by these limitations.

The *steady-state* hypothesis makes it possible to define the following identities:

$$ueU + neN \equiv (eu + en)E \quad (24)$$

$$euE + nuN \equiv (ue + un)U \quad (25)$$

The identity (24) ensures steady employment, by equating the inflows (left-hand side) and the outflows from this condition (right-hand

⁹A detailed technical description of the Maximum Likelihood method in this context can be found in Gourieroux (1989) (ch.5), and Cameron and Trivedi (2005) (ch.15).

¹⁰Coefficient estimates of MNL models for each year of the time period are not reported in the paper but are available upon request.

side). The identity (25) instead ensure steady unemployment, again equating inflows and outflows. By solving both the identities with respect to N we find the following equations:

$$N = \frac{(eu + en)}{neE} - \frac{ue}{neU} \quad (26)$$

$$N = \frac{-eu}{nuE} + \frac{(ue + un)}{nuU} \quad (27)$$

we therefore obtain the identity:

$$eE = dU \quad (28)$$

where $e = [eu + (1 - pne)en]$; $d = (ue + un \times pne)$. The *steady-state* unemployment rate is expressed by the relation $u = U/(U + E)$, we are therefore able to express this indicator in terms of transition probability by using the identity (28):

$$u = \frac{e}{e + d} \quad (29)$$

The transition probabilities are computed by using specific microeconomic estimates. For each year of the time period examined we estimated the determinants of the relevant transition probabilities by using MNL models, as explained above. We expressed the probabilities as a function of specific individual characteristics, e.g. gender, age, education, geographical area of residence, and structural indicators, e.g. labour units and unemployment rates. We exploited these estimates by expressing the transition probabilities as allowed by the MNL model structure:¹¹

$$eu = \frac{\exp(\alpha_i^{[eu]} + \beta_i^{[eu]}UR_t)}{\exp(\alpha_i^{[eu]} + \beta_i^{[eu]}UR_t) + \exp(\alpha_i^{[en]} + \beta_i^{[en]}UR_t) + 1} \quad (30)$$

where $\alpha^{[eu]}$ is the contribution of the individual characteristics,¹² whilst $\beta^{[eu]}$ is the coefficient of the unemployment rate.¹³ Since the equation is estimated for each year of the time period analysed we also

¹¹We show the equation for the transition from employment to unemployment only, since the remaining transitions are analogously determined. This equation is the equivalent of (20) given above.

¹²Obtained by multiplying the MNL coefficient estimates of the variable for each individual characteristic used in our model and their means.

¹³The MNL coefficient estimates of the unemployment rates multiplied by UR_t , which is the unemployment rate computed by using the identity (9) of the macro-level identities module of the model.

added the time indicator t . The results of this computation, which is carried out for each transition probability entering identity (29), is used to compute the *steady-state* unemployment rate and its gap with respect to the official unemployment rate (identities (13) and (12), respectively).

3 Data

The empirical analysis exploits data from two sources. The first is a time series dataset used for the macro-level estimates of the model. The second is the Italian National Institute of Statistics (ISTAT) longitudinal dataset, which covers the period 1993-2003 and is used for the micro-level estimates.

For the macro model we updated the dataset based on annual data at the NUTS2 level provided by Barbieri (2010).¹⁴ This dataset covers the period 1970-2005. It offers aggregate data on production activities (gross value added, labour costs, employment, employees, labour units, gross fixed capital formation) as well as data on demographic variables at both the national and regional level.

According to the Regional Accounts published by ISTAT, the dataset is characterized by a sectoral disaggregation in three main sectors: industry, private services and a third special sector which includes agriculture, construction and public sector.

Note that all monetary variables, except labour cost, are expressed at constant 1995 prices. Since 2007, in accordance with EU rules, ISTAT has also published the series of economic accounts at chained prices (reference year 2000) and at previous year prices.

Unfortunately, these new series are not fully comparable with the previous ones and until now ISTAT has only reconstructed the series for the period 1980-2010 at the national level. It was in order to cover a longer time span, essential for estimating our macro-level model, that we decided to refer to the old series at constant 1995 prices.

The micro-level estimates are carried out by using longitudinal microdata from the ISTAT labour force survey (LFS). The Quarterly Italian LFS conducted by ISTAT is the main source of statistical doc-

¹⁴The main sources of this dataset are the Demographic statistics, the Labour Forces Surveys and the Regional Accounts published by ISTAT (2005, 2010) for the period 1980-2005, and the Regional Accounts dataset set-up by SVIMEZ in cooperation with ISTAT (SVIMEZ, 1998) for the 1970-1980 period.

umentation on the Italian labour market. Definitions of the categories of employed, unemployed and 'out of the labour force' persons follow both the International Labour Office (ILO) standards and the Eurostat Bureau guidelines.¹⁵

The most recent changes in the definitions and design of the survey occurred in 2004, but they are not relevant to our application since our analysis covers the timespan 1993-2003. Below we briefly describe the main features of the survey during the decade 1993-2003.¹⁶

The LFS is a rotating panel survey with a 2-2-2 rotation scheme. This rotation scheme implies, in principle, a 50% overlapping of the sample to a quarter of distance, a 25% overlapping to three quarters, a 50% to four quarters, and a 25% to five quarters. Of course the rotation scheme is fundamental for the generation of longitudinal data of the kind used in this paper, and it allows for both the estimation of labour market flows, and a valuable analysis of labour mobility. The sampling design for the selection of new units is two-stage stratified. Primary sampling units are given by municipalities stratified according to administrative provinces and demographic size. Secondary sampling units are given by households. Within sampled households every member aged 15 or over and resident in Italy is interviewed. The overall sample includes almost 75,000 households each quarter.

In this paper we consider transitions at time distances of twelve months using longitudinal datasets referred to the decade 1993-2003. These datasets therefore contain only two observations for each individual.

4 Simulations and policy exercise

This section reports and comments on the dynamic simulation of our model at both the regional and national level. The results are shown in Appendices B and C.

The model has been dynamically simulated across the overall sample period. In addition, a policy experiment has been implemented in order to analyse the effects of policies aimed at reducing the negative effects of a recession on the economy and, in particular, on the

¹⁵For a debate on the ILO four-week requirement for active job search, see Brandolini et al. (2004); for details on the Italian LFS definitions, see ISTAT (2002).

¹⁶For more details, see Commission Regulation (EC) No 1897/2000 of 7 September 2000 implementing Council Regulation (EC) No 577/98 on the organisation of a labour force sample survey in the European Community concerning the operational definition of unemployment.

unemployment rate.

We can compare the performance of the regional model (Lombardy) with that of the national model. It is shown that employment multipliers (short- and long-run) are not negligible in either framework. The use of the full-time equivalent labour units appears to be more appropriate than the typical standard measure of employment given by a head count of sectoral employees. It is worth noting that employment elasticity may also be affected by labour legislation, which might have produced a significant impact, in particular since the mid-1990s.

The regional labour market shows a higher elasticity of unemployment with respect to demand shocks. This fact crucially depends on the low discouragement effect estimated for Lombardy in the participation rate equation, also shown in the microeconomic evidence.

On the supply side, labour cost shocks affect the demand and supply for labour and, therefore, unemployment. This latter increases more in the national context than in Lombardy, as the discouragement effect is milder in the latter compared with that prevailing in the national labour market, as we have previously emphasized.

One should note that although the decline in industrial employment has been significant across the overall sample period, employment multipliers in industry are still relevant in the regional framework. This fact is relevant, as policy aiming at increasing employment in industry - an increase which might be partly related to the new labour legislation - is crucial for fostering growth and enabling the economy to recover from stagnation, and through this route reduce the unemployment rate towards its natural rate.

This fact is also confirmed by our policy package exercise, which consists in reducing labour costs in industry and services by 10% in the initial time period and, simultaneously, involves a 2% increase in value added in both sectors brought about an increase in demand.

Results show that the increase in employment in both industry and services is consistent with the previous analysis of the multipliers. Also, the effect is not limited to the short run, as the unemployment rate declines significantly over the entire period of simulation.

The regional labour market shows, as expected, a larger decrease in the unemployment rate, as the discouragement effect is milder and employment outflows from unemployment do increase as a consequence of the economic stimulus).

The microeconomic block of the model enables us to show the effect of labour market flows on the *steady-state* unemployment rate, which declines over the entire period of simulation. This fact depends on the increase in the probability of successful entry into the labour

market, on the one hand, and on the decrease in unemployment inflow, on the other.

This exercise illustrates the mechanism through which a reduction in unemployment toward its natural level is feasible in both the regional and the national labour markets, thus identifying a future line of research in the field of applied regional policy analysis.

5 Conclusions

We have presented and integrated a macro and micro model of the labour market, which enables us to discuss the impact of an economic downturn on labour demand and supply and thus on unemployment.

The model integrates a macroeconomic specification which implies the estimation of sectoral (industry and services) labour demand, and aggregate labour supply.

The unemployment rate is endogenously determined by an interaction of labour demand and supply. This consideration enables us to determine unemployment multipliers which are coherent with an endogenous labour force.

Models which typically assume an exogenous labour force overestimate the impact of demand or supply shocks on unemployment. In addition, and this represents the novelty of our approach, we have integrated a microeconomic block of the labour market into the more general macro block. In particular, we have introduced equations which define labour market flows, and in particular, unemployment inflows and outflows. This allows us to define and determine the natural rate of unemployment in terms of *steady-state* unemployment, i.e. that unemployment rate which is compatible with counterbalancing inflows and outflows from the labour force.

The simulation exercise emphasizes the different behaviour of the regional and national labour demand and supply equations. In particular, we find that the discouragement effect prevails in the national context, thus implying a milder reduction of unemployment when appropriate economic stimulus is introduced. This latter might produce significant effects both in the short and in the long run (unemployment reduction) but with a larger impact in the regional context.

Finally, it is worth stressing the fact that our empirical methodology may represent the starting point for important developments in the field of economic modelling, as the integration of macro and micro components has not yet been widely used for policy analysis.

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A List of variables

<i>DEFIND</i>	value added deflator in industry (1995=100)
<i>DEFSER</i>	value added deflator in private services (1995=100)
<i>DEFOTH</i>	value added deflator in the third special sector
<i>EE</i>	total employees
<i>EEIND</i>	employees in industry
<i>EESER</i>	employees in private services

<i>EEOTH</i>	employees in the third special sector
<i>IMMIG</i>	immigration flows from abroad
<i>INTAX</i>	net indirect taxes
<i>LF</i>	labour force
<i>LHIND</i>	labour productivity in industry
<i>LHSER</i>	labour productivity in private services
<i>PR</i>	participation rate
<i>PROF</i>	nominal total profits
<i>POP</i>	population
<i>SE</i>	self employment
<i>SERATE</i>	$=SE/POP$
<i>EERATE</i>	$=EE/POP$
<i>TE</i>	total employment (full-time equivalent units of labour)
<i>TEI</i>	total employment derived from the labour force survey by ISTAT and obtained by applying the appropriate coefficient of transformation to <i>TE</i>
<i>UR</i>	unemployment rate
<i>USS</i>	<i>steady-state</i> unemployment rate
<i>VAIND95</i>	value added in industry at constant 1995 prices
<i>VASER95</i>	value added in private services at constant 1995 prices
<i>VAOTH95</i>	value added in the third special sector at constant 1995 prices
<i>VAIND</i>	value added in industry at current prices
<i>VASER</i>	value added in private services at current prices
<i>VAOTH</i>	value added in the third special sector at current prices
<i>WIND</i>	per capita nominal labour cost in industry at current prices
<i>WSER</i>	per capita nominal labour cost in private services at current prices
<i>WOTH</i>	per capita nominal labour cost in the third special sector at current prices
<i>YU</i>	ratio of people searching for a job for the first time to total unemployed
<i>e</i>	exits from employment: numerator of <i>USS</i>
<i>ue</i>	transition probability from unemployment to employment
<i>un</i>	transition probability from unemployment to inactivity
<i>pne</i>	probability of successful entry into the labour force
<i>eu</i>	transition probability from employment to unemployment
<i>en</i>	transition probability from employment to inactivity
<i>ne</i>	transition probability from inactivity to employment
<i>nu</i>	transition probability from inactivity to unemployment
<i>num_eu_t</i>	microeconomic estimates for the transition eu
<i>num_en_t</i>	microeconomic estimates for the transition en
<i>num_ne_t</i>	microeconomic estimates for the transition ne
<i>num_nu_t</i>	microeconomic estimates for the transition nu
<i>i</i>	Lombardy, Italy

B Estimates

Table 1: Labour Demand - Employees in Industry - OLS Estimates - Dependent Variable: $\Delta \log(EIIND)$

	Lombardy	Italy
$\Delta \log(EIIND)_{t-1}$	0.385** (2.749)	0.294** (2.202)
$\Delta \log(VAIND)_{t-1}$	-0.072 (-0.691)	-0.005 (-0.061)
$\Delta \log(WIND - DEIIND)_t$	-0.065 (-4.401)	-0.030 (-0.208)
$\log(EIIND)_{t-1}$	0.442*** (-4.401)	-0.414*** (-5.594)
$\log(VAIND)_t$	0.291*** (2.981)	0.270*** (3.909)
$\log(WIND - DEIIND)_t$	-0.215** (-2.521)	-0.195* (2.202)
$LHIND_t$	-0.523*** (-2.850)	-0.518** (-1.799)
<i>Constant</i>	1.436 (1.575)	1.534** (2.174)
Adjusted- R^2	0.466	0.580
<i>F</i> -statistic	5.115	7.513

t-statistics in parenthesis.

* Significant at the 90% level; ** significant at the 95% level;

*** significant at the 99% level.

Table 2: Labour Demand - Employees in Tradable Services - OLS Estimates - Dependent Variable: $\Delta \log(EESER)$

	Lombardy	Italy
$\Delta \log(EESER)_{t-1}$	0.118 (0.858)	0.390*** (3.993)
$\Delta \log(VASER)_t$	0.249 (1.923)	0.164 (1.886)
$\log(EESER)_{t-1}$	-0.434*** (-4.371)	-0.401*** (-5.746)
$\log(VASER)_{t-1}$	0.352*** (4.269)	0.312*** (5.317)
$\log(WSER - DEFSER)_t$	-0.200*** (-3.304)	-0.296*** (-4.679)
$LHSER_t$	-0.650*** (-3.580)	-0.277** (-2.243)
<i>Constant</i>	1.055*** (3.067)	0.957*** (4.817)
Adjusted- R^2	0.614	0.712
<i>F</i> -statistic	9.762	14.580

Table 3: Labour Supply - Participation Rate - OLS Estimates - Dependent Variable: $\Delta\log(PR)$

	Lombardy	Italy
$\Delta\log(PR)_{t-1}$	2.228 (1.338)	0.087 (0.826)
$\Delta\log(SERATE)_{t-1}$	0.138* (1.978)	0.363*** (4.192)
$\Delta\log(EERATE)_t$	0.274*** (2.812)	0.570*** (4.248)
$\Delta\log(IMMIG)_t$	0.004 (0.724)	-0.004 (-0.627)
$\log(PR)_{t-1}$	-0.447** (-2.637)	-0.595*** (-2.880)
$\log(SERATE)_{t-1}$	0.068* (2.015)	0.290*** (3.309)
$\log(EERATE)_{t-1}$	0.064 (0.846)	0.206 (1.345)
$\log(IMMIG)_{t-1}$	0.009** (2.360)	0.000 (0.064)
<i>Constant</i>	-2.272** (-2.519)	-0.341 (-0.686)
Adjusted- R^2	0.370	0.724
F-statistic	3.418	11.812

Table 4: Labour Supply - Self Employment - OLS Estimates Dependent Variable: $\Delta\log(SE)$

	Lombardy	Italy
$\Delta\log(SE)_{t-1}$	0.198 (1.271)	0.166 (1.018)
$\Delta\log(PROFSE - DEF)_t$	-0.004 (-0.044)	-0.024*** (-0.234)
$\Delta\log(YUR)_t$	0.063** (2.127)	0.059*** (1.512)
$\log(SE)_{t-1}$	-0.124*** (-2.814)	-0.267 (-3.894)
$\log(PROFSE - DEF)_{t-1}$	0.211** (2.396)	0.086*** (3.116)
$\log(YUR)_{t-1}$	0.060** (2.679)	0.140 (3.810)
<i>Constant</i>	-0.208 (-0.875)	1.485 (3.473)
Adjusted- R^2	0.497	0.409
F-statistic	6.441	4.810

C Figures

Figure 1: Lombardy – Value added and labour cost shocks

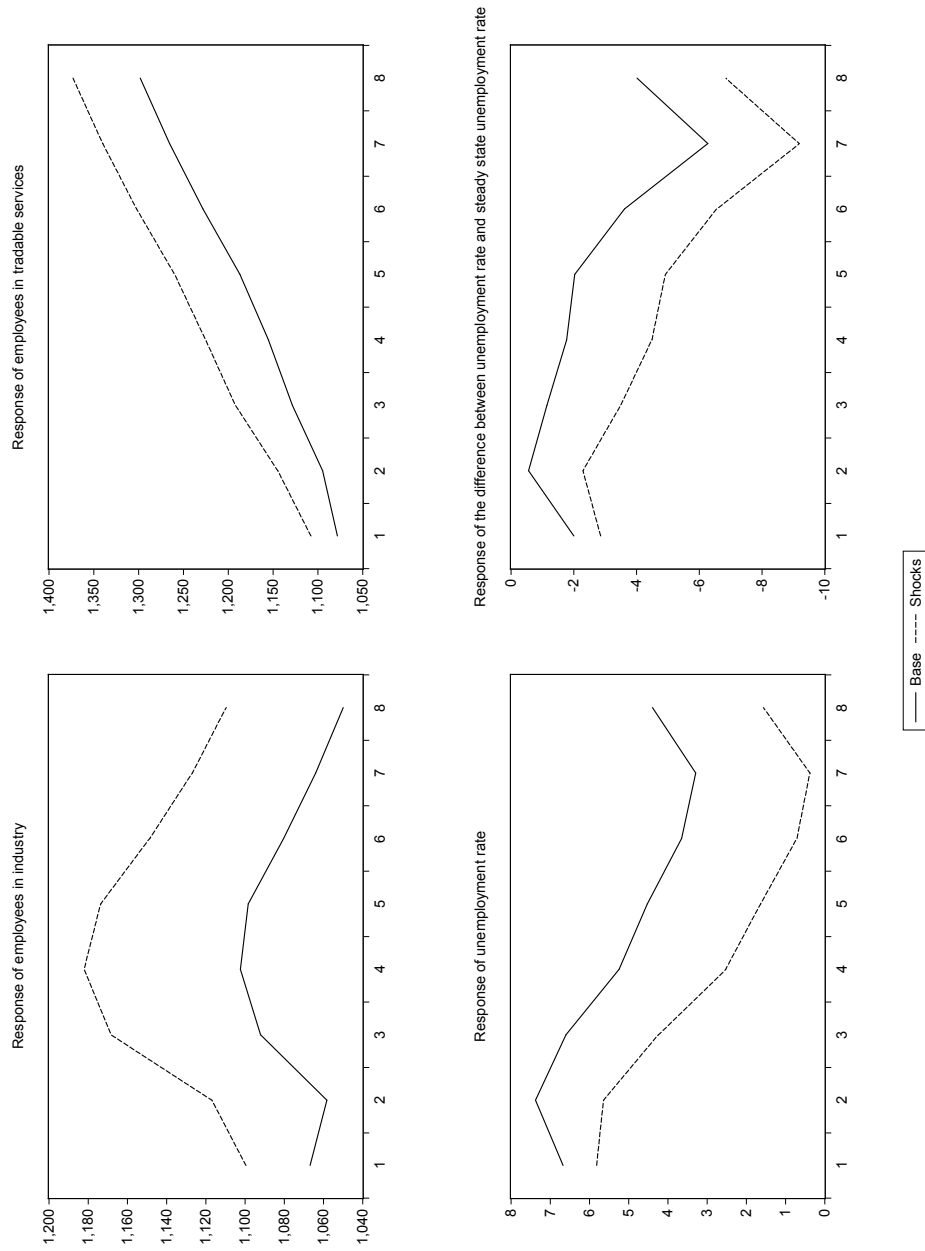


Figure 2: Italy –exogenous model– Value added and labour cost shocks

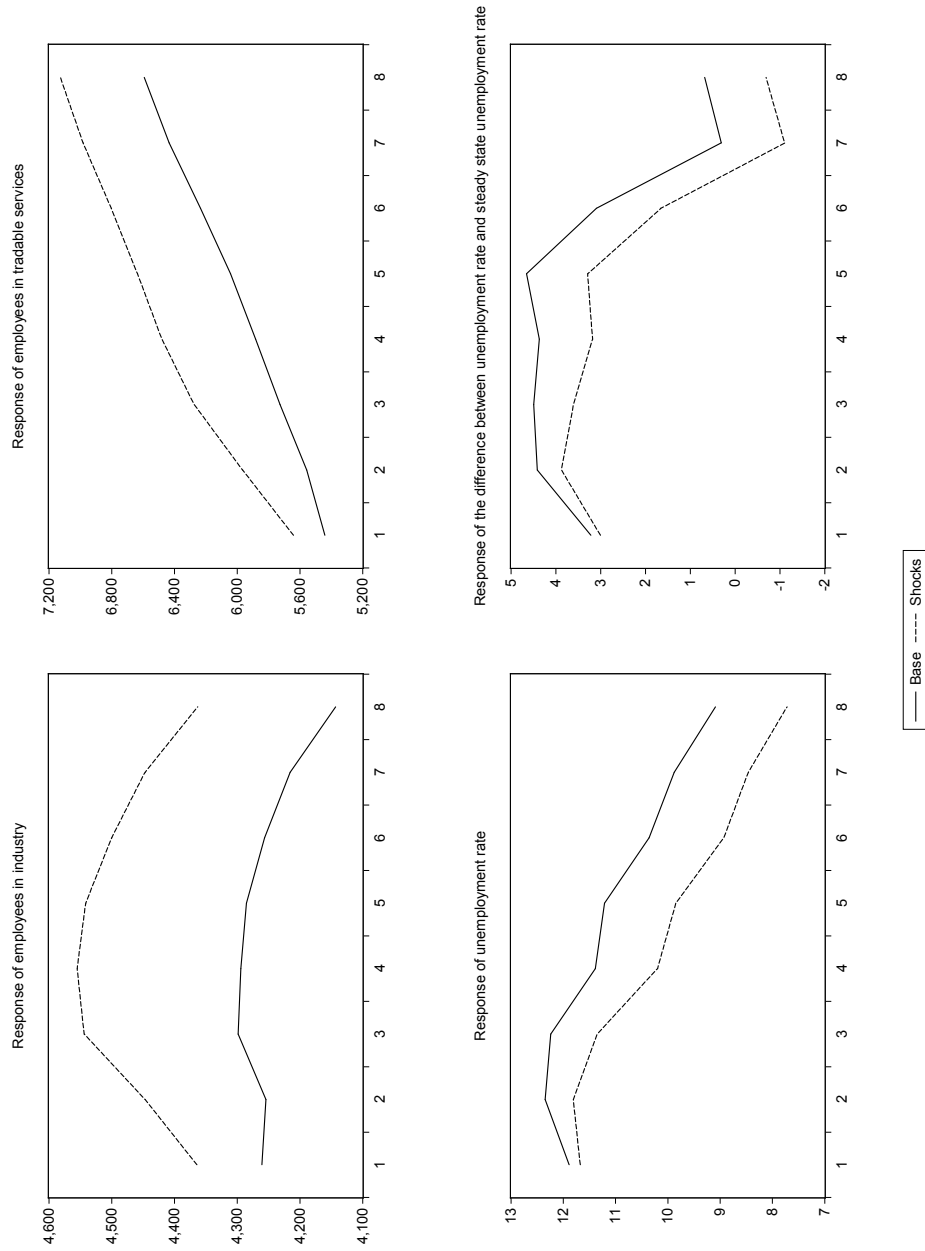
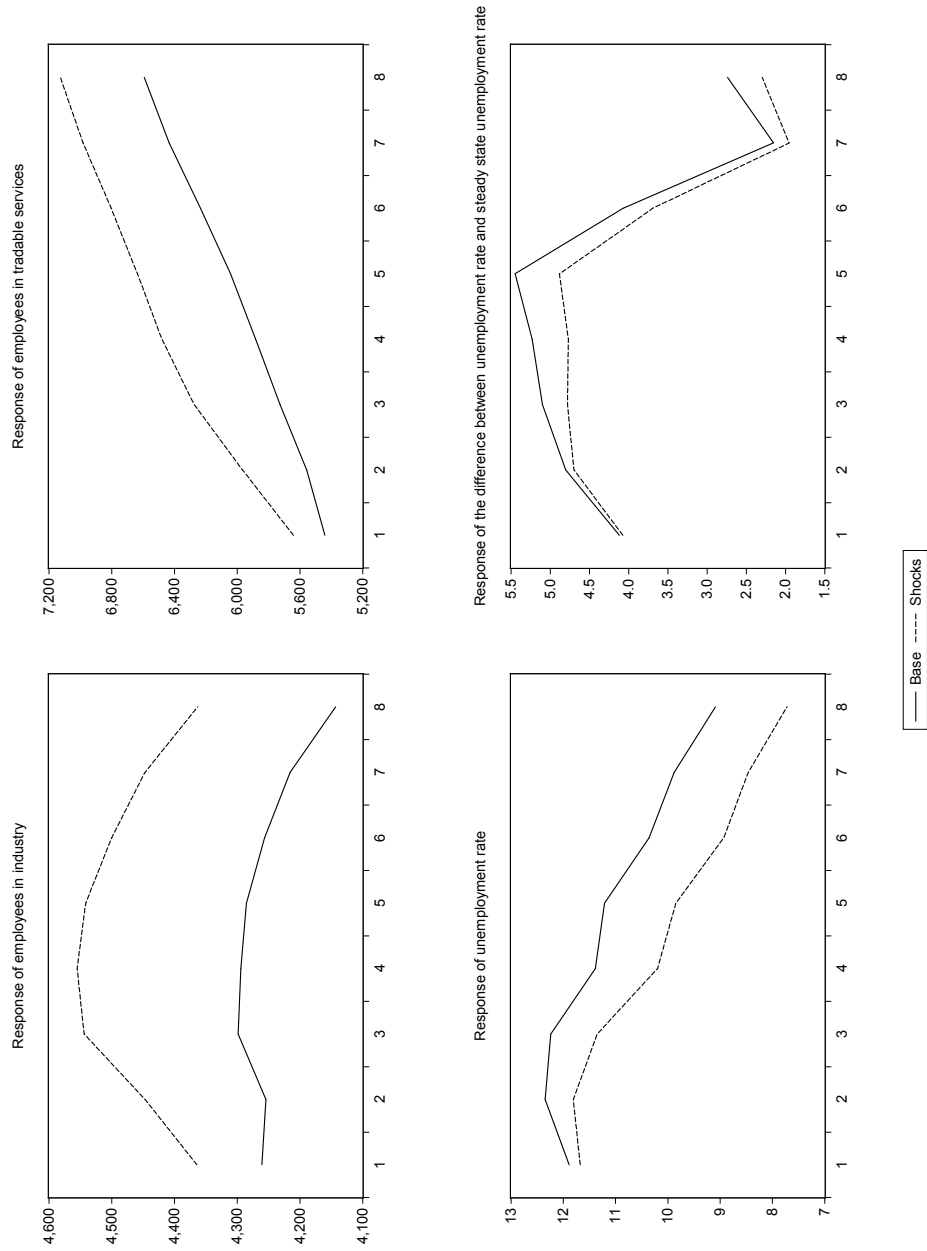
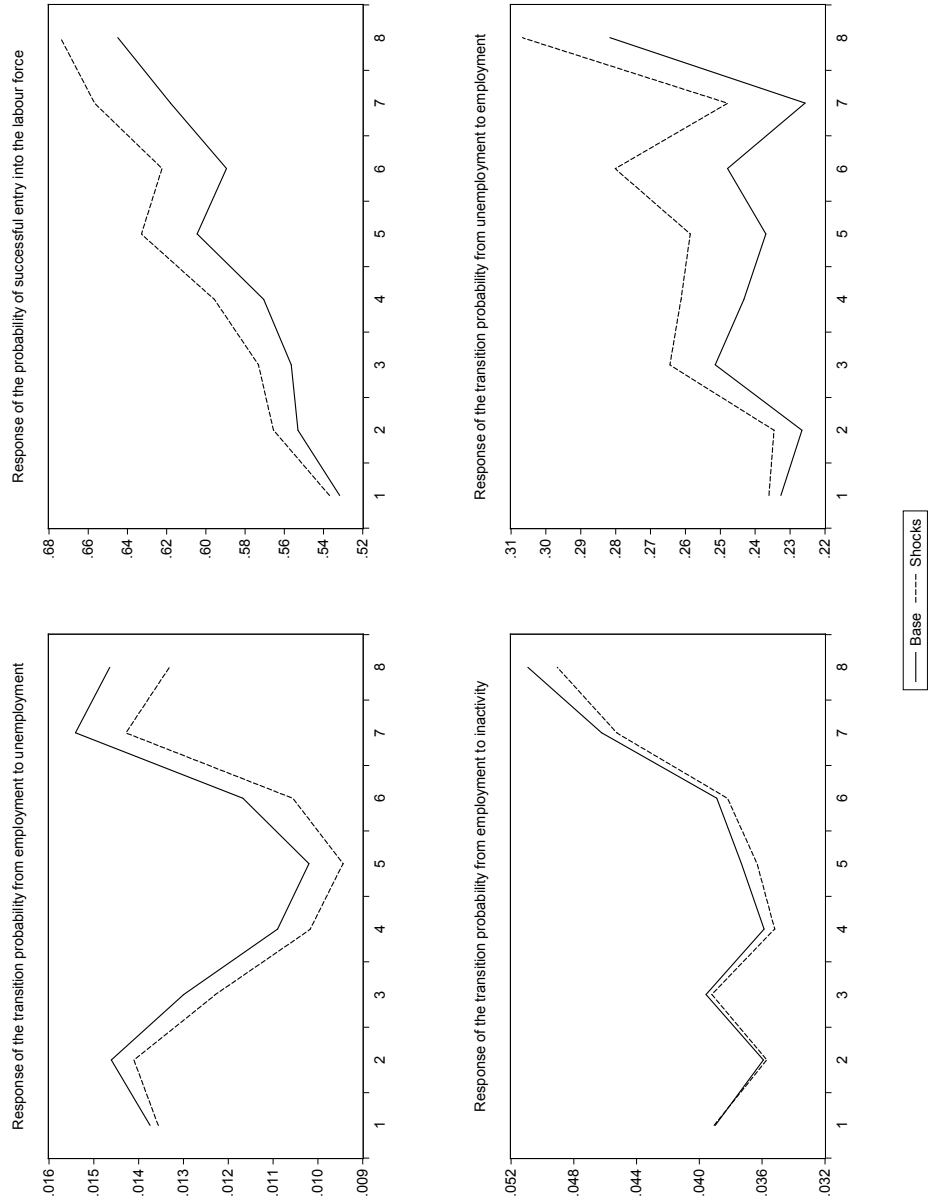
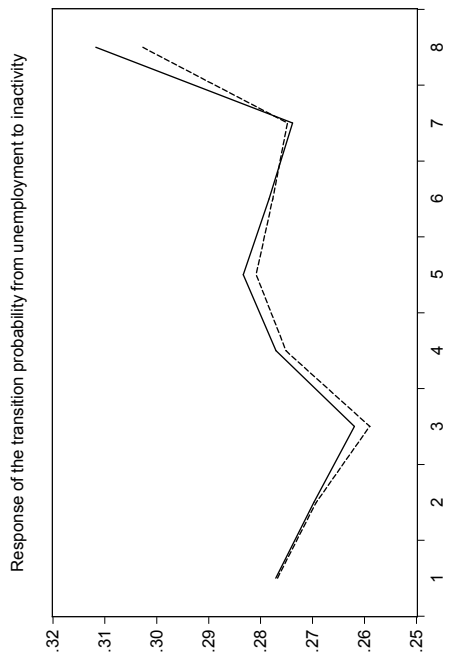
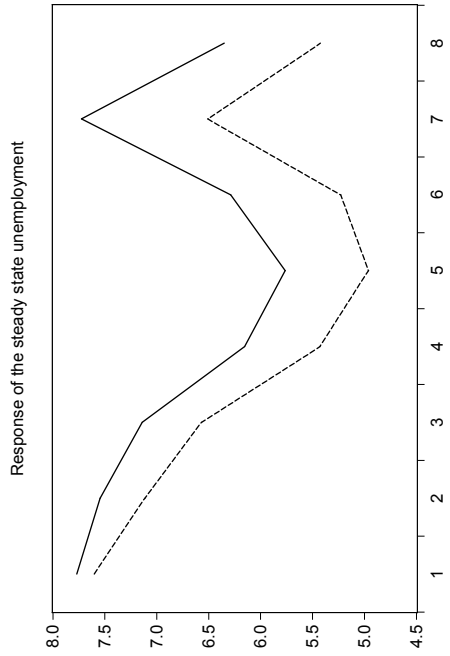


Figure 3: Italy –endogenous model– Value added and labour cost shocks







— Base ---- Shocks