REAL COST OF EMPLOYMENT AND TURKISH LABOUR MARKET: A PANEL COINTEGRATION TESTS APPROACH

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Abstract

The study aims to analyze the probability of employment in Turkey after 1990. In Turkey, real cost of labour sharply increases after 1990. It has happened to become the highest in OECD countries. This affects the employment of the firms and the level of employment in the economy. It is also an indisputable fact that level of labour cost affects the number of operating firms. While unemployment rapidly increases, inability of decreasing the real cost makes the policies aimed at unemployment ineffective.

JEL Classification: J, C32, C33
Key Word: Employment, Panel Cointegration, Unit Roots

1-Theory

Although there are different approaches, the literature on labour has a compromisation that there is a relation between wages and efficiency. A dual relation is constructed between these variables. In these studies, wages are increased in order to increase efficiency or wages increase following the rises in efficiency. The situation recently discussed in literature is that efficiency could be increased as a consequence of increasing wages. There three approaches to this relation:

a) Theory of effective wage
b) Wage increases according to efficiency
c) Wage increase-manager effectiveness relationship.

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The first mechanism can be named as economics of high wages. According to this theory, better wage, health and nutrition of the worker not only increases efficiency act the current level of employment but also reduces cheating. Besides, payment of high wages has many psychological effects. It is claimed that the first effect is abundant in underdeveloped countries. Positive psychological effects of high wages are observed in developed countries. Wage increases according to efficiency assert the opposite of effective wage theory. In foresights of this view, it was primary rise in wages while theory of effective suggests payment depending on efficiency. It's most important assumption is that efficiency depends on the absolute wage and attractiveness of opportunities within and outside the firm. In short, the study explains why wages do not decrease, adjustments slow down and prices differ from Walrasian equilibrium prices under involuntary unemployment. The third mechanism is Shock Theory.

The logic in under of this hypothesis is that managerial efficiency and work force increases can be provided by improvements in wage increases. Bildirici (1997,1998); Bildirici and Bakirtas (1998, 1999), Eren and Bildirici (1999, 2000).

The study claims that wage determination in Turkey does not take place within the concept of views mentioned above.

2. Wage and Employment in Turkey: 1990-2003 Period

In Turkey wages are determined without considering efficiency and there are many negative consequences of this. Negative impact of this is the variation in wage determination. Wage is considered as the sum of direct payment for labour and nearly 30 different items of seniority shares, cost of the worker for the firm (real cost hereafter)

Distorted structure of labour force cost in Turkey hampers efficiency. In this context, if we analyze OECD countries for comparison, we can see that wage increases have kept around 1% while efficiency increases have annually averaged 1.6% for the period 1980-1989. The cost of labour (in real terms) has decreased by

an average of 0.8% per annum. The most important factor that creates this consequence is the decisions of governments, employers and employees of countries in 1987. With these decisions, the principle of keeping the increase per capita real cost of labour less than the efficiency increase and increasing wages at mediocre rates has been compromised. But in Turkey no relation is founded between wages and efficiency. Because of application of lump-sum increases in collective bargaining, resistance against work evaluation system, degeneration of system, minimum wage, extensive fringe payments, increasing employment taxes and etc. wage follows a path independent of efficiency.

Another important situation for Turkey is the distinction in the approaches of employee and employer to wages. From the point of the worker, wage is the bare wage while it is the cost of employment for the employer. Bare wage constitutes 30-40 percent of the cost while gross wage constitutes 50-66 percent of the cost. Fringe payments that increase the gross wage sum up to 30 items while it is 7 in Europe and 5 in the USA.

Mentioned structure of wage and labour force in Turkey in 1990-2003 is important. The new period is a special one for employment and wages. The period will be evaluated from the viewpoint of labour force cost. However 1994 and 2000-2001 crisis experienced in the period has caused deviations in the structure. For this reason, periods of 1988-1996 and 1997-2003 periods are formed in order to include crisis of 1994 and 2000-2001. In the period 1998-1996, average cost of labour has increased by 125% during the interval 1989-1990. Compared to 1988, average cost of labour has increased by 120% in 1989, 88% in 1990, 145% in 1991, and 68% in 1993 and reached 77.018 TL/hour. The cost has increased 29 times between 1993 and 1999. (Parasiz I. and Bildirici M.; 2002)

Labour cost has perpetually increased throughout the period 1989-1994, and the rise has continued after the crisis. Real wage cost has reached a high rate of increase compared to pre-1994 crisis period. Since formation of wage and labour force cost could not be determined with respect to concrete criteria such as production,

efficiency, sales, competitiveness and investment requirement, wage increase has become twice the efficiency increase. Obligation of firms to pay much higher wages than income generation of production has become the underlying factor that created economic imbalances. Real labour cost that has raised too much prior to 1994 and real wages has deteriorated because of the increase in production and rising of inflation to it's highest in the republic period.

The other important point for our country is the high amount of curtailments of government from the gross wage. The rate of cutbacks for the government from gross wage was 31% in 1985 while it was 30% in 1991 and decreased to the level of 34% because of the crisis and decrease of obligatory savings fund cutbacks. For the reasons mentioned above, cost of active labour force is increasing. Real cost of labour that has fallen in 1994 crisis has risen again by 1999.

The period after 1999 is the years of crisis. Undertaken stability policies has decreased the real cost of labour relative to pre-crisis period. In this process, increasing of labour cost by 77%, net wage by 85% is important. For the reasons mentioned above, high real cost of labour creates informal employment. On the other hand, the only factor that increases informal employment is not real cost. Besides high real costs of employment, rise of tax burden during the period 1985-2001 has forced the firms to informal employment. Change in tax burden in the period 1985-2001 is 20.4%. This is the great change among OECD countries.

Adding parafixal incomes such as social security premia, tax burden reaches to 35.8%. The 2000-2001 differencial is 2.4. If we return to employment issues; Turkey held the first rank in heaviness of employment taxes in 2001 among 30 OECD countries, as she had the third rank in the year 2000. This, undoubtedly, encourages informal employment. (OECD; 2002). Besides, SIF (Social Insurances Foundation) premia exceeding 50% of the net wage pushes the employer and the employee to informal employment.

Since the minimum income level subject to insurance premia is below the minimum wage, the difference is paid by the employer.

Another factor that increases informal employment is rigid employment legislation. This rigidity prevents elasticity in production.

3. Data and Econometric Methodology

A. Data

21 sectors in manufacturing industry are analyzed. These sectors are, Food and Beverage Manufacturing, Tobacco Products Manufacturing, Textile Products, Clothing, Leather Processing (bags etc.), Wood and Cork Products Manufacturing (excluding furniture), Paper and Paper Products Manufacturing, Press and Publishing, Coke Coal Industry, Refined Petroleum Products Manufacturing, Chemical Products Manufacturing, Plastic-Rubber Products Manufacturing, Mineral Products Other Than Metal, Main Metal Industry, Metal Products Industry (excluding machinery and equipment), Machinery and Equipment Manufacturing, Office, Accounting and Data Processing Machinery Manufacturing, Radio, TV and Communication Devices Manufacturing, Medical, Optic and other Precision Instruments, Clock Manufacturing, Motor Vehicles, Furniture Manufacturing and Other Manufacturing Sectors.

In these industries, an analysis for 1990(1) and 2003(8) period(monthly) is made. In the period and sectors mentioned, series of number of firms, capacity utilization rates, real cost of labour, number of labour in production and earning indices of manufacturing industry workers are formed and analyzed.

B. Econometric Methology

In this paper, it will be used panel cointegrating procedure.

i. Panel Unit Root Test

Levin and Lin (1992, 1993, called LL after) have proposed panel unit root test, the most popular panel unit root test. This test allows for fixed effects and unit specific time trends in addition to common time

trends. LL and Levin, Lin and Chu (2002, called LLC after) test is based on analysis of equation below.

$$Dy_{i,t} = a_i + d_i t + q_t\, r_i y_{i,t-1} + u_{it} \quad i = 1, ..., N;\ t = 1, ..., T$$

In theirs model allowing for two–way fixed effects, the unit–specific fixed effects are an important source of heterogeneity. The coefficient of the lagged dependent variable is restricted to be homogeneous across all units of the panel. The test involves the null hypothesis for all against the alternative for all with auxiliary assumptions under the null also being required about the coefficients relating to the deterministic components. The test may be evaluated as a pooled DF or ADF, potentially with differing lag lengths across the units of the panel and they use ADF tests to test for unit roots.

t-statistic is

$$t_\rho = \frac{(\hat{\rho}-1)\sqrt{\sum_{i=1}^{N}\sum_{t=1}^{T}\tilde{y}_{i,t-1}^2}}{\frac{1}{NT}\sum_{i=1}^{N}\sum_{t=1}^{T}\tilde{u}_{it}^2}$$

Levin and Lin(1992) obtain the limiting distributions of $\sqrt{NT}(\hat{\rho}-1)$ and t_ρ (Baltagi B.and Kao C.,2000,p.5)

$\hat{\rho}$	t_ρ
$\sqrt{NT}(\hat{\rho}-1) \Rightarrow N(0, 2)$	$t_\rho \Rightarrow N(0,1)$
$\sqrt{NT}(\hat{\rho}-1) \Rightarrow N(0, 2)$	$t_\rho \Rightarrow N(0,1)$
$\sqrt{NT}(\hat{\rho}-1)+3\sqrt{N} \Rightarrow N(0, \frac{51}{5})$	$\sqrt{1.25}\, t_\rho + \sqrt{1.875N} \Rightarrow N(0,1)$
$\sqrt{N}\,(T(\hat{\rho}-1)+7.5) \Rightarrow N(0, \frac{2895}{112})$	$\sqrt{\frac{448}{277}}\left(t_\rho + \sqrt{3.75N}\right) \Rightarrow N(0,1)$

The Im–Pesaran–Shin (1997, called IPS after) develop LL's framework by allowing for heterogeneity of the coefficient on the

lagged dependent variable. IPS test allows for heterogeneity in the value under the alternative hypothesis (Smith R.P. and Fuertes A.M.,2003,p.40). Approach used by IPS in context of the standard ADF-test in a panel is:

$$Dy_{i,t} = m_i + b_i t + r_i y_{i,t-1} + \sum_{j=1}^{p} j_{ij} \Delta y_{i,t-j} + e_{i,t}$$

where y_{it} stands for each of the variables presented. The null hypothesis and the alternative hypothesis are defined as:

H_0: $\rho_i = 0$ for all i

H_0: $\rho_i < 0$ at for least one i.

Instead of pooling and assuming that $?_i$ is the same for all N, the IPS methodology uses separate unit root tests for the N. The IPS t-bar statistic is calculated as the average of the individual ADF statistics,

$$\bar{t} = \frac{1}{N} \sum_{i=1}^{N} t_{\rho_i}$$

Maddala and Wu (1999, called MW after) focus on the shortcomings of both the LL and IPS tests. MW shows that their test dominates that of IPS in that it has smaller size distortions and comparable power, and does not require a balanced panel and is robust to statistic choice, and can use lag length in the ADF regressions, and varying time dimensions for each cross sectional unit.(Moon R.H.,2002,p.12)

$$P = -2 \sum_{i=1}^{N} \ln p_i$$

The signifiance level Pi , i=1,…,N are independent uniform [0,1] variables and *-2ln Pi is* distributed as a $P^2(2)$.

In Harris and Tzavalis (called HT after) test the estimates of the unadjusted autoregression coefficient is $\hat{r}$ and the test statistic is $C_{\infty}^{-1/2} \sqrt{N} \tilde{r}$. The *standardised* test statistic $C_{\infty}^{-1/2} \sqrt{N} \tilde{r}$ will be smaller than unity. This will have the effect of drawing the tails of the distribution of the test statistic of asymptotic T in, and will thus reduce the empirical size and power of the test (Christopoulos D.K.

and Tsionas E.,2003,p.8) Main result is following (Baltagi B., and Kao C.,2000,p.5)

$\hat{\rho}$
$\sqrt{N}T(\hat{\rho}-1) \Rightarrow N(0, \frac{2}{T(T-1)})$
$\sqrt{N}T(\hat{\rho}-1+\frac{3}{T+1}) \Rightarrow N\left(0, \frac{3(17T^2-20T+17)}{5(T-1)(T+1)^3}\right)$
$\sqrt{N}(T(\hat{\rho}-1)+7.5) \Rightarrow N\left(0, \frac{15(193T^2-728T+1147)}{112(T-2)^3(T-2)}\right)$

HadriLM, the panel-based KPSS, tests the null that the panel series is stationary. In HadriLM test, model is specifed as follows (Hadri;2000)

$$y_{it} = z_{it}^{'}\gamma + r_{it} + u_{it}$$

Here r_{it} is a random walk: $r_{it} = r_{i,t-1} + u_{it}$. u_{it}~IID(0, σ_u^2) and ε_{it} is stationary proces. $e_{it}=\sum_{j=1}^{t} u_{ij} + \varepsilon_{it}$ and $y_{it} = z_{it}^{'}\gamma + e_{it}$

If $S_{it} = \sum_{j=1}^{t} \hat{e}_{ij}$ and LM statistic is defined as following

$$LM = \frac{\frac{1}{N}\sum_{i=1}^{N}\frac{1}{T^2}\sum_{t=1}^{T} S_{it}^2}{\hat{\sigma}_e^2}$$

The null hypothesis is specifed below

$H_0: \lambda=0$ against $H_1: \lambda>0$ ($\lambda=\sigma_u^2/\sigma_t^2$).

If $E\left[\int W_{iZ}^2\right]<\infty$, than $LM \xrightarrow{p} E\left[\int W_{iZ}^2\right]$

$$\text{And } T_i \to \infty, \quad \frac{\sqrt{N}\,(LM - E\left[\int W_{iZ}^2\right]}{\sqrt{\text{var}\left[\int W_{iZ}^2\right]}} \Rightarrow N(0,1)$$

ii. Panel Cointegration Tests

Most popular test among panel cointegration tests is Pedroni test. It has a number of advantages compared to other cointegration techniques for being more flexible than the other panel unit root tests (MacDonald R. and Nagayasu J.; 2000,p.122). Pedroni (1999) derives seven panel cointegration statistics. The first category of four statistics is defined as within-dimension-based statistics and includes a variance ratio statistic, a non-parametric Phillips and Perron type r statistic, a non-parametric Phillips and Perron type *t*-statistic and a DF type *t*-statistic.

The second category of three panel cointegration statistics is defined as between-dimension-based statistics and is based on a group mean approach. The set includes a Phillips and Perron type r -statistic, a Phillips and Perron type *t*-statistic and finally an ADF type *t*-statistic (Gutierrez L., 2003,p.107) The first category of tests uses specification of null and alternative hypotheses while the second category uses

$$H_0 : p = 1, \quad H_A : p < 1, \quad \text{for all } i.$$

where the statistics now require computing N autoregressive coefficients, by using the equation for each i^{th} unit, i.e. in this case heterogeneity is permitted under the alternative hypothesis. (Drine I. and Rault C.; 2002,pp.12-13)

Pedroni proposed Fully Modified Ordinary Least Squares (FMOLS) estimator suggested by Philips and Hansen(1990) for heterogenous panel. (Breitung J., and Hassler U.,2002, pp167-180) and derives asymptotic distributions for residual.

The estimator is the average value of FMOLS-coefficients of the single equation estimates

$$\hat{b}_j = \frac{1}{N}\sum_{i=1}^{N} \hat{b}_{ij}$$

where b_{ij} is the FMOLS-estimator.

The panel dynamic OLS (DOLS) assumes a homogeneous cointegration vector. Heterogeneity is limited to fixed effects, time trends and short run dynamics. The panel DOLS estimator arises from the pooled regression.In the DOLS, panel DOLS estimation, cointegrating regression is as follows.

$$Y_{it} = \alpha_i + \beta_i X_{it} + \sum_{k=-Ki}^{Kt} g_{ik}\Delta X_{it-k} + m_{it}^{*}$$

which is estimated on the country level. Estimated coefficient β is given by

$$b_{DS}^{*} = N^{-1}\sum_{i=1}^{N}\left(\sum_{t=1}^{T} Z_{it}Z_{it}^{'}\right)^{-1}\left(\sum_{t=1}^{T} Z_{it}Y_{it}^{*}\right)$$

$Z_{it} = \left(X_{it} - \overline{X}, \Delta X_{it-k}, \cdots \Delta X_{it+k}\right)$ is *2(K+1)x1* vector of regressors (Basher S.A., and Mohsin M.;2003,p.2)

4. Emprical Result

In this paper, the cointegration analysis of panel data was consisted two step.: First, it is test for time series and panel unit root. In time series analysis, it was used three statistic and in panel unit root test, five statistics proposed by LL, IPS, MW, HT and HadriLM are used. Second, it was tested for cointegration in panel data using: johansen, FMOLS and DOLS.

A vector error correction model (VEC) is used to represent the dynamics of the system. Framework of this paper can be seen as

Johansen's cointegrated vector autoregression in panel perpectives.To vary across firm of the short-run parameters are allowed and the long-run parameters are homogenous.

Time series ADF, PP and KPSS tests are reported in tables 1.1 and 1.2 for all 21 firms. All time series involved unit roots according to the ADF test. ADF tests in first differences show that their first differences are stationary. Tests are calculated with a constant plus a time trend and they have a null hypothesis of non-stationary against an alternative of stationarity.

Table 1.1 ADF, PP and KPSS Results Employment (IS) Capacity Utilasition Rate (KK)

	ADF	PP	KPSS	ADF	PP	KPSS
Food and Beverage	-8.63	-77.9	0.5	-7.61	-98.56	0.33
Tobacco Products	-7.6	-114.6	99.36	-9.51	-52.4	0.32
Textile Products	-12.9	-115.3	0.5	-5.51	-92.31	0.22
Clothing	-12.8	-241.6	14.52	-5.51	-71.43	0.22
Leather Processing (bags etc.)	-8.53	-76.8	0.5	-6.6	-85.15	0.55
Wood and Cork Products (excluding furniture)	-10.9	-164.1	4.4	-7.5	-77.85	0.98
Paper and Paper Products	-6.61	-73.3	0.9	-7.01	-70.55	0.55
Press and Publishing	-8.38	-50.9	0.86	-10.1	-76.06	0.49
Coke Coal Industry, Refined Petroleum Products	-13.1	-160.2	5.05	-8.01	-102.1	0.50
Chemical Products	-13.8	-85.6	0.5	-7.01	-52.45	0.24
Plastic-Rubber Products	-13.7	-78.5	0.35	-7.51	-54.52	0.23

Mineral Products Other Than Metal	-7.73	-75.6	0.35	-6.58	-35.3	0.26
Main Metal Industry	-6.53	-88.7	12.89	-6.64	-184.7	0.81
Metal Products Industry (excluding machinery and equipment)	-11.1	-65.3	7.69	-5.12	-40.20	0.05*
Machinery and Equipmen, Office	-10.5	-76.9	0.5	-7.87	-86.35	0.38
Accounting and Data Processing Machinery	-7.57	-69.9	4.76	-6.31	-161.5	1.04
Radio, TV and Communication Devices	-6.87	-81.0	0.5	-6.22	-73.9	0.15*
Medical, Optic and other Precision Instruments Clock	-6.75	-98.2	0.9	-7.5	-87.6	0.87
Motor Vehicles, Furniture	-7.86	-90.3	0.82	-8.61	-86.1	0.91
Other Sectors	-11.7	-91.2	0.94	-12.3	-98.1	1.05
Furniture	-10.2	-93.2	0.81	-11.2	-90.1	1.20

Level show the ADF t-tests for a unit root in levels. Bold number show sampling evidence in favour of unit root. (*), (**) and (***) denote rejection of the unit root hypothessis at the 1%, 5% ve 10% levels.

Table 1.2 ADF, PP and KPSS Results Real Cost (RC) Earnings from production(EP)

	ADF	KPSS	PP	ADF	KPSS	PP
Food and Beverage	-9.25	-91.03	0.43	-7.73	-129.1	0.63
Tobacco Products	-10.94	-62.64	0.88	-9.94	-225.8	0.55
Textile Products	-6.92	-111.3	0.43	-9.6	-93.21	0.51
Clothing	-6.99	-142	1.39	-9.67	-63.15	1.002
Leather Processing (bags etc.)	-9.49	-78.3	0.53	-7.15	-104.3	0.47
Wood and Cork Products (excluding furniture)	-5.49	-115.3	1.14	-7.04	-127.81	1.16
Paper and Paper Products	-7.53	-103.7	1.53	-5.09	-75.6	2.1
Press and Publishing	-9.02	-221.18	0.703	-7.45	-105.05	0.38
Coke Coa l Industry, Refined Petroleum Products	-5.97	-160.19	0.5	-10.43	-99.75	0.515
Chemical Products	-5.99	-160.26	10.15	-6.57	-35.52	0.44
Plastic-Rubber Products	-5.93	-106.2	0.79	-6.57	-32.5	0.41
Mineral Products Other Than Metal	-5.97	-126.2	0.59	-8.26	-83.03	0.407
Main Metal Industry	-5.98	-160.2	10.14	-8.719	-113.78	0.59
Metal Products Industry	-5.97	-100.6	10.1	-7.028	-144.87	0.89

(excluding machinery and equipment)						
Machinery and Equipmen, Office	-5.98	-160.2	9.8	-8.45	-84.31	1.15
Accounting and Data Processing Machinery	-5.93	-128.6	1.15	-11.004	-88.9	2.41
Radio, TV and Communication Devices	-5.96	-160.2	0.5	-11.04	-87.5	0.79
Medical, Optic and other Precision Instruments Clock	-7.43	-99.7	0.93	-13.4	-93.2	0.96
Motor Vehicles, Furniture	-8.91	-108.5	1.2	-12.7	-98.1	1.09
Other Sectors	-7.89	-112.3	1.3	-13.2	-96.7	1.04
Furniture	-9.23	-102.2	1.12	-11.9	-101.2	1.32

Level show the ADF t-tests for a unit root in levels. Bold number show sampling evidence in favour of unit root. (*), (**) and (***) denote rejection of the unit root hypothessis at the 1%, 5% ve 10% levels.

Table 2. Panel Unit Root Test[2]

	IPS	LL	MW	NH		HT
		t-star		RW errors	NA*	
RC	-9.68	-4.638	58.62	10	11.9	5.97
KK	-7.437	-4.551	80.51	11.99	29.8	9.17
IS	-4.855	-9.930	65.46	9.96	11.13	8.99
EP	-7.023	-4.682	75.17	11	27.3	10.1

*NA= With nonparametric adjustment for long-run variance (3 lags)

[2] NHARVEY Critical values for N= 30 20 10% 6.0307 4.1794; 5% 6.4118 4.4957; 1% 7.1863 5.1142

Table 3. HadriLM Test

KK		RC		EP		IS	
	eps	Z(mu)	Z(tau)	Z(mu)	Z(tau)	Z(mu)	
Z(tau)	Z(mu)	Z(tau)					
	Homo	5.966	7.091	4.798	4.056	5.097	
5.514	3.805	3.586					
	Hetero	5.155	5.471	5.359	4.245	4.667	
4.259	3.738	3.788					
	SerDep	5.230	5.958	3.66	3.442	9.785	
5.597	5.599	5.389					

Results of panel unit roots tests were reported in Table 2 and 3. The result support the hypothesis of a unit root in all variables across firms and the hypothesis of zero order integration in first differences.

Firm by firm Johansen maximum likelihood cointegration results are reported in Table 4. The hypothesis of no cointegration is rejected for all firms, and the hypothesis of one cointegrating vectors are accepted.

Table 4. Cointegration Result

	Max.Eigenvalue Statictic Ho: rank=r		
	r=0	*r£1*	*r£2*
Food and Beverage	180.59	21.38	2.95
Tobacco Products	239.35	17.17	8.31
Textile Products	224.58	17.06	9.85
Clothing	224.58	17.05	8.85
Leather Processing (bags etc.)	186.85	19.31	9.45
Wood and Cork Products (excluding furniture)	196.12	18.93	11.00
Paper and Paper Products	250.17	16.64	9.96
Press and Publishing	215.76	19.31	2.48
Coke Coal Industry, Refined	217.82	13.98	5.74

Petroleum Products			
Chemical Products Manufacturing	122.07	12.98	9.94
Plastic-Rubber Products Manufacturing	125.07	14.89	8.9
Mineral Products Other Than Metal	144.08	13.90	4.96
Main Metal Industry	216.55	14.35	4.36
Metal Products Industry (excluding machinery and equipment)	170.7	13.27	4.94
Machinery and Equipment Manufacturing, Office	155.76	21.26	2.39
Accounting and Data Processing Machinery Manufacturing	142.41	24.05	2.51
Radio, TV and Communication Devices Manufacturing	144.14	21.53	5.27
Medical, Optic and other Precision Instruments Clock Manufacturing	173.57	20.34	6.23
Motor Vehicles, Furniture Manufacturing	243.02	11.14	8.65
Other Manufacturing Sectors	220.29	13.72	8.72
Furniture Manufacturing	209.04	12.45	3.40

r show the number of cointegrating vectors. Results denote rejection of the null hypothesis of no-cointegration at 5% level of significance

Panel cointegrating tests are reported in Table 5. While Fisher's test supports the presence of one cointegrating vector, the HT test support the hypothesis of a cointegrating relation and LL test supports the hypothesis of a cointegrating relation. Time series tests and panel-based tests agree that there is cointegrating vector.

Table 5. Panel Cointegration Test

Fisher c^2 Cointegration Test		
r=0	*r£1*	*r£2*
98.99	12.73	8.91
Pedroni Result		
Panel v stat: 8.12 Panel rho-stat= -9.61 Panel pp-stat=-8.803 Panel adf-stat=-7.99		
Group rho-stat= -10.10 Group pp-stat= -8.19 Group adf-stat= -8.23		
Group FMOLS Result		
1.28	0.99	-1.11
(33.64)	(9.37)	(22.31)
N=21,	T=164,	max-lag =3
DOLS Result		
1.43	0.97	-1.09
(32.66)	(9.01)	(22.11)
N=21,	T=164,	

FMOLS estimates of the cointegrating relationship on a per firm basis and for the panel as a whole are showed in Table 6. For the panel, the coefficient of reel cost is 1.11 with t-statistic of 22.31. It is statistically significant and the effect is negative. The share of KK has a positive effect and it seems to be statistically significant with 0.29 (9.37). On a per firm basis, reel cost has a nagetive impact on employment and the relation seems to be statistically significant in firms.

Table 6. Fully Modified OLS Estimates (Employment is dependent variable) (t-stats in parentheses) IS is dependent variable

EP	KK	RC	
0.01 (78.35)	0.93 (2.15)	-0.98 (3.49)	Food and Beverage
0.7 (3.69)	0.10 (2.96)	-1.28 (5.47)	Tobacco Products
17.94 (2.45)	0.69 (2.23)	-1 (14.03)	Textile Products
0.01 (2.47)	0.49 (2.78)	-0.57 (3.52)	Clothing
3.13 (3.45)	0.79 (3.17)	-2.20 (2.61)	Leather Processing (bags etc.)
0.44 (2.48)	0.35 (4.93)	-1.61 (7.31)	Wood and Cork Products (excluding furniture)
0.56 (4.14)	0.94 (0.27)	-0.72 (2.44)	Paper and Paper Products
2.22 (3.76)	0.23 (5.33)	-0.68 (4.92)	Press and Publishing
2.57 (2.42)	0.55 (1.39)	-0.24 (2.88)	Coke Coal Industry, Refined Petroleum Products
0.5 (2.84)	0.04 (2.61)	-1.7 (3.07)	Chemical Products
0.01 (7.13)	0.55 (2.48)	-2.33 (7.11)	Plastic-Rubber Products Manufacturing
0.24 (16.60)	1.36 (1.5)	-0.92 (8.63)	Mineral Products Other Than Metal
0.17 (5.63)	0.94 (0.27)	-0.8 (4.1)	Main Metal Industry
0.4 (7.66)	0.03 (4.4)	-0.85 (6.07)	Metal Products Industry (excluding machinery and equipment)
0.3 (5.68)	0.46 (2.1)	-1.46 (4.5)	Machinery and Equipment Office
1.07 (2.9)	0.36 (2.6)	-2.04 (3.81)	Accounting and Data Processing Machinery
3.66 (2.74)	0.2 (4.49)	-1.4 (6.02)	Radio, TV and Communication Devices

2.57 (2.76)	0.51 (3.35)	-0.89 (2.64)	Medical, Optic and other Precision Instruments Clock
0.74 (1.61)	0.61 (2.49)	-0.18 (1.99)	Motor Vehicles, Furniture
0.15 (0.53)	0.27 (7)	-1.16 (5.18)	Other Manufacturing Sectors
0.24 (2.1)	0.3 (2.5)	-1.89 (2.56)	Furniture

The hypothesis of short run causality can not be rejected for all firms.It is investigated whether relation between employment and reel cost is short run. Used ECM model is as follows

$$\Delta IS_{i,t-1} = c_i + \sum_{i=1}^{m} b_i \Delta RC_{t-1} + \sum_{i=1}^{m} \Delta c'_{i,t-1} g_i + l(IS_{t-1} - c'_{t-1} f - f_0 RC_{t-1}) + n_t$$

equilibrium error and/or deviation from the long run are

$$IS_{t-1} - c'_{t-1} f - f_0 RC_{t-1}$$

Important problem is whether $l \neq 0$. Other problem is whether $H_0 : b_i = 0$ can be rejected. This point is very important because when it can be rejected, there is no short run causality. The c^2 test for VEC model is given in Table 7.

Table 7. Short Run Causality Between Employment and Reel Cost: Error Correction Model(ECM)

Firm	*Lags of Reel Cost* c^2	*p-value of* l
Food and Beverage	35.74 (0.00)	(0.00)
Tobacco Products	165.48 (0.00)	(0.00)
Textile Products	105.75 (0.00)	(0.00)
Clothing	71.45 (0.00)	(0.00)
Leather Processing (bags etc.)	88.78	(0.00)

	(0.00)	
Wood and Cork Products (excluding furniture)	28.98 (0.00)	(0.00)
Paper and Paper Products	72.45 (0.00)	(0.00)
Press and Publishing	74.02 (0.00)	(0.00)
Coke Coal Industry, Refined Petroleum Products	74.03 (0.00)	(0.00)
Chemical Products	72.04 (0.00)	(0.00)
Plastic-Rubber Products	60.29 (0.00)	(0.00)
Mineral Products Other Than Metal	72.62 (0.00)	(0.00)
Main Metal Industry	77.50 (0.00)	(0.00)
Metal Products Industry (excluding machinery and equipment)	74.85 (0.00)	(0.00)
Machinery and Equipment Office	52.25 (0.00)	(0.00)
Accounting and Data Processing Machinery	76.95 (0.00)	(0.00)
Radio, TV and Communic ation Devices	75.96 (0.00)	(0.00)
Medical, Optic and other Precision Instruments Clock	33.23 (0.00)	(0.00)
Motor Vehicles, Furniture	169.24 (0.00)	(0.00)
Other Manufacturing Sectors	235.26 (0.00)	(0.00)
Furniture	153.2 (0.00)	(0.00)
Panel Fisher Test	163.45	278.09

Fisher test is computed based on p-values from individual tests. All value show statistical significance

As result, the short run causality can not be rejected for all firm. Estimates and diagnostic tests for the VEC model are presented in Table 8

Table 8. Diagnostic Tests for The Vector Error Correction (VEC) Model

	Jarque-Bera Test(JB)	Lagrange Multiplier Test(LM) p-value
Food and Beverage	38.41 (0.00)	(0.0007)
Tobacco Products	11.35 (0.00)	(0.00011)
Textile Products	69.32 (0.00)	(0.0009)
Clothing	10.73 (0.00)	(0.000)
Leather Processing (bags etc.)	21.79 (0.00)	(0.000)
Wood and Cork Products (excluding furniture)	20.65 (0.00)	(0.00)
Paper and Paper Products	73.37 (0.00)	(0.0003)
Press and Publishing	12.43 (0.00)	(0.0004)
Coke Coal Industry, Refined Petroleum Products	13 (0.00)	(0.0005)
Chemical Products	12.45 (0.00)	(0.0004)
Plastic-Rubber Products	32.91 (0.00)	(0.0002)
Mineral Products Other Than Metal	14.05 (0.00)	(0.00)
Main Metal Industry	11.26 (0.00)	(0.003)
Metal Products Industry	9.13	(0.002)

(excluding machinery and equipment)	(0.00)	
Machinery and Equipment, Office	28.20 (0.00)	(0.0012)
Accounting and Data Processing Machinery	16.98 (0.00)	(0.003)
Radio, TV and Communication Devices	20.41 (0.00)	(0.004)
Medical, Optic and other Precision Instruments Clock	31.9 (0.00)	(0.00)
Motor Vehicles, Furniture	62.2 (0.00)	(0.00)
Other Manufacturing Sectors	9.27 (0.00)	(0.0001)
Furniture Manufacturing		
Panel Fisher Test	100.98	110.95

Jargue-Berra show the Jargue-Bera normality test of errors. Lagrange Multiplier Test(LM) tests the null hypothesis hat there is no second order autocorrelation.

VEC model for panel data is as below

$$\Delta IS_{i,t-1} = c_i + \sum_{i=1}^{m} b_i \Delta IS_{i,t-1} + \sum_{i=1}^{m} \Delta c'_{i,t-1} g_i + l(IS_{i,t-1} - c'_{i,t-1} f - f_0 RC_{i,t-1}) + n_{it}$$

where ci is fixed firm effects. The model can be estimated with instrumental variables. I must use an instrumental variables estimator to deal with the correlation between the error term and lagged dependent variables ΔIS_{t-1}.

Diagnostic statistics for the VEC model was given in Table9.

Table 9. Panel Error Correction Model

Variable	*Estimate*
ΔIS_{t-1}	9.77
ΔIS_{t-2}	6.6
ΔRC_{t-1}	9.9
ΔRC_{t-2}	6.09
ΔKK_{t-1}	10.87
ΔKK_{t-2}	5.39
Error Cor Ter	1.52
LR	7.446
JB	10.34

As it was seen in the result, there is evidence of short run causality. The most important result is policy recommendation. If it is wanted to increase employment, it should be focused short and long run policies.

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