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WP 08/2010/DE/SOCIUS

WORKING PAPERS

ISSN Nº 0874-4548

The Portuguese intra-industry trade and the labor market adjustment costs: The SAH Again

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Abstract

This paper provides an empirical test of the SAH (Smooth Adjustment Hypothesis) using data from Portugal. According to SAH, intra-industry trade leads to relatively lower adjustment costs in comparison to inter-industry trade. The paper tests the SAH by using a dynamic panel data analysis that takes into account lagged effects of changes in the MIIT (Marginal Intra-Industry Trade) index. The regressions use the absolute change in the total employment in a given industry as a proxy for trade adjustment costs.

The main results imply that a higher MIIT leads to lower adjustment costs in the same year. More specifically, the coefficients of the MIIT index are negative and statistically significant in all regressions. These results provide support for the SAH. In addition, the coefficients of the lagged MIIT indicators (one or two period) are mostly positive but *not* significant throughout. These findings highlight the importance of lagged trade indicators in affecting labor reallocation outcomes and thus adjustment costs.

Key Words: Adjustment costs; dynamic panel data, labor market; marginal intra-industry trade, smooth adjustment hypothesis, Portugal.

JEL Code: C33; F16; J30.

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I. Introduction

The adjustment costs in the labor market arise from temporary inefficiencies, wage rigidity, innovation and technical progress. The increased imports are also associated with employment reductions. The technological changes affect both intra-industry trade(IIT) industries and non-IIT industries. The labor market theories suggest that while we have temporary unemployment, in the long run, the economy will return to equilibrium. In the short term, there are labor adjustment costs due to heterogeneity and product-specificity of some factors, downward rigidity of nominal wages, market imperfections and trade-induced adjustment costs.

If we assume that labor is not a homogeneous factor and has some degree of industry specificity, the adjustment cost will be less for IIT labor reallocation than in the inter-industry case. In other words, the labor-market adjustment costs in the form of unemployed labor will be lower if trade expansion is intra-industry rather than inter-industry in nature. The hypothesis that IIT expansion will bring lower labor adjustment costs than inter-industry trade expansion is known as the smooth adjustment hypothesis (SAH).

The concept of marginal intra-industry trade (MIIT) is a central concept in the analysis of labor-market adjustment costs and trade patterns. It is usually considered that the Brulhart (1994) MIIT index is more adequate than the Grubel and Lloyd (1975) static index to explain or test the relationship between labor-market adjustment and intra-industry trade (IIT). The change of the Grubel and Lloyd index between two periods do not adequately reflect the changes in trade pattern, as Hamilton and Kniest (1991) demonstrated, because we do not know the type of the marginal trade . The MIIT index varies between 0 and 1, where the value 0 means that the changes in trade flows are attributable to being entirely of an inter-industry, while the value 1 signifies that the marginal trade is entirely of the intra-industry type. As the empirical studies have not found a high correlation between the two indexes, the econometric results differ according to the index used. Underlying to the SAH is the assumption that the higher the proportion of new trade that is of the IIT type, the smaller is the distance between job moves and related adjustment costs. At one extreme, when all new trade is of the IIT type, the workers are not displaced or they will move within their industry or their firm ("short-distance" assumption). In this case, industry employment changes between t and t+1 can be used as an inverse proxy for labor adjustment costs. At the other extreme, if the new trade is of the inter-industry type, reallocation of labor will take place from the contracting industries to the expanding industries and the distance of the job moves increases as well as the adjustment costs. If we use the absolute industry employment changes as an inverse proxy for adjustmet costs (Brulhart and Elliot, 1998), the SAH is valid if an increase in the MIIT index has a negative effect on this dependent variable.

This paper tests the SAH and also seeks to establish whether or not the MIIT effects are persistent in one-year and two-year lags. Furthermore, the paper estimates the global effect of trade variables on Portuguese employment growth, controlling the effects of other relevant variables such as productivity, wages, industrial concentration, scale economies, human capital and physical capital intensity. The findings of the paper are consistent with the SAH and confirm the results of other research that employed a similar labor adjustment cost indicator, if we do not consider the effects of the lagged MIIT (see, for example, Brulhart and Elliot, 1998; Brulhart, 2000). The paper analyzes the impact of trade and marginal intra-industry trade on Portuguese employment changes, using a dynamic panel data for the period 1996-2003. This took into account the bilateral trade between Portugal and its European Union partners and the employment turnover in 22 industries.

The paper introduces a dynamic panel data model because the employment change involves labor adjustment costs in different periods of time. A dynamic econometric model similar to those used in empirical growth studies better fits the theoretical hypothesis that the short- and long-run adjustment costs, associated with the reallocation of labor in reaction to trade changes, are different. The consideration of a dynamic empirical model was considered previously by Greenaway et al. (1999). These authors used the GMM-DIF estimator, whereas the present paper applies the GMM system estimator (GMM-SYS) developed by Blundell and Bond (1988, 2000). The paper also uses different explanatory variables accounting for endogeneity. The remainder of the paper is organized as follows. Section 2 presents the theoretical background and the revisited empirical work on labor market responses to trade structure. Section 3 presents the measurement of IIT and marginal IIT. Section 4 presents the econometric model. Section 5 analyzes the estimation results. The final section concludes.

II. Theoretical Background and Empirical Studies

The neoclassical trade theory considers that the long-term gains from trade always outweigh the short-term labor adjustment costs. There is a positive sum game and eventually, the gains will be large enough to compensate the losers. In the Heckscher-Ohlin (HO) model, a consequence of free trade will be a redistribution of employment from the import substitute industry to the export industry. The HO framework (traditional HO theory and specific factors theory that considers that labor is not specific) assumes that inter-industry labor movements are free, so that no cost adjustments arise. Labor economists do not agree with this idea and consider that there are short-run adjustment costs, in terms of lost production, unemployment and reduced wages. Furthermore, the trade-off between the gains of trade liberalization and short-term labor adjustment costs depend on the labor skills. Every industry requires a workforce equipped with specific skills and the inter-industry labor reallocation implies a loss of these skills and a short - term adjustment cost. However, if the migration of labor occurs within the same industry, the labor adjustment cost will be lower. These arguments led to the formulation by trade economists of the SAH.

The theoretical basis for this hypothesis is the Jones (1971) specific-factors model and the new trade theory that originated the IIT models (see, for example, Krugman, 1979, 1980, 1981; Lancaster, 1980; Helpman and Krugman, 1985).

There is no general equilibrium model that integrates labor adjustment costs, specific industry factors and IIT theory. However, there is a theoretical consensus which considers that the trade and specialization patterns are linked and that changes of industry specialization motivated by increasing IIT implies low adjustment costs. The underlying assumption is that the goods are produced with the same factor proportions and that the mobility of labor within the same industry is easier to accomplish than the mobility of labor between different industries (see, for example, Balassa, 1966; Krugman, 1981, 1991; Greenaway et al., 1999; Brulhart, 2000; Brulhart and elliot, 2002;Brulhart et al., 2006; Elliot and Lindley, 2006).

The two other problems associated with the SAH are: (i) the adequate indicator of labor adjustment costs; (ii) the exogenous or endogenous condition of trade variables. Some empirical studies use the industry employment change as an inverse proxy for adjustment costs (Brulhart and Elliot, 1998; Grenaway et al., 1999). Other studies consider the index for intra-industry job turnover as defined by Davis and Haltiwanger (1992) (see, for example, Brulhart, 2000), while the most recent analyses use data on individual workers' moves (Brulhart et al., 2006; Elliot and Lindley, 2006; Cabral and Silva, 2006). The tests of the SAH usually regard trade variables as exogenous. This paper will consider that the trade flows are not exogenous and will employ the industry employment change, in absolute values, as the dependent variable.

Employmen changes are a dynamic phenomenon.The dynamics in the employment can be introduced by considering a lagged dependent variable into the econometric equation. As Greenaway et al. (1999:492) pointed out: "Purely specifying dynamics in terms of lags of the dependent variable implicitly imposes a common evolution for employment following a change in an explanatory variable. This restriction may be relaxed by additionally introducing a distributed lag structure for the independent variables". We also adopt this explanation because we do not know the sources of the dynamics process in the employment equation. We only know that the level of employment changes when the adjustment to equilibrium takes place. Erlat and Erlat (2006) also consider the lags in the dependent variable and dynamic estimations using the estimator that appears in Arellano and Bond (1991).

Greenaway et al. (1999) also consider that the labor demand also depends on the volume of trade.[1]

This assumes that: (i) there is a relationship between IIT and employment changes; (ii) labor should, in general, move more easily within, rather than between, industries; (iii) the trade flows are not exogenous: they depend on the level of technology and factor endowments; (iv) there are other potential sources of adjustment costs, such as nominal wage rigidity and imperfect substitutability of labor between sectors, which must be considered in the econometric model, as control variables. As the lagged dependent variable enters into the regression equation as an explanatory variable and there are other endogenous variables, we need to use an instrumental variable approach, such as the GMM system estimator, in order to obtain consistent estimates (see, e.g. Baltagi 2008,ch.8).

III.Measuring Intra-Industry Trade and Marginal Intra-Industry Trade

Traditional intra-industry trade index

The empirical literature uses the index proposed by Grubel and Lloyd (1975). The Grubel and Lloyd (1975) index is given by:

$$B_i = 1 - \frac{|X_i - M_i|}{(X_i + M_i)}$$

where Xi and Mi are the exports and imports of a particular industry i in a given year .

The index is equal to 1 if all trade is IIT. If Bi is equal 0, all trade is inter-industry trade.

The Grubel and Lloyd index is a static measure and as Hamilton and Kniest (1991)

[1] Greenaway et al. (1999) considered that the technical efficiency is correlated with trade changes and therefore, introduced the exports and imports into the employment equation. They also apply the logarithms and differences to obtain a dynamic employment equation.

demonstrated, the changes in this index over time do not adequately reflect the changes in trade pattern. Hamilton and Kniest (1991) proposed a new index, but their measure did not eliminate the scale effect. In other words, their index did not allow the comparison between industries of different dimensions. This problem was resolved by the Brulhart (1994) marginal IIT index (MIIT).

Marginal intra-industry trade index

$$MIIT_i = 1 - \frac{\left|\Delta X_i - \Delta M_i\right|}{\left|\Delta X_i\right| + \left|\Delta M_i\right|}$$

Where Xi and Mi have the same meaning as in the case of Grubell and lloyd index and Δ is the change in trade flows between two years.

The Brulhart index is a transformation of the Grubel and Lloyd (1975) index. The MIIT index also takes the values between 0 and 1. The value 0 indicates that the marginal trade in the industry is exclusively of the inter-industry type, whereas the value 1 represents the marginal trade as being entirely of the intra-industry type.

IV. Econometric Model

The econometric equation must comprise three elements: (i) a dependent variable proxy for adjustment costs; (ii) independent variables for trade: marginal intra-industry trade, exports and imports; (iii) a set of other explanatory variables to control for other influences on the dependent variable.

The dynamic nature of the adjustment process indicates a dynamic regression equation to the theory. We specified three different equations with different control variables and some differences in the lag structure.

Dependent variable

The dependent variable used is the absolute change in total employment in Portuguese manufacturing industries. Most empirical studies use percentage employment changes as an inverse proxy for adjustment costs. This proxy does not take into account the labor movements due to wage differences. Therefore, we introduced wages as the explanatory variable to control for these effects.

The source used for the dependent variable was the Portuguese Ministry of Labor.

Explanatory variables and expected sign

There are multiple determinants of the employment changes. In this paper, the following explanatory variables were considered:

- Lagged Employment (Nt-j). This is the employment in the preceding years. A positive coefficient of this variable is expected (see Greenaway et al., 1999), because the past changes in employment may have a positive impact on the current variations in employment;
- Real wages (W). It is expected that the coefficient of this variable has a negative sign. The increase in real wages increases the labor costs and leads to a decrease in employment (Greenaway et al., 1999);
- Real output (Q). According to the literature, the expected sign is positive. When production expands, employment also increases;
- M and X are the imports and exports. The expected sign should be negative for imports and positive for exports (see, Greenaway et al., 1999). The idea is that the exports promote the increase of production and employment (export-led growth theory), whereas the imports imply competitive pressures on domestic firms;
- The average real wages in total imports (WM) and the average real wages in total exports (WX) were introduced to control for the openness of trade. The expected sign is negative for import penetration and positive for export promotion (Greenaway et al,. 1999);
- MIIT (Marginal Intra-Industry Trade). For this variable, a negative effect on the dependent variable is expected (see Brulhart and Elliot, 1998; Brulhart, 1999; Brulhart, 2000; Ferto, 2009);

- Productivity (Prod). According to the economic theory, the expected sign is negative. The increase in productivity reduces the labor requirements. However, Ferto (2009) considers that the relationship is ambiguous and that we can assume that an increase in productivity may be associated with an increase in employment and expansion in the industry;

- CONC (Industrial Concentration). This index is the ratio of the four largest firms' sales relative to total sales plus imports in the industry. The expected sign is negative, since highly concentrated industries have a low intra-industry labor reallocation because the competitive pressures are lower;

-MES (Minimum Efficient Scale). We use the value added by the four main firms as a variable proxy. If we consider the hypothesis of a small number of firms, the expected sign is negative, because scale economies can reduce the factor demands on this industry and promote inter-industry labor reallocation;

- K/L (Intensity of Physical Capital). The variable proxy is the ratio between the non-salaried returns and the total employment in the industry (see Hirsch, 1974). The expected sign is negative. When the capital-intensity increases, there is a decrease in the use of the labor;

- HC (Human Capital). The variable proxy is the absolute difference between salaries and the average salary of non-qualified workers, divided by the opportunity cost of capital (Cf. Branson and Monoyios, 1977). The expected sign is a matter of empirical evidence. However, if we consider that HC is a specific factor (specific factors model) one may expect a relatively low employment reallocation and in this case, the effect on employment changes is negative or not significant.

The data for the explanatory variables are sourced from INE (the Portuguese National Institute of Statistics), the Bank of Portugal and the Ministry of Labor.

Model specification

$$|\Delta N|_{it} = \beta_1 |\Delta N|_{i,t-j} + \beta_2 \Delta X_{it} - \beta_3 \Delta X_{i,t-j} + \beta_4 MIIT_{it} + \beta_5 MIIT_{i,t-j} + \delta t + \eta_i + \varepsilon_{it}$$

Where N_{it} is the total employment in industry i in time t. Δ stands for the difference between years t and t-n. X is the vector of explanatory variables, excluding MIIT. All variables are in logs except MIIT. η_i is the unobserved time-invariant country-specific effects; δt captures a common deterministic trend. ε_{it} is a random disturbance assumed to be normal, independent and identically distributed (IID) with E (ε_{it}) =0 and Var (ε_{it}) = σ^2 >0 .

V. Estimation Results

The results of the estimations are presented in Table 1. We may note that the instruments are not correlated with the residuals and there is no second-order serial correlation. Thus, the dynamic models are valid.[2]

In all equations, the independent variable MIIT is statistically significant and has the predicted negative sign. The SAH that intra-industry adjustment is costless is confirmed by the empirical results for Portuguese industry. At least, there is no positive correlation between MIIT and employment changes. However, when we consider the lags of this variable, the coefficients are always positive, but only statistically significant in the second equation. In addition, the two-year lag has a greater effect than the one-year lag. The data suggests that the intra-industry trade adjustment imposes less reallocation of labor in the same year (contemporaneous effect), but over the long term this change effect and the pressure for factor reallocation is increasing. Thus, the effects of intra-industry trade changes on labor market may depend crucially on time-period lags. In the second equation, if we add the coefficient of the contemporaneous variable MIIT (-0.517) to the coefficients of the lagged variable MIIT t-2 (0.898), the SAH hypothesis is not

[2] The equations will give consistent estimates if there is no second-order serial correlation.

confirmed. The results suggest that if we consider further time-lags, the results may be different. Possibly, if we introduced other alternative measures for the labor adjustment cost (for example, the three alternative indicators proposed by Brulhart and Elliot , 2002), we would obtain different results. So, we conjecture that the selection of the adjustment cost indicator and the model specification may be crucial to the verification of the SAH in the long run.

There are other results that should be noted. The lagged dependent variable presents a positive and significant expected sign in all equations and for one-year and two-year lags. These results indicate persistence effects. As expected, the employment responds negatively to wages and productivity. In equation (2), the growth of imports (exports) relates negatively (positively) to employment changes, as expected. Similarly, the import penetration (measured by WM) and the export promotion (WX) also have the expected sign, but they are not statistically significant. In equation (3), the increase in industrial concentration has a predicted negative effect on employment changes and this negative effect is persistent in time lags, but in equation (1), the growth in industrial concentration has a positive effect. We should highlight that the econometric specifications are different, which may explain these contradictory results.

Table 1
Dynamic Estimates

Variables	(1)	(2)	Variables	(3)
ΔLog N_{t-1}	0.295 (2.15)**	0.300 (3.42)***	ΔN_{t-1}	0.239 (4.38)***
ΔLog N_{t-2}	0.362 (2.74)***	0.192 (1.85)*	ΔN_{t-2}	0.497 (2.11)**
ΔLog W	-0.135 (-3.41)***	-0.030 (-0.713)	Δ Prod	-23.824 (-1.34)
ΔLog W_{t-1}	0.135 (3.40)***	0.063 (146)	Δ $Prod_{t-1}$	-0.033 (-0.016)
ΔLog W_{t-2}	-0.080 (-1.73)*	-0.040 (-1.37)	Δ $Prod_{t-2}$	-2.274 (-2.00)**
Δ Log Q	0.074 (0.727)	0.160 (1.96)**		
ΔLog Q_{t-1}	-0.114 (-1.02)	0.015 (0.138)		
ΔLog Q_{t-2}	0.023 (0.219)			
MIIT	-1.013 (-3.50)***	-0.517 (-1.75)*	MIIT	-2548.75 (-1.97)**
$MIIT_{t-1}$	0.461 (1.22)	0.159 (0.375)	MIT_{t-1}	132.506 (0.112)
$MIIT_{t-2}$		0.898 (2.46)**	$MIIT_{t-2}$	1646.50 (1.12)
ΔLog CONC	0.28 (3.10)***		Δ CONC	-7648.82 (-1.64)
ΔLog $CONC_{t-1}$	-0.059 (-0.472)		Δ $CONC_{t-1}$	-6542.07 (-1.82)*
ΔLog $CONC_{t-2}$	-0.056 (-0.56)		Δ $CONC_{t-2}$	-6548.22 (-1.92)*
ΔLog K/L	0.590 (1.32)		Δ MES	-167.380 (-0.292)
ΔLog K/L_{t-1}	-1.445 (-3.07)***		Δ MES_{t-1}	205.300 (-1.25)
ΔLog K/L_{t-2}	-0.227 (-0.443)			
ΔLog HC	-0.404 (-1.16)			
ΔLog HC_{t-1}	0.289 (0.679)			
ΔLog HC_{t-2}	0.301 (0.708)			
ΔLog X		0.104 (1.33)		
ΔLog X_{t-1}		0.009 (0.147)		
ΔLog X_{t-2}		0.093 (1.85)*		
ΔLogM		-0.018 (-0.375)		
ΔLog M_{t-1}		-0.077 (-1.83)*		
ΔLog M_{t-2}		0.014 (0.234)		
ΔLog WX		0.073 (1.43)		
ΔLog WX_{t-1}		0.072 (2.12)**		
ΔLog WX_{t-2}		0.053 (1.49)		
ΔLog WM		-0.049 (-1.08)		
ΔLog WM_{t-1}		-0.013 (-0.87)		
ΔLog WM_{t-2}		0.053 (1.49)		
C	3.453 (3.45)	-0.870 (-0.363)		280.9 (1.47)
M1	-1.583 [0.113]	-0.427 [0.669]		-1.225 [0.221]
M2	0.7092 [0.478]	-0.6143 [0.539]		-0.054 [0.957]
WJs	10.40 [0.000]	126.0 [0.000]		707.8 [0.000]
Sargan	2.164 [1.000]	1.417 [1.000]		5.796 [1.000]
Observations	110	110		110

Notes: The hypothesis that each coefficient is equal to zero is tested, using one-step robust standard error. T-statistics (heteroskedasticity corrected) are in round brackets. ***/**/*- statistically significant, respectively at the 1%, 5% and 10% levels. P-values are in square brackets. Year dummies are included in all specifications (this is equivalent to transforming the variables into deviations from time means, i..e the mean across the *n* industries for each period).

M_1 and M_2 are tests for first-order and second–order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation (based on the efficient two-step GMM estimator). W_{JS} is the Wald statistic of joint-significance of independent variables (for first steps, excluding time dummies and the constant term). Sargan is a test of the over-identifying restrictions, asymptotically distributed as χ^2 under the null of instruments' validity (with two-step estimator). The equations will give consistent estimates if there is no second-order serial correlation.

VI.Conclusion

According to the smooth adjustment hypothesis (SAH), labor-market adjustment costs in the form of a reallocation of resources and factor price disparities will be lower if trade expansion is intra-industry rather than inter-industry in nature. We test this empirically using industry–level data from Portugal, the Brulhart (1994) marginal intra-industry trade index (MIIT) and a dynamic panel data analysis. We consider the contemporaneous effect of MIIT and found that results support the SAH. However, if we consider the one-year and two-year lag effects of MIIT on the absolute value of employment changes, the conclusion is sensitive to the size of the lag. The SAH may not hold in a dynamic analysis.

Acknowledgments: The authors express their gratitude for useful comments from two anonymous referees.The usual disclaimer applies.

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