Does Labour Market Intervention Lead to Unemployment? What the Data Show

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Abstract

This paper analysed the OECD data on employment protection for 23 OECD countries over the time span 1990-2008 on the basis of alternative dynamic panel data models and panel causality tests and examines the validity of the neo-liberal argument that strictness of employment protection hurts labour through increased long-term and youth unemployment rates. While it finds no empirical basis for this orthodox standpoint it observes that unemployment dampens aggregate production which in turn aggravates long-term unemployment problem.

JEL Codes: K31, J08, J50, J60, J83

Keywords: labour law; regular job protection; temporary job protection, unemployment rate; long-term unemployment; youth unemployment.

1. Introduction

The regulation of labour market to protect the interest of labour is often taken as an exogenous interference with market relations causing a rise in unemployment and poverty. During the era of Reaganomics and Thatcherism in the 1980s, USA and UK underwent a process of labour market deregulation (along with other things) and subsequently it has become the essential part of 'Washington Consensus'-IMF-World Bank policy package prescribed to the crisis-stricken less developed countries.

In the late 1990s La Porta and his collaborators (La Porta et al., 1997, 1998, 1999, 2000; 2006, 2008; Djankov et al., 2003; Glaeser and Shleifer, 2002, 2003; Beck et al., 2003a, 2003b; Botero et al., 2004) set in motion a series of systematic analysis of the relationships between legal and economic variables. Legal variables ('leximetric' data) are by and large binary variables (0, 1) used to quantify the quality of various types of law that exist in different countries to protect the interests of various stakeholders such as shareholders, creditors and labourers. The countries are classified according to their 'legal origin': English common law and civil law are two broad categories. Through various cross-section regression studies of these 'leximetric' data, it is argued that English common law systems are more market-friendly; they provide higher level of shareholder and creditor protection to promote financial development. It is also pointed out that the civil law countries interfere more in the labour market which exerts a negative impact on employment and productivity.

In this perspective, we shall study one crucial aspect of labour law –employment protection and its unemployment consequence on the basis of the OECD data available over the time span 1990-2008. In the next section we shall discuss in brief the cases for and against labour regulations, especially from the perspective of its unemployment consequences. In Section 3 we shall discuss the short-term and long-term relationship between various aspects of labour regulation and unemployment through dynamic panel data modelling and causality tests. Section 4 provides summary and conclusion.

2. The Cases For and Against Labour Regulation: A Brief Overview

From the standpoint of social democracy, state interventions in the labour market facilitate better or fairer income distribution and improve the quality of life of the working class. Instead of having a regime of classical antagonistic capitalism riddled with class struggles the social democracy calls for a cooperative capitalism which is expected to mitigate the potential destabilising force of class struggles and social unrest (communist insurgencies). In 'structuralist'/neo-Kaleckian macro models (see for e.g. Dutt 1984), it is even shown that better income distribution in favour of the working class solves the problem of 'realisation crisis' of capitalism (pinpointed by Karl Marx) as it increases effective demand and profitability of production thereby promoting investment and growth. These models, however, over-emphasised the forces of 'realisation 'and overlooked the 'profit squeeze' force (also pinpointed by Karl Marx) - better income distribution and higher real wages

reduce profitability and dampen investment and growth (see Bhaduri and Margin, 1990 and Sarkar 1992, 1993).

Whatever may be the ambiguity in the relationship between growth and distribution, the policy of social democracy and welfare states dominated in most of the industrialised countries during the first three decades after the Second World War. Accepting labour market 'distortions' due to labour regulations and trade union activities as hard realities, the governments pursued Keynesian full employment policy – namely fiscal stimulus to inject extra demand into the economic system.

In the face of oil price hike in the mid-1970s, the industrialised countries faced the problem of stagflation (simultaneous occurrence of recession and inflation); continuation of Keynesian fiscal stimulus policy aggravated the problem of inflation without making any dent on the problem of unemployment and recession. This marked the demise of Keynesianism in favour of a 'neo-liberal' era of Reaganomics/Thatcherism that found its place in the subsequent IMF/World Bank policy prescriptions, known as Washington Consensus. This is actually an old wine in a new bottle – the resurrection of old *laissez-faire* philosophy and 'Invisible Hand' theorised in college textbook of neoclassical economics as self-equilibrating market solution to all economic problems including unemployment. The collapse of Berlin Wall and the demise of Soviet Union gave further impetus to this 'neoliberal' ideology in the absence of a credible threat from communism.

In essence the policies shifted towards deregulations of markets (including labour markets) to pave the way for free market forces. It is argued that firms will respond to stringent labour regulation by substituting capital for labour; even there will be a shift in production from the formal sector to unregulated areas of the economy and/or flight of capital and relocation of production in a country with more market-friendly labour regulation (Fallon and Lucas, 1993; Heckman and Pagés, 2000; Botero et al., 2004). In the words of Besley and Burgess (2004: 101), 'labor regulation will typically create adjustment costs in hiring and firing labor'.

The neo-liberal arguments for labour market deregulations, however, failed to convince many scholars such as Richard B. Freeman (see for e.g. Freeman, 1993 and 2005) who continue to argue in favour of labour regulations. Apart from the arguments from the perspective of fair income distribution, social justice, social security etc (often brushed aside by the proponents of economics as 'science' that precludes value judgement and interpersonal utility comparisons) there are some other arguments such as the laws setting basic labour standards in the areas of pay and working time and providing employees with protection against arbitrary discipline or dismissal may encourage firms and workers to co-invest in firm specific skills and complementary productive assets (Sengenberger and Campbell 1994); legislation mandating collective employee representation in the workplace can help raise worker commitment and morale (Rogers and Streeck, 1995). For more other arguments and references see Deakin and Sarkar, 2008 and 2011).

There are different studies to examine the economic consequences of labour regulation. In the context of OECD countries some studies tried to prove that employment protection led to unemployment. For details of these studies and their strong critique see Baker at el., (2004). In the context of India, an influential study was conducted by Besley and Burgess (2004). Their analysis was based on an index of changes in state-level (i.e. provincial level) labour laws in India; it showed that that Indian provinces ('states ') which enacted pro-labour

regulation experienced lowered output, employment, investment, and productivity in registered or formal manufacturing. Bhattacharjea (2006) strongly refuted their arguments. One very important point was raised by Bhattacharjea (2006): the 'license raj' (regime of licenses) dominated the period of study (1958-92) of Besley and Burgess (2004); discriminatory allocation of industrial licenses across the states by the central government was a significant determinant of industrial location during that period.

Another influential work was conducted by Botero et al. (2004); it was partly funded by the World Bank. Botero et al. based their analysis on an index of labour regulation consisting of around 60 individual indicators, covering a full range of labour law rules, including laws on the employment relationship, collective labour relations, and social security. Their index covered 85 countries and coded for their laws as they stood in the late 1990s. The econometric analysis carried out by Botero et al. (2004) found that higher scores on the labour index were correlated with lower male employment, higher youth unemployment, and a larger informal sector.

In this perspective a team of legal scholars at Centre for Business Research, CBR (University of Cambridge, UK) generated a detailed dataset for four OECD countries (UK, USA, France, Germany)[1] and India over a long time-span (see Deakin et al 2007). Using this dataset Deakin and Sarkar (2008, 2011) examined various aspects of labour regulations of these five countries and their economic consequences. They observed that the USA is the only country where an inverse relationship exists between labour regulation and employment growth; this is because of the changes in the US regulation of dismissal—the only area in which there was a significant change in US law over the period of this study.

The present study seeks to carry these analyses further. Since the CBR data cover only seven countries, the present study uses the OECD data on strictness of regular and temporary labour employment protection over the time span 1990-2008 and examines their unemployment consequences through dynamic panel data modelling.

3. The Present Study: Estimates of Short run and Long-run Relationships

The OECD data on employment protection indices are available for OECD countries and some non-OECD countries (see Venn, 2009 for details of index construction). But due to non-availability of the relevant data for all the years between 1990 and 2008, we have considered only 23 OECD countries (among the new members only Korea is included). We have considered regulations concerning both regular and temporary employment protection series (hereafter REGLAB and TEMPOLAB, respectively).

For unemployment rate we have used three alternative series:

(i) Rate of unemployment as percentage of civilian labour force (TU);

(ii) Long-term unemployment rate (LU) defined as persons unemployed for 12 months or more as a percentage of total unemployed;

(iii) Youth unemployment rate (YU) defined as total youth unemployment as percentage of total labour force aged 15 to 24.

Our objective is to examine the relationship between employment protection index and different indicators of unemployment. To control for the level of economic activity of a country we shall consider (log of) GDP in purchasing power parity dollars (LPPPY). Excepting youth unemployment data (which is available from the source of World Bank -see Table 1 for details), all other data are available from OECD iLibrary (see Table 1 for details).

We have followed the dynamic panel data methodology (described below) which takes into account a short-term relationship and a time path leading to a long-term relationship. This helps us to ascertain whether there exists a short-term relationship between employment protection and unemployment and whether there exists a stable adjustment path leading to a long-term relationship. The conventional regression study assumes that the relationship between the dependent and independent variables is instantaneous – this is what we capture in our long-run relationship. To get a meaningful long run relationship one should analyse a short-term relationship (if any) and examine whether there exists a stable adjustment process leading to the long-run relationship (if any). A panel regression based on a short-term time series has the constraint of studying only the instantaneous relationship which may not be meaningful, rather spurious. We have here a sufficiently long (1990-2008) panel data for 23 countries to remove this lacuna of the existing literature.

Alternative Dynamic Panel Data Models

For a large time dimension of panel data (as we have here), Pesaran and Smith (1995) showed that the traditional procedures for estimation of pooled models, such as the fixed effects, instrumental variables, and generalized method of moments (GMM) 'can produce inconsistent, and potentially very misleading estimates of the average values of the parameters in dynamic panel data models' (Pesaran and Shin, 1999, p.622). Therefore, to ascertain the nature of the relationships between employment protection regulation and unemployment we shall use the Pesaran-Shin dynamic panel data analysis.

We start with a postulate of long-run relationship involving X (the unemployment rate, TU, LU or YU), Y (GDP in purchasing power parity dollar - in natural log, LPPPCY) and Z (employment protection index, REGLAB or TEMPOLAB):

$$X_{it} = \psi_i Y_{it} + \pi_i Z_{it} + \eta_{it} \quad (1)$$

where i (=1,2,3,4,..23) stands for countries, t (=1,2,… T) stands for time-periods (years), ψ_i and π_i are the long-run parameters and η_{it} is the error term.

We are interested to know whether there exist long-term and short-term effects of Z (employment protection regulation) along with Y (GDP measuring economic activities) on X (unemployment rate) and whether there exists a stable adjustment path from the short-term relationship (if any) to the long-run relationship.

Following Pesaran and Shin (1999), our panel data analysis is based on the following error correction representation:

$$\Delta X_{it} = \theta_i(\eta_{it-1}) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta X_{i,t-j} + \sum_{k=0}^{q-1} \psi_{ik} \Delta Y_{i,t-k} + \sum_{l=0}^{r-1} \pi_{il} \Delta Z_{i,t-l} + \mu_i + \phi_{it} \quad (2)$$

where Δ is the difference operator, θ_i is the group-specific error-correcting speed of adjustment term, λ_{ij}, ψ_{ik} and π_{ij} are the coefficients of the lagged variables, μ_i is the country fixed effect and ϕ_{it} is the disturbances term. The existence of a meaningful long-run relationship with a stable adjustment dynamics requires $\theta_i < 0$.

Under this general structure, we can have three alternative models. On one extreme, we can have dynamic fixed effect estimators (DFE) where intercepts are allowed to vary across the countries and all other parameters and error variances are constrained to be the same. At the other extreme, one can estimate separate equations for each group and calculate the mean of the estimates to get a glimpse of the over-all picture. This is called mean group estimator (MG). Pesaran and Smith (1995) showed that MG gives consistent estimates of the averages of parameters. The intermediate alternative is pooled mean group (PMG) estimator, suggested by Pesaran and Shin (1999). It allows intercepts, short-run coefficients and error variances to differ freely across the countries but the long run coefficients are constrained to be the same; that means, $\psi_i = \psi$ and $\pi_i = \pi$ for all i in equation (1) while θ_i , λ_{ij} etc of equation (2) may differ from country to country.

Using the STATA ado developed by Blackburne and Frank (2007) we have estimated all the three alternative models, MG, PMG and DFE (Table 1). Based on Lag Exclusion Wald Test for each variable separately we have determined the lag structure (p, q, r).

A series of Hausman tests - PMG vs.MG, PMG vs. DFE and DFE vs. MG (details not reported here) confirms appropriateness of the DFE model. This implies that the OECD countries covered in the study differ only in fixed effect (determined by time-invariant explanatory variables not included in the study) - they do not differ in short-term or long-term relationships between unemployment and employment protection regulations and the time-path connecting the two relationships.

We have also conducted VEC (Vector Error Correction) Granger Causality/ Block Exogeneity Wald Tests to ascertain the direction of causality. To determine the order of the test we have used a number of criteria[2] and have chosen the maximum order of the VAR (Vector Autoregression) model and subtracted 1 from that to arrive at the order of the VEC model. Estimates are reported in Table 2.

Combining the estimates of Table 1 and Table 2 we can make the following observations:

1. *Relationship between employment protection regulations and total unemployment rate*: We find a causal influence of REGLAB on TU. But we find no such relationship between TEMPOLAB and TU (Table 2 Parts I.A and II.A). None of the dynamic panel data models found a significant long-run relationship between TU and REGLAB or TEMPOLAB (Table 1 Parts I.A and II.A).[3] Hence the nature of the causal relationship cannot be ascertained. This casts doubt on the contention that strictness of employment protection contributes toward general unemployment problem.

2. *Relationship between employment protection regulations and long-term unemployment rate*: We observe no causal relationship between LU and REGLAB or TEMPOLAB. In conformity with this result, our panel data models show that neither REGLAB nor TEMPOLAB has a short-run relationship with LU. Examining only the statistically significant long-run relationships, we observe that the PMG model shows a negative relationship between REGLAB and LU while the DFE model shows a similar relationship between TEMPOLAB and LU (Tables 1 and 2 Parts I.B and II.B). So the contention that strictness of employment protection aggravates long-term unemployment problem cannot be supported by our causality test and panel data modelling.

3. *Relationship between employment protection regulations and youth unemployment rate*: None of the panel data models found a short-term or long-term relationship between YU and REGLAB (Table 1, Part I.C). Only the PMG model shows a significant long-term positive relationship between YU and TEMPOLAB whereas all the models show a short-term negative relationship. As there is no causal relationship between youth unemployment (YU) and REGLAB or TEMPOLAB (Table 2 Parts I.C and II.C) we can conclude that neither regular nor temporary employment protection regulations can be blamed for the problem of youth unemployment problem.

4. *Relationship between GDP and Unemployment Rate*: Our causality tests show a causal relationship running from unemployment (each of the three measures, TU, LU and YU) to aggregate production as measured by GDP (LPPPY). All the DFE models show a negative long-term relationship in each case and other models by and large corroborate this type of relationship. The explanation can be found in 'underconsumptionist' or 'statgnationist' literature (see Dutt, 1984; Steindl, 1952 and 1979 and Taylor, 1983 and 1991): higher unemployment and lower wage income reduces aggregate demand and production (see also Deakin and Sarkar, 2011 for a similar conclusion in the Indian context). Furthermore, there is reverse causality from GDP (LPPPY) to LU implying lower aggregate production leads to more long-term unemployment.

4. Summary and Conclusion

In the perspective of dominant orthodox standpoint against state-intervention to protect the interest of labour, this paper examines a longitudinal dataset prepared by OECD (Venn,2009) on strictness of regular and temporary labour employment protection for 23 OECD countries over the time span 1990-2008. It uses three alternative dynamic panel data models –dynamic fixed effect, mean group and pooled mean group models and examines the short-term as well as long-term effects of employment protection on various measures of unemployment rate – over-all unemployment rate, long-term unemployment rate and youth unemployment rate. To supplement the dynamic panel data modelling, it also uses VEC (Vector Error Correction) Granger causality. It finds only one causal relationship following from regular employment protection to total unemployment rate but the nature of the causal influence cannot be ascertained from dynamic panel data models. Only one dynamic panel model (PMG) shows a significant long-term positive relationship between youth unemployment and temporary employment protection regulation but the causality test cannot ascertain the direction of causality. There is no causal relationship between long run unemployment rate and employment protection regulations. Our panel data models find no short-term or long-term positive relationship between long-run unemployment and employment protection.

Thus our study casts serious doubt on the orthodox standpoint that strictness of employment protection hurts labour through increased unemployment. As a by-product of our study we find a clear dampening impact of rising unemployment (which does not follow from strict labour regulations) on aggregate production which in turn aggravates long-term unemployment problem. The policy prescription should be employment generation by other means (perhaps Keynesian policy of fiscal stimulus rather than neo-liberal 'hire and fire' labour regulations) to tide over sluggish demand and production.

Foot Notes

1 Recently two more OECD countries are included in the dataset: Sweden and Japan.

2 The criteria are: LR (sequential modified LR test statistic), FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion) and HQ (Hannan-Quinn information criterion). For further details of VEC Granger causality tests see Table 2, note 1.

3 There is no short-run relationship between TU and REGLAB. In two models (MG and DFE), however, we observe that the short-run relationship between TEMPOLAB and TU is negative (!) -not even a loose support to the orthodox standpoint!

Table 1. Short-run and Long-run Relationships between Labour Regulation Index on Unemployment, 1990-2008: Dynamic Panel Data Models

Part No.	Models[1]	**PMG**	**MG**	**DFE**
	Impact of Strictness of Employment Protection-Regular Employment (REGLAB) , Z **on**			
I.A	**Rate of Unemployment (as percentage of civilian labour force), TU (X)**			
	Long-term Relationship			
	Y (LPPPY)	-5.879**	-7.983*	-3.947**
	Z (REGLAB)	-0.471	10.158	2.272
	Short-term Relationship			
	θ	-0.251**	-0.353**	-0.188**
	ΔX_{t-1}	0.369**	0.369**	0.452**
	ΔY_t	-11.911**	-10.173**	-11.139**
	ΔZ_t	-0.58	-2.325	-0.747
	μ	11.622**	3.305	5.613**
	Chosen Model[2]			DFE
I.B	**Long-term unemployment (more than one year) as percentage of total unemployment, LU (X)**			
	Long-term Relationship			
	Y (LPPPY)	-17.584**	-18.603	-13.467**
	Z (REGLAB)	-10.229**	-47.153	-2.648
	Short-term Relationship			
	θ	-0.372**	-0.657**	-0.274**
	ΔX_{t-1}	0.19**	0.232**	0.187**
	ΔY_t	13.062	12.081	9.556

	ΔZ_t	3.654	11.447	-1.829
	μ	56.142**	96.873	32.124**
	Chosen Model[2]			DFE
I.C	**Youth unemployment as percentage of total labour force in the age group 15-24, YU (X)**			
	Long-term Relationship			
	Y (LPPPY)	-7.88**	-11.239	-4.468**
	Z (REGLAB)	-0.909	23.875	2.951
	Short-term Relationship			
	θ	-0.259**	-0.446**	-0.222**
	ΔX_{t-1}	0.227**	0.278**	0.302**
	ΔY_t	-26.527**	-22.582**	-25.222**
	ΔZ_t	-8.456	-10.463	-1.409
	μ	17.753**	7.229	9.36**
	Chosen Model[2]			DFE
	II. Impact of Strictness of Employment Protection-Temporary Employment (TEMPOLAB), Z **on**			
II.A	**Rate of Unemployment (as percentage of civilian labour force), TU (X)**			
	Long-term Relationship			
	Y (LPPPCY)	-6.319**	-1.782	-3.794**
	Z (TEMPOLAB)	0.121	0.317	0.549
	Short-term Relationship			
	θ	-0.268**	-0.378**	-0.188**
	ΔX_{t-1}	0.345**	0.319**	0.466**

	ΔX_{t-2}	0.08	0.051	-0.021
	ΔY_t	-12.691**	-11.632**	-11.158**
	ΔZ_t	0.279	-1.054*	-0.467**
	μ	12.831**	5.619	6.095**
	Chosen Model[2]			DFE
II.B	**Long-term unemployment (more than one year) as percentage of total unemployment, LU (X)**			
	Long-term Relationship			
	Y (LPPPCY)	-15.784**	-10.961**	-14.884**
	Z (TEMPOLAB)	0.377	-1.374	-2.464*
	Short-term Relationship			
	θ	-0.381**	-0.669**	-0.287**
	ΔX_{t-1}	0.209**	0.254**	0.188**
	ΔY_t	11.267	18.752**	9.221
	ΔZ_t	-2.813	-2.242	-0.166
	μ	46.555**	56.832**	36.168**
	Chosen Model[2]			DFE
II.C	**Youth unemployment as percentage of total labour force in the age group 15-24, YU (X)**			
	Long-term Relationship			
	Y (LPPPCY)	-9.819**	2.235	-5.229**
	Z (TEMPOLAB)	1.164**	-24.643	1.203
	Short-term Relationship			
	θ	-0.215**	-0.347**	-0.213**
	ΔX_{t-2}	0.094*	0.109**	0.106*
	ΔX_{t-3}	-0.042	-0.002	.014
	ΔY_t	-33.663**	-28.24**	-27.365**

	ΔZ_t	-1.007*	-2.457**	-1.127**
	μ	18.17**	9.649	10.908**
	Chosen Model[2]			DFE

* Significant at 5 per cent level.

** Significant at 1 per cent level.

1 The regressors are estimated from the following long-term relationship and its error correction form.

Long-run Relationship:

$$X_{it} = \psi_i Y_{it} + \pi_i Z_{it} + \eta_{it}$$

where i (=1,2,3,..23) represents countries, t (=1,2,… T) represents periods (years), ψ_i and π_i are the long-run parameters and η_{it} is the error term.

It's Error Correction Form:

$$\Delta X_{it} = \theta_i(\eta_{it-1}) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta X_{i,t-j} + \sum_{k=0}^{q-1} \psi_{ik} \Delta Y_{i,t-k} + \sum_{l=0}^{r-1} \pi_{il} \Delta Z_{i,t-l} + \mu_i + \phi_{it}$$

where Δ is the difference operator, θ_i is the group-specific error-correcting speed of adjustment term, λ_{ij}, ψ_{ik} and π_{ij} are the coefficients of the lagged variables, μ_i is the country fixed effect and ϕ_{it} is the disturbances term. The existence of a meaningful long-run relationship with a stable adjustment dynamics requires $\theta_i < 0$.

2 An appropriate model is chosen on the basis of a series of Hausman tests.

Data Sources:

REGLAB, TEMPOLAB, TU, LU and LPPPY are from OECD iLibrary available online: http://stats.oecd.org/Index.aspx?DatasetCode=ALFS_SUMTAB.

YU is collected from World Development Indicators compliled by World Bank, available online: http://data.worldbank.org/data-catalog/world-development-indicators

Table 2. Labour regulation, unemployment and GDP in 23 OECD countries, 1990-2008: VEC causality analysis[1]

Part No	Dependent variable	Excluded independent variable	Chi-square	Degree of freedom	Probability
I.A					
	TU				
		LPPPY	9.747219	7	0.2034
		REGLAB	17.90540*	7	0.0124
	LPPPY				
		TU	23.24136*	7	0.0015
		REGLAB	5.329991	7	0.6198
	REGLAB				
		TU	7.111341	7	0.4174
		LPPPY	7.979373	7	0.3344
I.B					
	LU				
		LPPPY	36.72932*	7	0.0000
		REGLAB	5.156955	7	0.6408
	LPPPY				
		LU	25.67149*	7	0.0006
		REGLAB	6.203194	7	0.5162
	REGLAB				
		LU	4.277353	7	0.7473
		LPPPY	3.163608	7	0.8695
I.C					
	YU				
		LPPPY	8.753818	7	0.2708
		REGLAB	6.639573	7	0.4673
	LPPPY				
		YU	15.29253*	7	0.0324
		REGLAB	4.700915	7	0.6964
	REGLAB				
		YU	8.676888	7	0.2767
		LPPPY	9.116684	7	0.2444
II.A					
	TU				
		LPPPY	7.009315	5	0.2199
		TEMPOLAB	10.80637	5	0.0554
	LPPPY				
		TU	19.16606*	5	0.0018
		TEMPOLAB	9.973051	5	0.0760
	TEMPOLAB				
		TU	8.792223	5	0.1176
		LPPPY	3.032552	5	0.6950
II.B					

	LU				
		LPPPY	38.98773*	5	0.0000
		TEMPOLAB	1.376023	5	0.9269
	LPPPY				
		LU	18.05062*	5	0.0029
		TEMPOLAB	7.095796	5	0.2136
	TEMPOLAB				
		LU	4.571372	5	0.4704
		LPPPY	6.444890	5	0.2653
II.C					
	YU				
		LPPPY	7.270453	5	0.2013
		TEMPOLAB	6.495216	5	0.2610
	LPPPY				
		YU	12.45790*	5	0.0290
		TEMPOLAB	7.418688	5	0.1913
	TEMPOLAB				
		YU	6.100480	5	0.2966
		LPPPY	4.209166	5	0.5197

* Significant at the 5% level: the null hypothesis of no causality is rejected.

1 The VEC (Vector-Error-Correction)-Granger causality tests are done on the basis of first differences of the variables. To understand whether the direction of causality is from labour protection (Z) to unemployment (X) or the opposite or both (mutual causation) we used panel VEC Granger causality test. To ascertain whether Z causes X, we fit a regression where first difference of X (the alternative rates of unemployment, taken one at a time), ΔX is a function of its past values (lagged first differences) and past values of first difference of Y (GDP, in natural log, LPPPY), ΔY and past values of first difference of Z (various labour protection indexes taken one at a time), ΔZ:

$$\Delta X_{it} = \mu + \sum_{j=1}^{p-1} \lambda_j \Delta X_{i,\,t-j} + \sum_{k=1}^{q-1} \psi_k \Delta Y_{i,\,t-k} + \sum_{l=1}^{r-1} \pi_l \Delta Z_{i,\,t-l} + + \phi_{it}$$

Fitting the above equation one has to test whether the coefficients of the lags of ΔZ are jointly significant (different from zero) through the Wald-test statistic. The null hypothesis is $\pi_1 = \pi_2 = \ldots = \pi_k = 0$. If the Wald test statistic calculated on the basis of this null hypothesis is very high (higher than a critical value), we can say that Z causes X (rejecting the null hypothesis of no causality).

Similarly to test whether X causes Z we fit a regression where ΔZ is a function of its past values and the past values of ΔX and ΔY and test the joint significance of the coefficients of the lags of ΔX.

We have used a number of criteria such as LR (sequential modified LR test statistic), FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion) and HQ (Hannan-Quinn information criterion) and have chosen the maximum order of the VAR (Vector Autoregression) model and subtracted 1 to arrive at the order of the VEC model.

Data Sources: See Table 1.

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