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AVRUPA BİRLİĞİNDE MARJİNAL ENDÜSTRİ İÇİ TİCARET VE İŞ GÜCÜ UYUM MALİYETİ[1]

MARJİNAL INTRA- INDUSTRY TRADE AND LABOR ADJUSTMENT COST IN EU

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Öz

Endüstri içi ticaret uluslararası ticarette giderek artan önemi ve iş gücü uyum maliyetini etkilemesi açısından literatürde önemli bir yere sahiptir. Bu çalışmada endüstri içi ticaret ile iş gücü uyum maliyeti arasındaki ilişkiyi endüstri içi ticaretin farklı ölçüm metotlarıyla ele alarak inceliyoruz. Marjinal Endüstri İçi Ticaretin farklı ölçümleri olan A, MD1 ve MD2 indekslerini karşılaştırıyoruz. Çalışmada 15 Avrupa Birliği ülkesinin 127 üretim alt sektörleri 1990 ile 2017 yılları arasında alınmıştır. Dinamik panel veri modelinin Sistem Genelleştirilmiş Momentler Metodu ’una (GMM) göre MD2 indeksi düşük uyum maliyetini MD1 indeksinden daha iyi açıklamaktadır. MD1 indeksi Avrupa Birliği ülkelerinde üretim sanayinde sektörel iş gücü, verimlilik, tüketim ve piyasaya açıklık açısından güçlü ilişki göstermekte. Üç gösterge indeksi de literatüre uyumlu olarak Marjinal Endüstri İçi Ticaret ve iş gücü uyum maliyeti arasında negatif ilişki göstermektedir.

Anahtar Kelimeler: Endüstri İçi Ticaret, Marjinal Endüstri İçi Ticaret, Dinamik Panel Data, Uluslararası Ticaret

JEL Sınıflaması: A10, E24, F16, F62

Abstract

Intra- Industry Trade is a crucial issue from the point of view of increased importance in international trade and its' labor adjustment cost influence in the literature. This research analyzes the relationship between MIIT and labor adjustment cost by comparing the different measures of marginal intra-industry trade. We compare the A, MD1, and MD2 indexes, which are different measures of MIIT. 127 manufacturing subsectors are used in 15 European Union countries in the period between 1990- 2017. The result of dynamic panel data of system GMM shows that the MD2 measurement method explains the low adjustment cost better than MD1. It significantly correlates with a few of the variables concerning trade. MD1j has a strong relationship with sectoral employment, consumption, productivity, and openness in the manufacturing industry in the European Union. Three measures of MIIT present a negative link between MIIT and adjustment cost, which is suitable with the literature.

Key Words: Intra-Industry Trade, Marginal Industry Trade, Smooth Adjustment Hypothesis, Dynamic Panel Data, Labor Adjustment Cost, International Trade

JEL Classification: A10, E24, F16, F62

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1.Introduction

The analysis of the condition of a country in international trade and trade pattern of this country has a significant role in understanding the economic wellbeing and development among other countries. Therefore, Intra-Industry Trade (IIT) is one of the fundamental factors in international trade. With the increasing demand for product differentiation, the production of more companies in the same industry rises and they have started to sell similar products. Thus, many countries trade pattern has evolved into products that are produced under the same industry, so IIT has increased among different countries and become prominent in the international trade.
The influence of IIT in international trade and changing trade patterns of countries also have affected and transformed various parts that are concern with international trade. Greenaway and Hine (1991) indicated that "specialization in Europe may have entered a new phase, and that this could pose greater problems for adjustment". The labor market is one of the affected parts of international trade; various aspects of the market are transformed by the increase of IIT in international trade. Firstly, the movement of laborers across different industries decreases by the rise in IIT. Since there is a big amount of demand for differentiated products in the same industry, the laborers do not need to change their working industry when they need to change their position, firm, etc. Those laborers can easily find new positions in the same industry, so the movement of laborers occurs in the same industry rather than from one industry to another industry. Since a change in demand of firms' production, the firm needs to alter its level of production and bear to a cost that is defined as adjustment cost. By the movement of a laborer in the industry, the adjustment cost of a laborer becomes lower rather than the adjustment cost of a laborer who moves from one industry to another. This situation is named as Smooth Adjustment Hypothesis (SAH).

In this research, we investigate the link between labor market adjustment cost and MIIT. The marginal Intra Industry of Brülhart's is compared with Menon and Dixon's different measures of MIIT. MD1 which shows the change in IIT to the percent change in total trade, MD2 presents part of trade change in matched changes in imports and exports. We present the paper in those parts; the second part represents literature review, the third part is about data and methodology, the fourth part is about results and the fifth part gives concluding remarks. Lastly, the sixth part presents references.

2. Literature Review

There are several investigations in the literature according to the link between Intra-Industry Trade (IIT) and labor adjustment cost. Balassa's (1966) work is seen firstly in the literature and showed Intra- Industry Trade adjustment may have a lower cost than Inter-Industry Trade adjustment. Labor markets are affected by many different factors like trade, a shift in labor supply, and technological changes. IIT suggests a way apart from those factors. IIT approach gives related information according to trade patterns to produce disruptive structural change. Dixon and Menon (1997) used IIT as an indicator of "non-disruptive trade growth". Brülhart (1994) indicates that trade pattern results change related to measurement method of Marginal Intra-Industry Trade (MIIT). Greenaway, Hine, Milner, and Elliott support the same results in 1994. Hamilton and Kniest (1991) pointed out the weakness of evidence about the relationship between adjustment and MIIT. Brülhart and Elliott show a similar result in 1998.

In the literature, much research has made a comparison between the various measure of IIT such as IIT, MIIT, and ΔGL. Those investigations result in MIIT has a stronger effect on describing the relationship between labor adjustment cost and intra-industry trade. Especially ΔGL implies misleading results in these papers. Dixon and Menon (1997) showed considering structural adjustment cost and IIT can measure exports and imports which have important contributions to MIIT but ΔGL has a deceptive result. Brülhart and McAleese indicated similar effects of MIIT and ΔGL which presents MIIT is correlated with measuring industrial performance about adjustment cost but ΔGL is misleading.

Sarris, Papadimitriu, and Mavrogiannis (1999) demonstrated a crucial relationship between sectoral employment which was used as an adjustment measure and MIIT. Likewise, Kol and Kuijpers (1999) displayed important relation between MIIT and sectoral employment. Additionally, the significant relationship between MIIT and sectoral employment and output change as a structural adjustment measure is indicated by Brülhart, McAleese, O'Donnell (1999) and Porto and Costa (1999). Tharakan and Calfat (1999), Smeets (1999), and Rossini and Burrattoni (1999) in the literature demonstrated that there is no evidence for a relationship between sectoral change and MIIT or inter-sectoral adjustment in EU and MIIT.

3. Data and Methodology

The calculations according to the dataset consists of the period from 1990 to 2017 of 15 European Union (EU) countries. Also, IIT calculations are made by the export and import values of the ISIC 4- digit dataset of the manufacturing industry. Since the 4-digit ISIC level gives a higher level of disaggregation, trade values are more homogenous at those levels and more disaggregation at the data provides to calculate less inflated IIT values. By those two features both wide time, period coverage, and the level of disaggregation provide a comprehensive IIT indicator for fifteen EU countries presently. Table 1 presents 127 manufacturing industries that are used in IIT calculation in the research. The data sources table is in the appendix part.

To analyze different measures of MIIT and relation with labor adjustment cost we use the empirical model is shown below:

$$MD1j*HI = \beta_0 + \beta_1 LNCONSUME_{j,t} + \beta_2 WAGE_{j,t} + \beta_3 LNEMPL_{j,t} + \beta_4 LNPROD_{j,t} + \beta_5 LNOPEN_{j,t} + \beta_6 IIT_{j,t} (MIIT_{j,t}) + \mu \qquad (1)$$

Also, in this model, we change the index in the dependent variable, which is MD1, MD2, and MIIT to test various measurements of marginal intra-industry trade. We use most of the explanatory variables in the natural logarithm form except wage and intra-industry trade in the model. HI indicates the Herfindahl- Index which shows the market concentration of firms in a given industry. By the way, the index demonstrates the existence of a monopoly or a decline of competition in the industry. MD1HI is used to analyze the covariant effect of marginal intra-industry trade and market share of firms at the same time.

lnCONSUME presents the natural logarithm of consumption in the manufacturing industry of country j in year t. WAGE shows the average wage in the manufacturing industry of country j in year t. lnEMPL represents the natural logarithm of the number of laborers in the manufacturing industry of country j in year t. lnPROD indicates the natural logarithm of labor productivity in the manufacturing industry at country j in year t. lnOPEN shows the natural logarithm of trade openness in the manufacturing industry at country j in year t. Finally, we use IIT or MIIT as an explanatory variable[4] in the model to test intra- industry trade and marginal intra- industry trade influence.

Let see the calculations of independent variables PROD and OPEN:

$$PROD = \frac{\text{Output in the industry}}{\text{number of laborers in the industry}}$$

$$OPEN = \frac{Xj+Mj}{\text{Sector Value Added}}$$

Which X_j and M_j show total export and import in industry j.

[4] The panel unit root test is presented in the appendix part. Variables are stationary at a 1% significance level except for wage and open variables. Wage and open have stationarity at a 5% significance level according to LLC and IMPS methods.

Table 1. ISIC Descriptions

1511 Processing/preserving of meat	2424 Soap, cleaning& cosmetic preparations	3330 Watches and clocks
1512 Processing/preserving of fish	2429 Other chemical products n.e.c.	3410 Motor vehicles
1513 Processing/preserving of fruit & vegetables	2430 Man- made fibres	3420 Automobile bodies, trailers & Semi- trailers
1514 Vegetable and animal oils and fats	2511 Rubber tyres and tubes	3430 Parts/ accessories for automobiles
1520 Dairy products	2519 Other rubber products	3511 Building and repairing of ships
1531Grain mill products	2520 Plastic products	3512 Building/ repairing of pleasure/ sport. Boats
1532 Starches and starch products	2610 Glass and glass products	3520 Railway/ tramway locomotives & rolling stock
1533 Prepared animal feeds	2691 Pottery, china and earthenware	3530 Aircraft and spacecraft
1541 Bakery products	2692 Refractory ceramic products	3591 Motorcycles
1542 Sugar	2693 Struct. non- refractory clay; ceramic products	3592 Bicycles and Invalid carriages
1543 Cocoa, chocolate and sugar confectionery	2694 Cement, lime and plaster	3599 Other transport equipment n.e.c.
1544 Macaroni, noodle & similar products	2695 Articles of concrete, cement and plaster	3610 Furniture
1549 Other food products n.e.c.	2696 Cutting, shaping & finishing of stone	3691 Jewellery and related articles
1551 Distling, rectifying & blending of sipirits	2699 Other non- metallic mineral products n.e.c.	3692 Musical instruments
1552 Wines	2710 Basic iron and steel	3693 Sports goods
1553 Malt liquors and malt	2720 Basic precious and non- ferrous metals	3694 Games and toys
1554 Soft drinks; mineral waters	2731 Casting of iron and steel	3699 Other manufacturing n.e.c.
1600 Tobacco products	2732 Casting of non- ferrous metals	3710 Recycling of metal waste and scrap
1711 Textile fibre preparation; textile weaving	2811 Structural metal products	3720 Recycling of non-metal waste and scrap
1712 Finishing of textiles	2812 Tanks, reservoirs and containers of metals	
1721 Made-up textile articles, except apparel	2813 Steam generators	
1722 Carpets and rugs	2891 Metal forging/pressing/stamping/roll-forming	
1723 Cordage, rope, twine and netting	2892 Treatment & coating of metals	
1729 Other textiles n.e.c.	2893 Cutlery, hand tools and general hardware	
1730 Knitted and crocheted fabrics and articles	2899 Other fabricated metal products n.e.c.	
1810 Wearing apparel, except fur apparel	2911 Engines & turbines (not for transport equipment)	
1820 Dressing & dyeling of fur; processing of fur	2912 Pumps, compressors, taps and valves	
1911 Tanning and dressing of leather	2913 Bearings, gears, gearing & driving elements	
1912 Luggage, handbags, etc.; saddlery & harness	2914 Ovens, furnaces and furnace burners	
1920 Footwear	2915 Lifting and handling equipment	
2010 Sawmilling and planing of wood	2919 Other general purpose machinery	
2021 Veneer sheets, plywood, particle boarc, etc.	2921 Agricultural and forestry machinery	
2022 Builders' carpentry and joinery	2922 Machine tools	
2023 Wooden containers	2923 Machinery for metallurgy	
2029 Other wood products; articles of cork/straw	2924 Machinery for mining & construction	
2101 Pulp, paper and paperboard	2925 Food/beverage/tobacco processing machinery	
2102 Corrugated paper and paperboard	2926 Machinery for textile, apparel and leather	
2109 Other articles of paper and paperboard	2927 Weapons and ammunation	
2211 Publishing of books and other publications	2929 Other special purpose machinery	
2212 Publishing of newspapers, journals, etc.	2930 Domestic appliances n.e.c.	
2213 Publishing of recording media	3000 Office, accounting and computing machinery	
2219 Other publishing	3110 Electric motors, generators and transformers	
2221 Printing	3120 Electricity distribution & control apparatus	
2222 Service activities related to printing	3130 Insulated wire and cable	
2230 Reproduction of recorded media	3140 Accumulators, primary cells and batteries	
2310 Coke oven products	3150 Lighting equipment n.e.c.	
2320 Refined petroleum products	3190 Other electrical equipment n.e.c.	
2330 Processing of nuclear fuel	3210 Electronic valves, tubes, etc.	
2411 Basic chemicals, except fertilizers	3220 TV/radio transmitters; line comm.apparatus	
2412 Fertilizers and nitrogen compounds	3230 Tvand radio receivers and associated goods	
2413 Plastics in primary forms; synthetic rubber	3311 Medical, surgical and orthopaedic equipment	
2421 Pesticides and other agro- chemical products	3312 Measuring/testing/navigating appliances, etc.	
2422 Paints, varnishes, printing ink and mastics	3313 Industrial process control equipment	
2423 Pharmaceuticals, medicinal chemicals, etc.	3320 Optical Instruments & photographic equipment	

In our empirical search, we use Grubel Lloyd (GL) index to calculate the IIT indices. This index changes between 0 and 1. The standard GL index is defined as follows:

$$GL_j = IITj = 1- \frac{|Xj,t-Mj,t|}{Xj,t+Mj,t} \qquad (2)$$

Where X_j and M_j are export and import of industry j at year t. We calculated the aggregated IIT values from the 127 manufacturing industries as we mentioned previously. In figure 1 the average IIT values of 15 EU Countries in the period 1990 to 2017 are presented. The weighted IIT following formula is shown below:

$$W_{j,\,iit} = \frac{Xi,t+Mi,t}{Xj,t+Mj,t} \quad (3)$$

$$IITj = \text{Weighted Intra-Industry Trade} = \sum Wj,iit \times IITi \quad (4)$$

Where $X_{i,\,t}$ and $M_{i,\,t}$ indicate export and import values of subsector i at year t. IIT_i shows subsector i's Intra Industry Trade value. IIT_j demonstrates Intra industry trade value of industry j and $W_{j,}$iit indicates weight calculations of the IIT index.

Marginal Intra-Industry Trade is a significant issue in the Intra- Industry Trade concept, after Cave (1981) Hamilton and Kniest searched that issue in 1991. Hamilton and Kniest indicate that the important issue is not the share of IIT have increased, the point of increase of IIT share in new trade is crucial to identify effects of change of trading situations on adjustment. Therefore, it is critical to calculating the contributions of change in intra- industry trade and variation in net trade relative to the change in total trade. By the way, marginal intra-industry trade (MIIT) is identified as a result. However, Hamilton and Kniest cannot show adequate intelligence on the adjustment issue and measurement of the structure of trade change. Different periods' GL index shows various features according to the trade at that period but does not reflect conclusions at the structure of change in trade. Greenaway (1994) demonstrated mistakes in this calculation. Jayant Menon and Peter Dixon focused on the measure of MIIT. Brülhart (1994) concentrated on the adjustment concept and suggested in the latter analysis related to MIIT index developed "A index". We use Brülhart's "A index" that shows the transposition of the GL index to the measurement of trade changes as MIIT and weighted MIIT calculations.

Let's see those calculations below:

$$MIIT = A = 1- \frac{|(Xt-Xt-n)-(Mt-Mt-n)|}{|(Xt-Xt-n)+(Mt-Mt-n)|},$$

$$A = 1- \frac{|\triangle X-\triangle M|}{|\triangle X|+|\triangle M|} \quad (5)$$

$$W_{j,\,miit} = \frac{|\triangle Xi|+|\triangle Mi|}{\sum(|\triangle Xi|+|\triangle Mi|)} \quad (6)$$

$$MIIT_j = \text{Weighted Marginal Intra-Industry Trade} = \sum Wj,miit \times Aj \quad (7)$$

Where $W_{j,\,miit}$ shows weight calculations of marginal Intra Industry Trade. $X_{i,\,t}$ and $M_{i,\,t}$ indicates export and import values of subsector i at year t.

"A index" difference between 0 and 1 like IIT. Where 0 demonstrates marginal trade is complete inter-industry trade in this industry and 1 indicates marginal trade completely intra- industry trade in this industry.
Dixon and Menon expressed the Theory of Marginal Intra- Industry Trade measurement noticeably detail which is the proportion of the contribution of change in IIT value to the percent change in total trade and called it MD1.

Let see $MD1_j$ measurement:

$$MD1_j = \frac{\Delta IIT^{5}}{TT} = \hat{IIT}*GL_j \text{ }^{6} \quad (8)$$

Menon and Dixon preferred to use the $MD1_j$ index rather than ΔGL_j since it causes incorrect inferences related to the contributions of MIIT in changing trade. Dixon and Menon (1997) indicate non-disruptive part of the change in trade will be overestimated by $MD1_j$[7]. As an alternative for MD1 measurement, Menon and Dixon calculate MD2

[5] Lovely and Nelson (2002) demonstrated $\Delta IIT = \Delta Xj + \Delta Mj + |Xj - Mj| - |Xj + \Delta Xj - Mj - \Delta Mj|$.

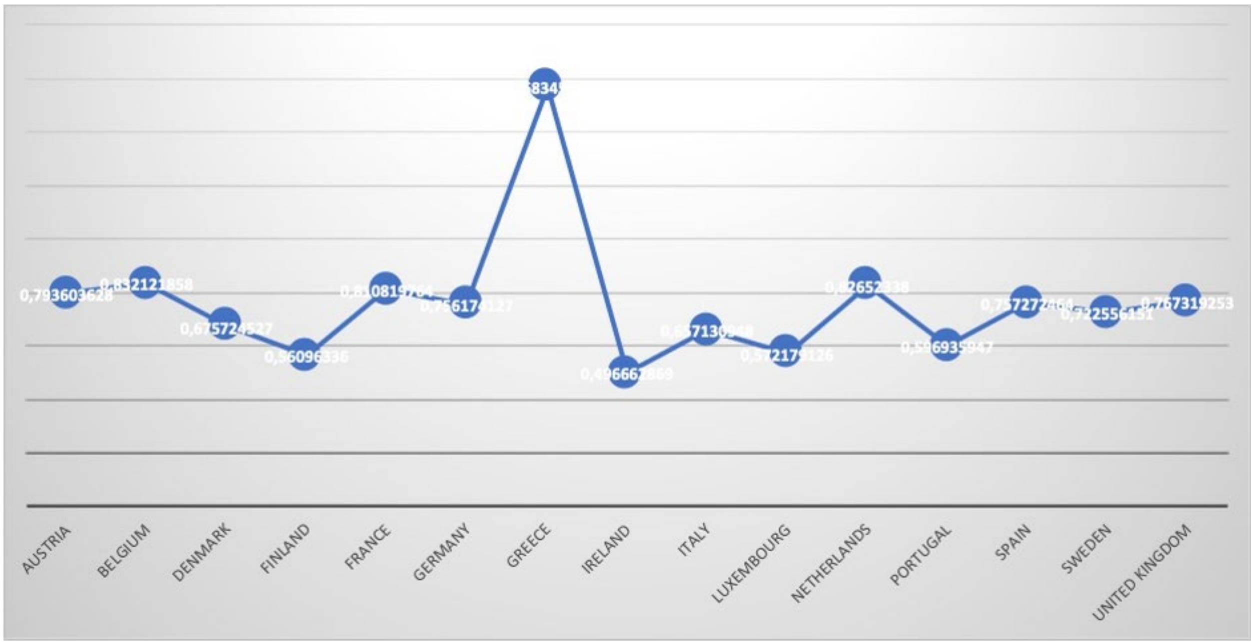
[6] "^" donates proportional change.
[7] $MD1_j > MD2_j$ when $sgn[Xj - Mj] \neq sgn[\Delta Xj - \Delta Mj]$

measurement since MD1 may produce false inference when we aim to calculate the share of trade growth which consists of low adjustment costs. Thus, Menon and Dixon offer $MD2_j$ measurement for calculating only the changed part of trade-related to appropriate changes in exports and imports. The matched change in exports and imports is a measurement of the percent of trade change which produces low adjustment costs. Therefore, $MD2_j$ shows point measurement of matched or dynamic changes in exports and imports concern to total trade which is defined as dynamic IIT(DIIT) in Menon and Dixon's research.

Let see $MD2_j$ measurement:

$$MD2_j = \frac{2\min[\triangle Xj, \triangle Mj]}{TT} = \frac{\triangle Xj + \triangle Mj - |\triangle Xj - \triangle Mj|}{TT} \quad (9)$$ [8]

Figure 1: Average IIT indices of 15 EU Countries between the period 1990 and 2017



Source: Author's Calculation

Lovely and Nelson (2000) indicate that there is a problem with the measurement of MIIT in the literature and by the way sensible measure of adjustment cost. The problem here comes out by the change in labor allocation because this change affects changes in production structure with the change in trade pattern affects change in production and demand. Thus, there is a domino effect among labor allocation, production, trade pattern, and demand. Similarly, Brülhart, Murphy, and Strobl (1998) declared that Grubel- Llyod index is consistently used by theoretical research to calculate IIT. However, there is not such kind of situation related to MIIT. MIIT is so crucial to detect the relationship between trade and adjustment cost, there is a weakness in this issue in the literature which Brülhart stated. Therefore, we add MD1 and MD2 to our analysis to make a comparison between Brülhart's A index, MD1index and MD2 index concerning to estimate the link between MIIT and labor adjustment cost.

In our empirical research, we used a dynamic panel data model (GMM-system). In the sense of a dynamic panel data model, it contains at least one lagged dependent variable.
Let consider the model:

[8] $DIIT_i = 2\,min[\triangle Xi,\ \triangle Mi]$, $DIIT_j = \sum DIIT_i$, $MD2 = \frac{DIITj}{TTj}$ *from Menon and Dixon (1997)*

$Y_{it} = \alpha_t y_{i,t-1} + \beta' x_{it} + \gamma_i^* + \varepsilon_{it}$

Where i = 1, .., n and t = 1, .., T . In the formulation α_t and γ_i shows the unobserved individual and time-specific effects in the model and ε_{it} the error (idiosyncratic) term with $E(\varepsilon_{it}) = 0$, and $E(\varepsilon_{it}\varepsilon_{js}) = \sigma^2_\varepsilon$ if j= i and t= s, and $E(\varepsilon_{it}\varepsilon_{js}) = 0$ otherwise.

The dynamic panel model, the formulation choice between fixed effect and random effect model has some implications which are different from the static model's implications. On the other hand, the GMM estimation method relies on a model of first differences to get rid of unobserved individual effects and time-invariant variables.

Let see the model:

$$(y_{i,t} - y_{i,t-1}) = \gamma (y_{i,t-1} - y_{i,t-2}) + \beta^{`} (x_{i,t} - x_{i,t-1}) + \varepsilon_{i,t} - \varepsilon_{i,t-1}$$

Where t= 2,…, T. The standard method of moments in this model become by equating the theoretical moments with their estimates which become by solving the unknown parameters in the model. GMM estimation model uses linear moment restrictions with some assumptions. These assumptions are no serial correlation at error terms, lagged dependent variable can be used, not strictly exogenous variable and individual effects in explanatory variables. The difference GMM works poorly when it is applied to short panels of continuous-time series (Blundell and Bond, 1998). Therefore, system GMM suggests using moment conditions based on the level equations together with the usual Arellano and Bond type orthogonality conditions. System GMM supports to come over the problem of finite sample bias and endogeneity of independent variables.

3.1. Specific- Factor Model with IIT

Lovely and Nelson used the general-equilibrium model to investigate the relationship between measurement of labor adjustment and measurement of MIIT analytically. MIIT literature shows labor reallocation has a positive relation with production volume changes which implies growing industries increase their labor but shrinking industries decrease their labor. To take MIIT as a proxy for labor adjustment the model of sector-specific capital should be used. The model explains intra- industry trade by imperfect competition and increasing returns basis.
The model defines labor as mobility and can freely move between sub-sectors of the economy. The literature on this issue mostly models adjustment costs explicitly but this model depends on the statement of movement of labor between industries is much more costly to labor than movement between sub-sectors. Thus, the movement of labor between sub-sectors of an industry with IIT provides low-cost labor adjustment.

As it is mentioned expanding sub-sectors employ more labor than contracting sub-sectors. To construct such an adjustment model, a production model composes of separates groups of intermediate products of two final goods. Those inputs can substitute each other by using those intermediate inputs in each industry. The economy in the model is assumed to be small and prices are given. Lovely and Nelson state that by this structural model we can focus on the demand part of MIIT measurement which is ignored in the literature while they concentrate on short-run adjustment costs.

If we call final goods Y_1 and Y_2, the production function for final goods is demonstrated by this way:

$Y_j = F^j (A_{1j}, A_{2j}),\ j = \{1, 2\},$ (10)

Where F^j is accepted as a linearly homogeneous and twice-differentiable function. A_{ij} shows domestic absorption of intermediate ij. The equilibrium needs zero profits in final goods because the producers have given input and output prices.

The model assumes the economy trades intermediate inputs and puts a tax on imports of intermediates at every industry. The inputs are labeled by 21 and 22 are imported inputs on the other hand inputs labeled by 11 and 12 are exported. Therefore, there are both import-competing and export competing sub-sectors. In a small economic change in the home, tariffs cause a proportional change in the price of imported intermediates. Thus, to prevent tariff transition from one final good to another, the same amount of tariff is assumed on imported final goods with imported inputs. This tariff application shows there is no trade-in final goods, the economy produces all the final products from imported and exported intermediates that it consumes.

The production of intermediate inputs consists of labor and subsector specific capital so we can show the production functions for the four intermediate inputs below:

$$X_{ij} = f^{ij} (L_{ij}, K_{ij}), \qquad (11)$$

In the production function total labor is defined as fully mobile, employed, and fixed. It is shown below and where $i = \{1,2\}$ indicates the input type and $j = \{1,2\}$ indicates the output sector.

$$L = L_{11} + L_{12} + L_{21} + L_{22} \qquad (12)$$

Demand is supposed to be a function of the domestic relative price, p where $p = P_2 / P_1$, and domestic aggregate income which includes tariff revenue. The domestic demand function is presented below.

$$Z_j = D^j (p, \Gamma) \qquad (13)$$

The equilibrium of domestic final goods occurred by consumption by the market since no final is traded.

$$Y_j = Z_j, \quad j = \{1,2\} \qquad (14)$$

The intermediate goods are traded opposite to final goods. Intermediate goods ij' net exports are $N_{ij} = X_{ij} - A_{ij}$. The Sum of the value of net exports needs to be zero to have balanced trade:

$$\sum_i \sum_j q_{ij}^* N_{ij} = 0, \qquad (15)$$

where q_{ij}^* is the world price of intermediate ij. The domestic price of exported intermediates and the world price is same i.e., $q_{ij} = q_{ij}^*$

4. Empirical Results and Discussion

In our empirical work, we investigate the relationship between the different measures of marginal intra- industry trade and labor adjustment cost. Our research base on 127 manufacturing industries in fifteen EU countries which are presented in Table 1. To make a comparison between the conflicting way of MIIT measures, we use Lovely and Nelson's analytical works basically, and represent empirical results for those measurements. Additionally, the analysis also demonstrates an empirical comparison for Brülhart's MIIT that is a commonly used measuring method for MIIT in literature with MD1 and MD2 calculations of Dixon and Menon.

In Table 2, we present the empirical results of the link between various measurements of MIIT and labor adjustment cost. We calculate the analysis by dynamic panel data (sys- GMM) estimation. In Table 2, the first column shows the MD1 type measure of Marginal Intra- Industry Trade. As it is mentioned previous part, we take MD1 as a proxy for labor adjustment cost. In the first equation, it is seen previous three periods of MD1HI have no significant effect on MD1HI currently. lnCONSUME has a positive and significant effect on MD1HI. 1% increase in consumption amount in manufacturing industry increases MD1HI approximately 0,0013. Consumption rise in the industry increases IIT change in total trade change so rise movement of labor in the industry and concentration of firms in the industry thus decreases labor adjustment cost. Brülhart and Elliot, 1998 indicated consumption increases rise employment movement in the same industry.

1 point increase in WAGE has no significant effect on MD1HI. 1% increase in lnEMPL decreases MD1HI about 0,0018. That means an increase in labor amount in the manufacturing industry decreases the change of IIT relative to percentage total trade with a market concentration of firms. Thus, allocation of labor between subsectors of the manufacturing industry decreases so adjustment cost increases. 1% increase in lnPROD decreases MD1HI

approximately 0,0017 so improvement in productivity of labor decreases the change of IIT concern to the percentage change in total trade with the firms' market concentration. This also shrinks the movement of labor between subsectors of the manufacturing industry thus labor adjustment cost increases (Brülhart and Elliot, 1998). MD1 measure has strong statistical results according to explain labor adjustment cost that demonstrates trade flow change has explanatory feature according to adjustment cost than traditional IIT index change in time (Shelburne,1992).

Openness has a significant and positive effect on MD1HI. An increase of 1% in lnOPEN increases MD1HI by about 0,0007. The increase in trade openness of a country supports Intra-Industry Trade and the increase in change of IIT relative to percent change in total trade so which provides an increase in movement of labor between subsectors of the manufacturing industry thus decreases labor adjustment costs. IIT and lag1 IIT has a positive and significant influence on MD1HI. 1% increase in IIT increases MD1HI approximately 0,21. As expected, improvement of IIT percentage in total trade increases the movement of labor in the manufacturing industry so adjustment cost decreases. Similarly, one-year previous IIT has a positive and significant effect on MD1HI and supports low adjustment cost.

In our empirical research, we also analyze the MD2 measure as a scale of the labor movement and labor adjustment cost. As MD2 is a direct measurement of precise changes in imports and exports relative to total trade, it is seen commonly as non-disruptive because of an exact change in that part of the change in total trade. In the second column, we present the results of MD2HI equations. Three-period lags of the dependent variable are used to observe previous periods' effect on MD2HI in period t. That two-period lag has a positive and significant effect on MD2HI in period t. 1 unit increase in MD2HI in lagged values rise MD2HI in period t approximately 0,14 unit. Matched changes in exports and imports in previous years support low adjustment cost at year t.

In Table 2, it is seen lnCONSUME does not have a significant influence on MD2HI. WAGE has a negative and insignificant effect on MD2HI. Similarly, lnEMPL and lnPROD do not have a significant effect on MD2HI.
lnOPEN has a positive and significant effect on MD2HI at a 1% significance level. 1% increase in trade openness increases MD2HI approximately 4e-5. The increase in trade relative to value-added in the industry supports the growth of the matched export and import changes in the manufacturing industry relative to total trade. Thus, the movement of laborers in subsectors of the manufacturing industry decreases the adjustment cost of labor in the industry. MIIT has a positive and significant effect on MD2HI at a 5% significance level. 1 unit increase in MIIT increases MD2HI 9e-6 unit. An increase in change of IIT relative to total trade provides to improve the covariant effect of precise change in export and import in the manufacturing sector relative to total trade and market concentration of firms.

In the last equation, we analyze Brülhart's A index that calculates marginal intra-industry trade. Since it is aggregated value, it provides a wide measure of MIIT by sectoral or economy. Two periods delayed effect of MIITHI on MIITHI in period t have positive and significant influence at 1% significance level. 1 unit increase in both two lagged periods of MIITHI rises MIITHI about 0,51 and 0,05 units respectively. The third period lagged MIITHI has no significant effect on MIITHI. lnCONSUME has a positive and significant effect on MIITHI at a 5% significance level. 1% increase in lnCONSUME increases MIITHI 4e-5 approximately. An increase in consumption in the manufacturing industry rises the covariant effect of IIT change in total trade and market concentration of firms. Therefore, reallocation of labor increases in the industry, and adjustment cost reduces.

WAGE has no significant influence on MIITHI at a 1% significance level. lnEMPL has a positive and significant effect on MIITHI at a 5% significance level. 1% increment in lnEMPL rises MIITHI approximately 0,00005. The rise of labor amount in the manufacturing industry increases MIIT and movement of labor in the industry thus labor adjustment cost diminishes. lnPROD and lnOPEN have no significant influence on MIITHI and adjustment cost of labor. Lastly, marginal intra-industry trade has a positive and significant effect at a 1% significance level. 1% increment in MIIT in the industry increases the market concentration of firms in marginal Intra Industry Trade at about 0,07 on the movement of labor and diminishes adjustment cost.

Table 2. The Empirical Results of Measurement of Marginal Intra-Industry Trade and Labor Adjustment Cost

Dependent Variable	MD1HI	MD2HI	MIITHI
MD1HI			
L1.	0,0043181	-	-
	(-0.16)		
L2.	-0,001957	-	-
	(-0.09)		
L3.	0,0078245	-	-
	(0.42)		
MD2HI			
L1.	-	0,1162698	-
		(2,40)**	
L2.	-	0,1413088	-
		(2,92)***	
L3.	-	0,1540451	-
		(1,94)*	
MIITHI			
L1.	-	-	0,5130933
			(13,92)***
L2.	-	-	0,0547212
			(1,94)***
L3.	-	-	0,0361538
			(1,00)
lnCONSUME	0,1322356	-0,0003846	0,0035673
	(2,15)**	(-1,44)	(-1,97)**
WAGE	-5.13e-07	-1.18e-08	1.24e-07
	(-0,25)	(-0,18)	(0,87)
lnEMPL	-0,1816204	0,0001138	0,0047658
	(-2,59)***	(0,42)	(2,18)**
lnPROD	-0,1696081	-0,0000461	0,0010538
	(-2,61)***	(-0,22)	(0,21)
lnOPEN	0,0654953	0,0035424	-0,0004046
	(2,90)***	(9,95)***	(0,38)
IIT	0,2120746	-	-
	(64,16)***		
L1.	0,177985	-	-
	(29,76)***		
MIIT	-	0,0008997	0,0720214
		(2,45)**	(29,74)***
L1.	-		-0,0327319
			(-8,77)***
CONS	-0,4094868	0,0063506	0,0157944
	(-1,59)	(2,98)***	(1,09)
Sargan (Prob> chi2)	0,20	0,24	0,27
Wald (Prob> chi2)	0,000	0,000	0,000
AR(1)(Prob> chi2)	0,02	0,02	0,01
Num. Of Obs.	364	375	375
Num. Of Instruments	57	56	57

*,**,*** represents significant p values of 0.10, 0.05, 0.01 respectively.The values in parenthesis shows z values.

Consequently, MD1, MD2, and MIIT have an explanatory influence on labor adjustment costs. MD1 gives more strong results rather than MD2 and MIIT measurement indexes according to the labor adjustment cost in the manufacturing industry in our sample data 15 EU countries. Since MD2 is a direct measurement method on the part of trade change that shows proper changes in export and import values, the index is more successful to measure the labor adjustment cost. MD1 can have an overestimation on the calculation of the non-disruptive component of change in trade (Dixon and Menon, 1997). We observe $MD1_j > MD2_j$ like Dixon and Menon. Thus, MD1 shows that has more explanatory power on consumption, employment, productivity, and trade openness of independent variables relative to MD2 and MIIT.

5.Conclusion

Labor adjustment cost is a crucial issue in the literature, and it is related to intra-industry trade issues in international trade. Our objective in this research is to observe the relationship between different measures of marginal intra-industry trade and labor adjustment cost. To compare those various measures, we use Brülhart's A index, Dixon and Menon's MD1, MD2 index in the IIT literature with Lovely and Nelson's theoretical model. Besides that, we calculate IIT values by 127 manufacturing industries aggregated value and we use ISIC 4- digit categorization at this measurement.

Our results differ from the most of searches in the literature since we take MD1, MD2, and MIIT as a proxy for labor adjustment cost. Because these measures of marginal intra- industry trade indicate a scale for labor movement between different subsectors of a given industry. An increase in IIT in total trade shows the rise of labor movement between different subsectors of the industry than between various industries. Thus, labor adjustment cost declines because of change of labor movement in the same industry which is the Smooth Adjustment Hypothesis. Low adjustment cost is significant both for labor and employer since it provides easy adaptation to new position and subsector for labors, also low cost of production for an employer.

In our empirical investigation, we take the covariant effect of MIIT measures with the market concentration index of HI as labor adjustment cost to see competitiveness in the market. At first equation rise in consumption in the manufacturing sector, trade openness in the sector, and aggregate IIT in years t and t-1 have a positive and significant effect on MD1HI. Increase of consumption in the industry rises change of IIT in percent total trade and market concentration of firms in that industry. Since the growth of IIT means an increase in the labor movement in the industry so decrease of labor adjustment cost. Similarly, improvement in trade openness provides a rise in IIT thus, labor allocation occurs in the industry and supports low adjustment costs. As expected, an increase in IIT like consumption and openness support low adjustment cost because of labor allocation increases in the industry with the growth of IIT.

On the other hand, labor productivity and labor amount in the industry have negative and significant effects on MD1HI. An increase in those variables decreases both IIT change in percentage change in total trade and market concentration of firms in the manufacturing industry. The decline effects of these variables weaken the movement of labor in subsectors of the industry. Therefore, labor adjustment cost increases by the allocation of labor between various industries. The average wage in the manufacturing industry has no significant effect on precision the relationship between labor adjustment cost and MD1 type marginal Intra Industry Trade measure.

Our investigation contains the MD2 index in the second model to show a different measure of marginal intra-industry trade. In this model, we measure the labor adjustment cost by MD2HI. Consumption in the manufacturing industry has no significant effect on MD2HI. Openness and MIIT have a positive and significant effect on MD2HI. A rise in trade openness of the manufacturing industry may increase the allocation of labor in the same industry so this provides low adjustment costs in the industry. As expected, an increase in the MIIT index rises IIT in total trade so the movement of labor in the industry. The number of labor and productivity of labor does not have a significant effect on MD2HI.

In the last model, we take MIITHI as a proxy of labor adjustment cost. In previous years MIITHI, consumption, MIIT, and the number of laborers in the manufacturing industry have a positive and significant effect on labor adjustment cost. They increase the labor movement in the industry and decrease labor adjustment costs. Employment has a positive effect on MIITHI thus rise the joint effect of MIIT and the market concentration of firms in the industry. By the way, labor force movement rises in the industry so adjustment cost declines. Openness has no significant effect on MIITHI. Other variables of productivity and average wage have no significant effect.

Consequently, we analyze empirically MD1HI, MD2HI, and MIITHI. They have different coefficients at some of the variables but when we investigate those models all of them are statistically significant. However, MD1 has a more significant result about 1% level so it has more powerful results and shows a stronger relationship with several employments, consumption, productivity, trade openness. The research presents that IIT and MIIT have a strong relationship with low adjustment costs as suitable with the literature.

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Appendix

The appendix consists of five tables. The first one presents a list of countries considered, the second one shows descriptive statistics and the third one represents correlations between variables. In table four, we calculate panel unit root tests of independent variables. Table five shows data sources of variables.

Table 3. List of countries considered

Austria	Germany	Neterlands
Belgium	Greece	Portugal
Denmark	Ireland	Spain
Finland	Italy	Sweden
France	Luxembourg	United Kingdom

Table 4. Descriptive Statistics

Variable	Obs.	Mean	Std.Dev.	Min.	Max.
lnCONSUME	420	18,578	1,703	13,767	21,258
WAGE	420	42,558	9,674	23,906	69,541
lnEMPL	420	6,767	1,473	2,219	9,270
lnPROD	420	12,000	0,911	6,921	14,520
lnOPEN	420	14,824	1,212	12,308	17,152
IIT	420	0,760	1,503	0,353	31,386
MIIT	420	0,537	0,165	0,151	0,997

Source: Author's calculation

Table 5. Correlation between variables

	lnCONSUME	WAGE	lnEMPL	lnPROD	lnOPEN	IIT	MIIT
lnCONSUME	1						
WAGE	-0,22	1					
lnEMPL	0,92	-0,37	1				
lnPROD	0,43	0,32	0,12	1			
lnOPEN	0,74	0,11	0,62	0,54	1		
IIT	0,03	-0,02	0,02	0,01	0,00	1	
MIIT	0,28	0,32	0,28	0,18	0,31	0,05	1

Source: Author's calculation

Table 6. Panel Unitroot Tests

LEVEL	lnCONSUME	WAGE	lnEMPL	lnPROD	lnOPEN	IIT	MIIT
Levin, Lin, Chu	-2,44***	-11,50***	-43,88***	-13,49***	0,44	-2,66***	-3,33***
Im, Pesaran and Shin W-stat	3,56***	-1,86**	-2,29**	-3,34***	-1,84**	-5,35***	-9,05***
ADF- Fisher Chi- Square	50,53**	30,47	27,17	45,54**	13,68	75,76***	159,42***
PP- Fisher Chi- Square	50,53**	30,47	27,17	45,54**	13,68	75,74***	159,42***
DIFFERENCE							
Levin, Lin, Chu	-8,60***	-11,43***	-85,27***	-20,46***	-85,27***	-6,77***	-7,08***
Im, Pesaran and Shin W-stat	-3,55***	-9,58***	-9,52***	-10,70***	-10,38***	-11,84***	-13,72***
ADF- Fisher Chi- Square	299,19***	238,19***	224***	301,88***	236,83***	399,53***	655,87***
PP- Fisher Chi- Square	299,19***	238,19***	224***	301,88***	236,83***	399,53***	655,87***

Source: Author's Calculation

Table 7. Data Sources

Export	United Nations Industrial Development Organization (UNIDO)
Import	United Nations Industrial Development Organization (UNIDO)
Consumption	United Nations Industrial Development Organization (UNIDO)
Output	United Nations Industrial Development Organization (UNIDO)
Wage	OECD Statistics
Employment	OECD Statistics
Trade	OECD Statistics
Value Added	OECD Statistics
HI	World Bank