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

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Abstract

The effects of the recent economic recession have been widely emphasized particularly at the macro economic level. However, the economic downturn has been pervasive and has determined a wider range of economic effects at different territorial levels. Thus, it is crucial to set up appropriate analytical tools aiming 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 both aggregate labour demand and supply, and the labour market flows which determine the steady–state unemployment rate. Thus, we can simulate either demand or supply shocks; then, we can evaluate their impacts on labour demand and supply on the one hand, and unemployment and labour market flows, on the other. This enables us to pinpoint the dynamic effects of such shocks and to underline the different behaviour of the regional framework with respect to the whole economy.

Keywords: regional econometric models, labour demand and supply, labour market flows, steady–state unemployment rate.
JEL classification codes: E1, E17, R2, R23

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1 Introduction

During recent years the demand for quantitative economic investigations to support policy makers has grown rapidly, particularly at the occurrence of the last economic downturn. The need for tools aiming at assessing the impacts of such a downturn and suggesting policy options has been increasingly demanding. In addition, the European economic and monetary integration process has increased the economic relevance of regional economies, thus calling also for analytical instruments aimed at supporting the decision-making process. This paper develops and implements a regional macroeconometric model of Lombardy's labour market in which both labour demand and supply are endogenously determined and, therefore, unemployment is determined by their interaction. We also offer a model simulation exercise aimed at assessing the responsiveness of the regional labour market, in comparison with the national one, to exogenous demand or supply shocks. The choice to analyze the regional context of Lombardy is primarily driven by its economic relevance. Lombardy is one of the most important Italian regions, which is representative of both richest regions in Europe and Italian regions as well (such as Tuscany or Emilia Romagna).[1] We integrate a macro–level analysis with microeconometric estimates, which on the whole provide a more detailed and complete vision of the labour market and to underline implications relevant from a policy perspective. The overall analysis allows evaluating the impact of changes of the 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 proceeds as follows. Section 2 presents the model specification both for the macroeconometric model and the microeconometric block, together with their connection. Section 3 describes the data. Section 4 describes the results and offer a policy exercise. Section 5 concludes.

2 Model specification and estimation

The model is made up of two blocks. Equations and identities pertaining to each block are explained below. Specifically subsection 2.1 describes the structure of the macroeconometric labour market model

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

used to estimate labour demand and supply for the Italian region of Lombardy and for Italy as a whole. The second subsection instead sketches the relevant features of the microeconometric model for the estimates used to implement a specific module of the macroeconometric model. Finally, the link between microeconometric and macroeconometric model estimates is explained in subsection 2.3. Relevant variables for the labour market model used in what follows are listed in Appendix A.

2.1 The Macroeconometric Labour Market Model

The macroeconometric model to analyze the national (Italy) and the regional (Lombardy) labour market is based on the insights of Baussola (2007) and the development of Barbieri (2010). It incorporates both aggregate labour demand and supply and it 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 have been considered exogenous while labour demand and supply includes each one two stochastic equations. Moreover, in order to not introduce any further methodological complications, no simultaneity mechanisms are provided in the model and the only connections among endogenous variables are indirectly obtained through the identities.
The equations belonging to the macro-block are the following:

Stochastic equations:

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

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

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

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

[2]As highlighted in Barbieri (2010) such a specification has also some relevant advantages, e.g. a strong cutback of the multicollinearity effects and a much more intuitive interpretation of the estimates.

Identities:

$$
\begin{aligned}
TE_t =& EEIND_t + EESER_t + EEOTH_t + SE_t && (5)\\
TEI_t =& \gamma_t TE_t && (6)\\
EE_t =& EEIND_t + EESER_t + EEOTH_t && (7)\\
LF_t =& PR_t * POP_t && (8)\\
UR_t =& (LF_t - TEI_t)/LF_t * 100 && (9)\\
PROFSE_t =& PROF_t/SE_t && (10)
\end{aligned}
$$

$$
PROF_t = (VAIND95_t * DEFIND_t + VASER95_t * DEFSER_t + \\
+ VAOTH95_t * DEFOTH_t) - (WIND_t * EEIND_t + WSER_t * EESER_t \\
+ WOTH_t * EEOTH_t) - INTAX_t \qquad (11)
$$

The demand side of the model includes one equation describing the employees in industry *EEIND* –equation (1)– and one 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 a labour supply decision.

Labour force participation rate depends on the employment rates (EERATE and SERATE) as well as on a migration variable included in order to take into account the phenomenon of immigration from foreign countries. Self-employment –equation (3)– is modelled including as regressors percapita earnings and young unemployment rate following the neo-classical assumption that labour supply depends on opportunity costs (labour/leisure choice).

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

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

[3] Industry and private services, the two Italian driving sectors, are individually considered in dataset, while “leftover” sectors (e.g. agriculture, construction and public sector) are overall considered as a third special sector. Even if agriculture should be considered a driving sector for Italian economy, the lack of relevant data makes us unable to conveniently model it.

As far as labour demand in industry is concerned, regional and national results are very similar in term of 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 the value added on employment. Also the effects of labour cost and labour hoarding variable are significant confirming the competitiveness of the Italian industrial sector that tends to pursue efficiency as much as possible.
In the case of labour demand in private services, the response of employment to value added changes is significant only in the long-run, both at the national and regional level. As regards the long-run behaviour of the two markets the biggest difference stays in the relevance of the labour hoarding impact. In fact, this impact in Italy is smaller than in Lombardy (here the coefficient is equal to -0.277 versus the -0.650 of Lombardy), while 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. Indeed, in Lombardy private service activities are characterized by a larger size than the Italian average and the labour cost fluctuations can be easily absorbed by means of business dimension increasing the expansion opportunities.
In referring to the labour supply estimates, the importance of the discouragement effect is highlighted by the strong 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. Only in Lombardy the variable migration seems to be significant even if with a very little impact.[4]
As far as self-employment estimate is concerned, in the Lombardy case the earning variable is significant only in the short-run, while the proportion of young unemployed people impacts both in the short and in the long run. In the Italy case, the earning variable is always significant, while the proportion of young unemployed people is significant only in the short-run but with a stronger impact.

2.2 The Microeconometric Labour Market block

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

[4]It should be noted that only in a little part of the sample period covered by our estimate Italy has experimented the large increasing of immigration flows from foreign countries.

Micro–Level identities:

$$DIFFUR_t = UR_t - USS_t \tag{12}$$

$$USS_t = \frac{e_t}{e_t + ue_t + un_t * pne_t} * 100 \tag{13}$$

$$e_t = eu_t + (1 - pne_t) * en_t \tag{14}$$

$$pne_t = \frac{ne_t}{ne_t + nu_t} \tag{15}$$

$$num\_eu_t = \exp\left(\alpha_t^{[eu]} + \beta_t^{[eu]} UR_t\right) \tag{16}$$

$$num\_en_t = \exp\left(\alpha_t^{[en]} + \beta_t^{[en]} UR_t\right) \tag{17}$$

$$num\_ne_t = \exp\left(\alpha_t^{[ne]} + \beta_t^{[ne]} UR_t\right) \tag{18}$$

$$num\_nu_t = \exp\left(\alpha_t^{[nu]} + \beta_t^{[nu]} UR_t\right) \tag{19}$$

$$eu_t = \frac{num\_eu_t}{num\_eu_t + num\_en_t + 1} \tag{20}$$

$$nu_t = \frac{num\_nu_t}{num\_ne_t + num\_nu_t + 1} \tag{21}$$

The labour market transition probabilities[5] displayed in the above equations by lower cases are estimated by using a microeconometric approach.

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

[5]We 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*).

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

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

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

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 their 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 probabilities can be written as follows:

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

[7]In their work, Aeschimann 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.

[8]For example, for the state of (E)mployment we have the permanence rate (*ee*) into 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.

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

We consider only the transition from the beginning to the end of the observation period. Each observation period is one year.[9]

2.3 Linking the Micro and the Macro blocks

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 its gap with the unemployment rate (identity 12). The former is introduced by exploiting the precision of specific microeconometric estimates.

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

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

$$ueU + neN = (eu + en)E \tag{24}$$

$$euE + nuN = (ue + un)U \tag{25}$$

The identity (24) ensure steady employment, by equating the inflows (left-hand side) and the outflows from this condition (right-hand side). The identity (25) instead ensure steady unemployment, again equating inflows and outflows. By solving with respect to N both the identities we find the following equations:

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

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

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

we therefore obtain the identity:

$$eE = dU \tag{28}$$

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 therefore are able to define this indicator in terms of transition probability by using the identity (28):

$$u = \frac{e}{e + d} \tag{29}$$

The transition probabilities are computed by using specific microeconometric 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 function of specific individual characteristics, e.g. gender, age, education, geographical area of residence, education 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:[10]

$$eu = \frac{exp(\alpha_t^{[eu]} + \beta_t^{[eu]} UR_t)}{exp(\alpha_t^{[eu]} + \beta_t^{[eu]} UR_t) + exp(\alpha_t^{[en]} + \beta_t^{[en]} UR_t) + 1} \tag{30}$$

where $\alpha^{[eu]}$ is the contribution of the individual characteristics,[11] whilst $\beta^{[eu]}$ is the coefficient of the unemployment rate.[12] Since the equation is estimated for each year of the time period analysed we also 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).

[10]We show the equation for the transition from employment to unemployment only, since the remaining transitions are analogously determined. This equation is the equivalent of identity (20) displayed above.

[11]It is obtained by multiplying the MNL coefficient estimates of the variable for each individual characteristics used in our model and their means.

[12]It is the 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.

3 Data

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

For the macro model we updated the dataset based on annual data at the NUTS2 level of Barbieri (2010).[13] This dataset covers the period 1970-2005. It offers data on aggregates on production activities (gross value added, labour costs, employment, employees, labour units, gross fixed capital formation) as well as data on demographic variables both at the national and regional level.
Accordingly to the Regional Accounts published by ISTAT, the dataset is characterized by a sectoral disaggregation that considers three main sectors: industry, private services and a third special sector where agriculture, construction and public sector are overall considered.

Note that all monetary variables, except labour cost, are expressed at constant 1995 prices. Since 2007, according to the EU rules, ISTAT also publishes 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 to estimate 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 the ISTAT is the main source of statistical documentation 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.[14]

The most recent changes in the definitions and design of the survey

[13]The 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.

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

occurred in 2004, but they are not relevant to our application since our analysis covers the time-span 1993-2003. Below we briefly describe the main features of the survey during the decade 1993-2003.[15]

The LFS is a rotating panel survey with a 2-2-2 rotation scheme. The 2-2-2 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 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 both at the regional and national level. The results are shown in Appendix 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 unemployment rate.

We can compare the performance of the regional model (Lombardy) with the national one. It is shown that employment multipliers (short and long run) are not negligible in both frameworks. The use of the full-time equivalent labour units appears to be more appropriate than the typical standard measure of employment given by the

[15] For more details, see the 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.

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 microeconometric 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 this 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, which may be partly related to the new labour legislation, is crucial to foster growth and enable the economy to recover from stagnation and through his route reduce the unemployment rate towards its natural rate.

This fact is also confirmed by our policy package exercise, which consists in reducing labour cost by 10% in the initial time period and, simultaneously, it involves a 2% increase in value added in both industry and services 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. (Figure 1)

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

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

5 Conclusions

We have presented and integrated 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 such 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 assumes an exogenous labour force do 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 has emphasized the different behaviour of the regional and national labour demand and supply equations. In particular, we find that the discouragement effect does prevail in the national context, thus implying a milder reduction of unemployment when appropriate economic stimulus is introduced. This latter might produce significant effect 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 development 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

DEFIND	value added deflator in industry (1995=100)
DEFSER	value added deflator in private services (1995=100)
DEFOTH	value added deflator in the "other sectors"[16] (1995=100)
EE	total employees
EEIND	employees in industry
EESER	employees in private services
EEOTH	employees in the "other sectors"
IMMIG	immigration flows from abroad
INTAX	net indirect taxes
LF	labour force
LHIND	labour hoarding in industry
LHSER	labour hoarding in private services
PR	participation rate
PROF	nominal total profits
POP	population
SE	self employment
SERATE	*=SE/POP*
EERATE	*=EE/POP*
TE	total employment (full-time equivalent units of labour)

TEI	total employment derived from the labour force survey by ISTAT and obtained by applying the appropriate coefficient of transformation to TE
UR	unemployment rate
USS	*steady-state* unemployment rate
$VAIND95$	value added in industry at constant 1995 prices
$VASER95$	value added in private services at constant 1995 prices
$VAOTH95$	value added in the "other sectors" at constant 1995 prices
$VAIND$	value added in industry at current prices
$VASER$	value added in private services at current prices
$VAOTH$	value added in the "other sectors" at current prices
$WIND$	per capita nominal labour cost in industry at current prices
$WSER$	per capita nominal labour cost in private services at current prices
$WOTH$	per capita nominal labour cost in the "other sectors" at current prices
YU	ratio of people searching for a job for the first time to total unemployed
e	exits from employment: numerator of USS
ue	transition probability from unemployment to employment
un	transition probability from unemployment to inactivity
pne	probability of successful entry into the labour force
eu	transition probability from employment to unemployment
en	transition probability from employment to inactivity
ne	transition probability from inactivity to employment
nu	transition probability from inactivity to unemployment
num_eu_t	microeconometric estimates for the transition eu
num_en_t	microeconometric estimates for the transition en
num_ne_t	microeconometric estimates for the transition ne
num_nu_t	microeconometric estimates for the transition nu
i	Lombardy, Italy

B Estimates

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

	Lombardy	Italy
$\Delta log(EEIND)_{t-1}$	0.385**	0.294**
	(2.749)	(2.202)
$\Delta log(VAIND)_{t-1}$	-0.072	-0.005
	(-0.691)	(-0.061)
$\Delta log(WIND - DEFIND)_t$	-0.065	-0.030
	(-4.401)	(-0.208)
$log(EEIND)_{t-1}$	0.442***	-0.414***
	(-4.401)	(-5.594)
$log(VAIND)_t$	0.291***	0.270***
	(2.981)	(3.909)
$log(WIND - DEFIND)_t$	-0.215**	-0.195*
	(-2.521)	(2.202)
$LHIND_t$	-0.523***	-0.518**
	(-2.850)	(-1.799)
$Constant$	1.436	1.534**
	(1.575)	(2.174)
Adjusted-R^2	0.466	0.580
F-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	0.390***
	(0.858)	(3.993)
$\Delta log(VASER)_t$	0.249	0.164
	(1.923)	(1.886)
$log(EESER)_{t-1}$	-0.434***	-0.401***
	(-4.371)	(-5.746)
$log(VASER)_{t-1}$	0.352***	0.312***
	(4.269)	(5.317)
$log(WSER - DEFSER)_t$	-0.200***	-0.296***
	(-3.304)	(-4.679)
$LHSER_t$	-0.650***	-0.277**
	(-3.580)	(-2.243)
$Constant$	1.055***	0.957***
	(3.067)	(4.817)
Adjusted-R^2	0.614	0.712
F-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	0.087
	(1.338)	(0.826)
$\Delta log(SERATE)_{t-1}$	0.138*	0.363***
	(1.978)	(4.192)
$\Delta log(EERATE)_t$	0.274***	0.570***
	(2.812)	(4.248)
$\Delta log(IMMIG)_t$	0.004	-0.004
	(0.724)	(-0.627)
$log(PR)_{t-1}$	-0.447**	-0.595***
	(-2.637)	(-2.880)
$log(SERATE)_{t-1}$	0.068*	0.290***
	(2.015)	(3.309)
$log(EERATE)_{t-1}$	0.064	0.206
	(0.846)	(1.345)
$log(IMMIG)_{t-1}$	0.009**	0.000
	(2.360)	(0.064)
Constant	-2.272**	-0.341
	(-2.519)	(-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	0.087
	(1.271)	(0.826)
$\Delta log(PROFSE-DEF)_t$	-0.004	0.363***
	(-0.044)	(4.192)
$\Delta log(YUR)_t$	0.063**	0.570***
	(2.127)	(4.248)
$log(SE)_{t-1}$	-0.124***	-0.004
	(-2.814)	(-0.627)
$log(PROFSE-DEF)_{t-1}$	0.211**	0.290***
	(2.396)	(3.309)
$log(YUR)_{t-1}$	0.060**	0.206
	(2.679)	(1.345)
Constant	-0.208	-0.341
	(-0.875)	(-0.686)
Adjusted-R^2	0.497	0.409
F-statistic	6.441	4.810

C Figures

Figure 1: Lombardy – Value added and labour cost shocks

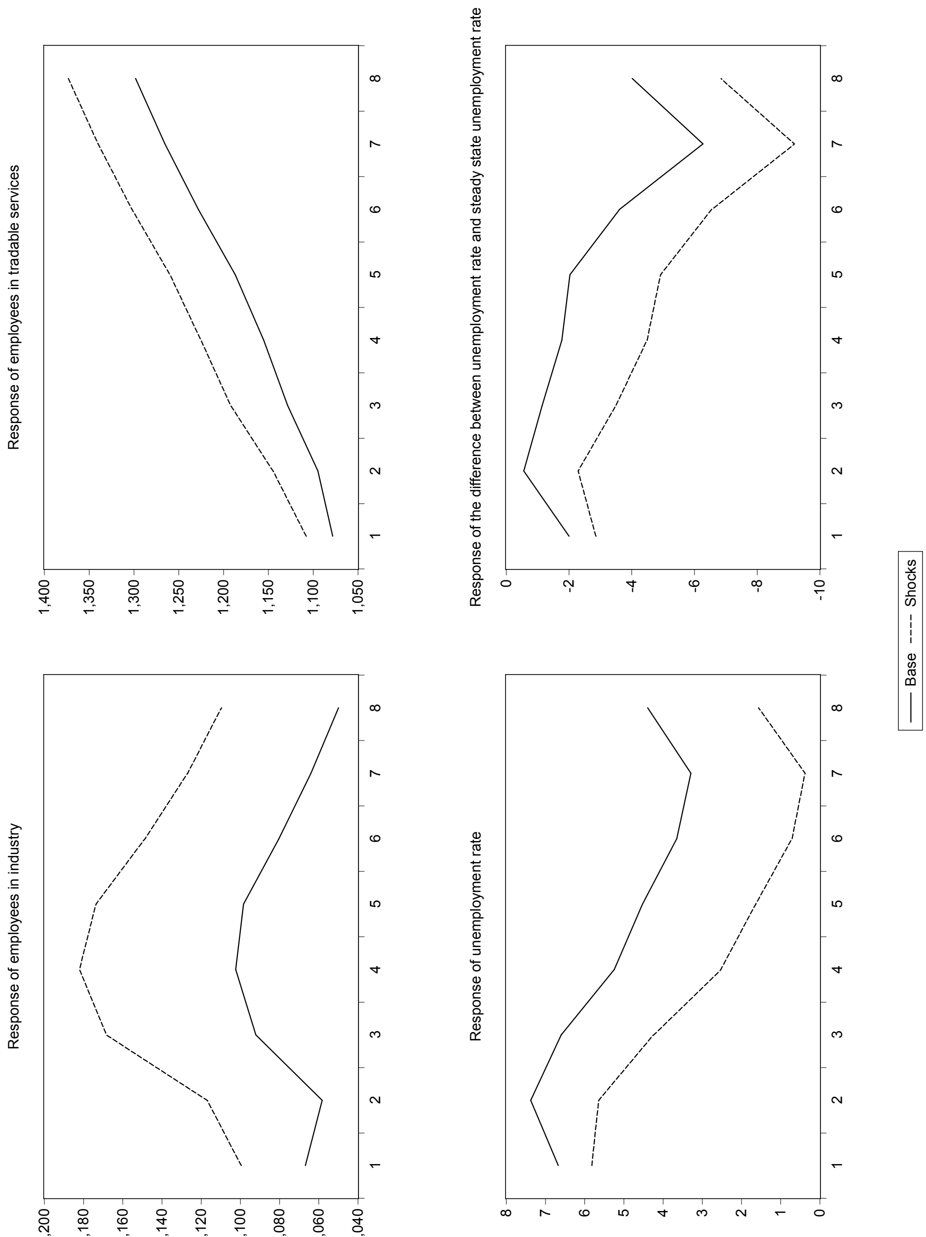


Figure 2: Italy –exogenous model– Value added and labour cost shocks

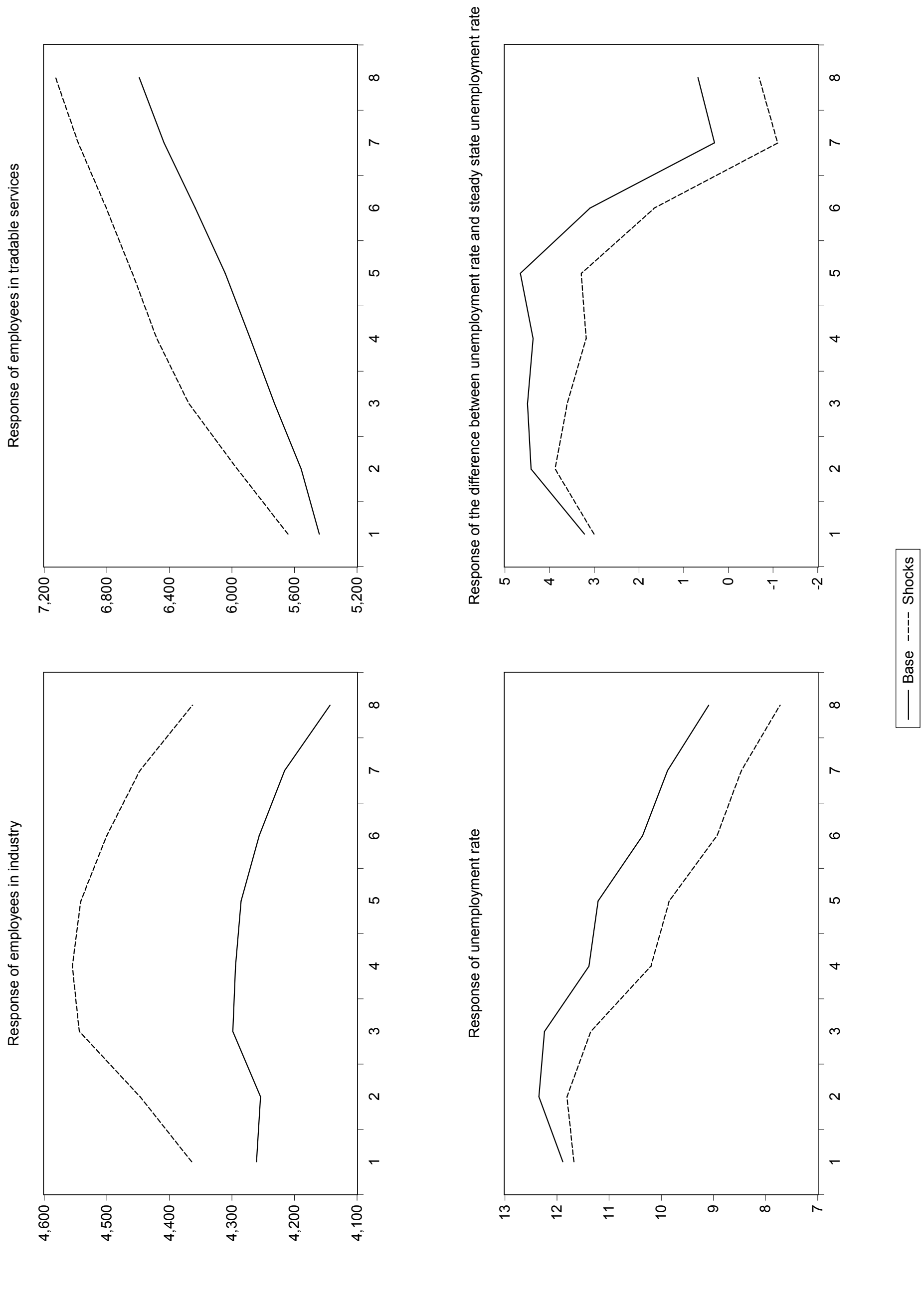
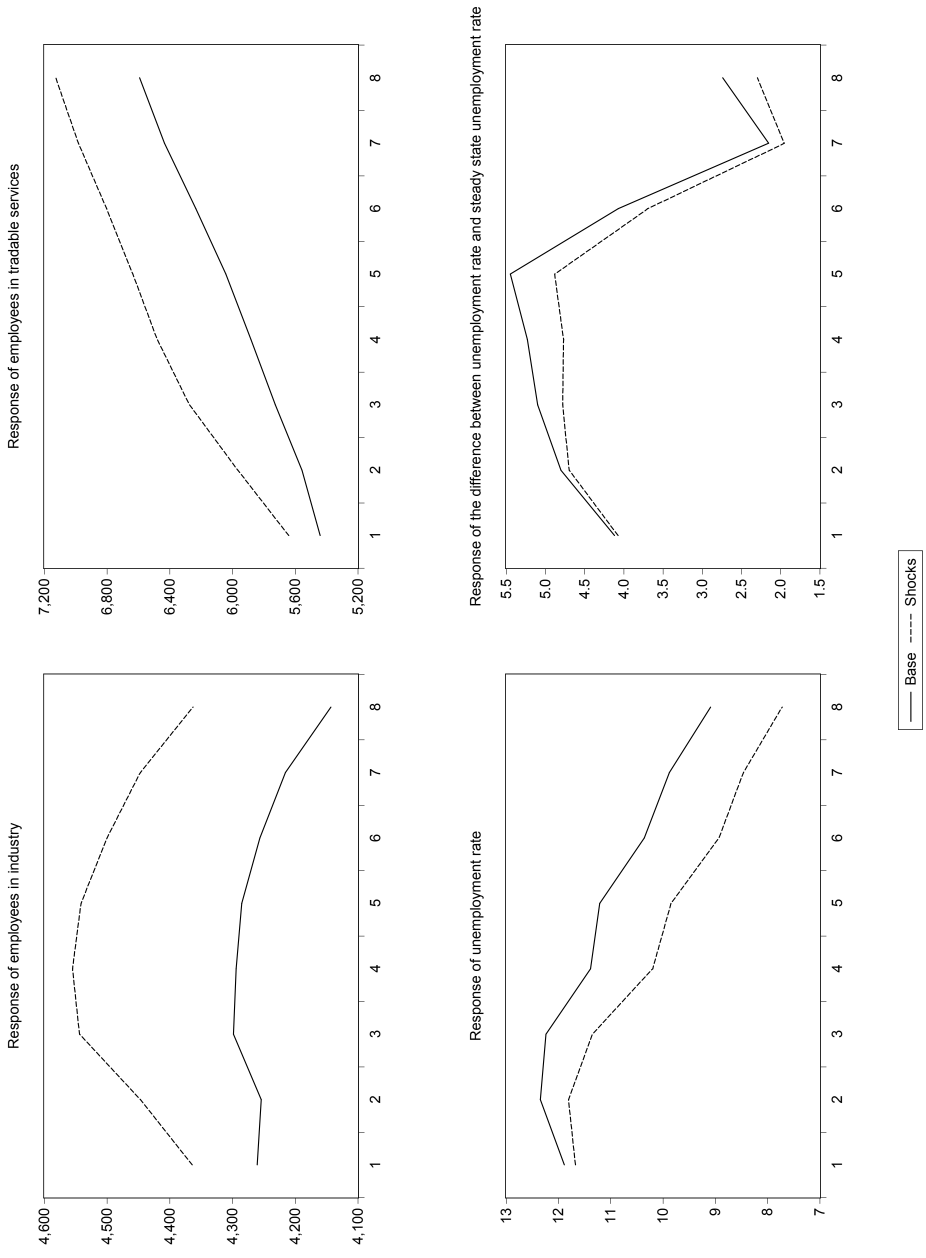
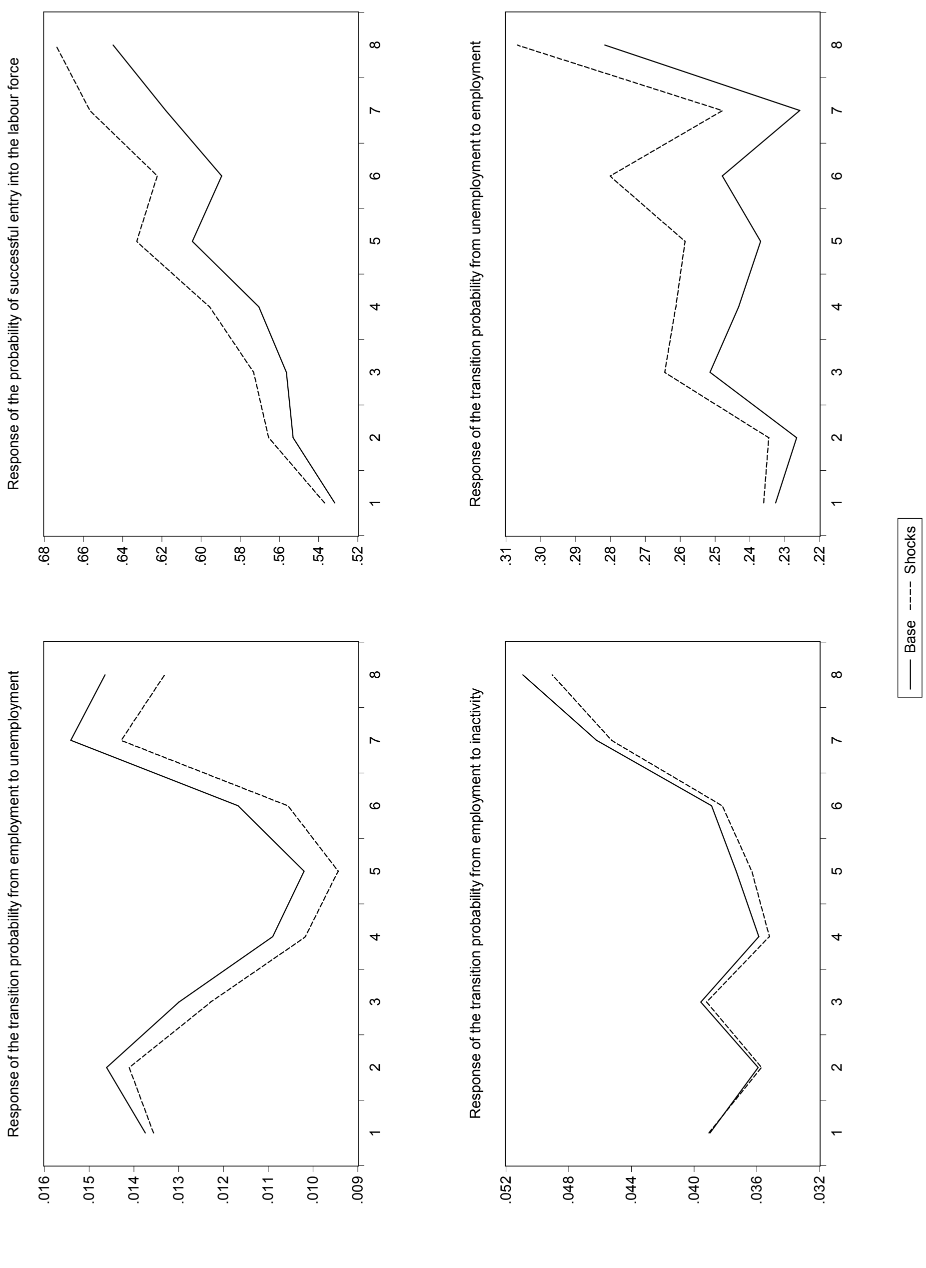
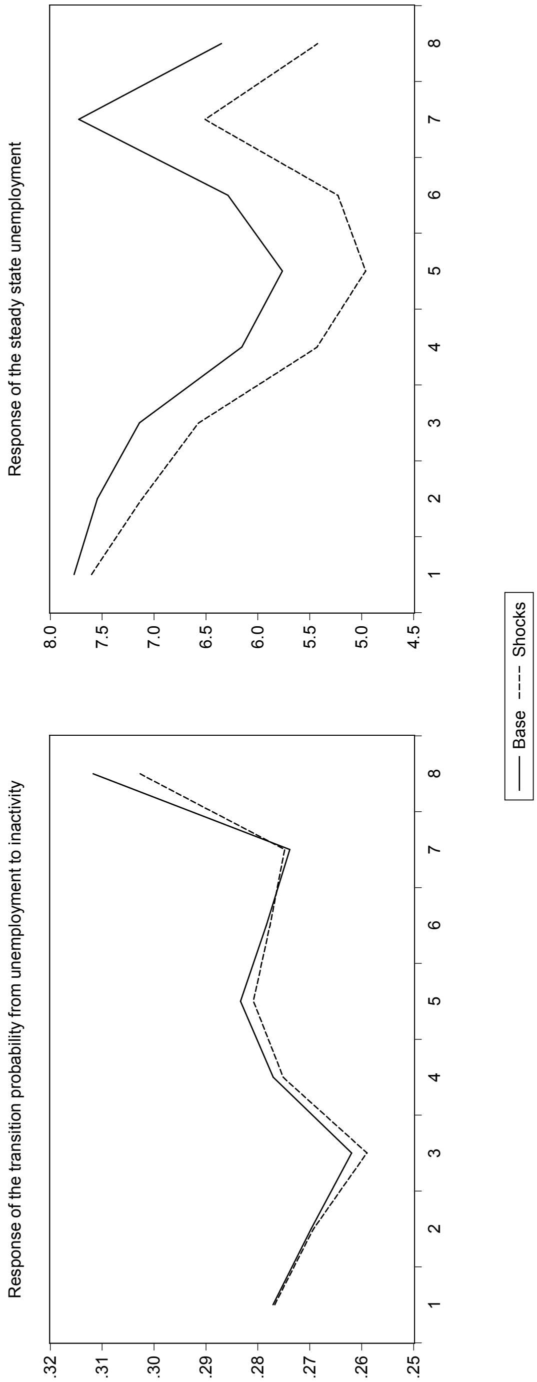


Figure 3: Italy –endogenous model– Value added and labour cost shocks




Response of the transition probability from employment to unemployment
Response of the probability of successful entry into the labour force
Response of the transition probability from employment to inactivity
Response of the transition probability from unemployment to employment
Base
Shocks


Response of the transition probability from unemployment to inactivity
Response of the steady state unemployment
Base
Shocks