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Diversifications in Turkish industry and trade

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Abstract

The expansion in the World economy over the last two decades had many positive effects on the growth performances of developing countries. The growth performance can be related to the increasing industrial productive capacities and product diversification in these countries. However, industrial progress is not identical over the developing countries. The rapid and aggressive expansion of the Chinese and Indian economies can be taken as an important factor which hinders the industrialization of the other developing economies. In addition to these contradictory developments experienced during the last two decades, recent financial crisis and the decline in the world economy created new obstacles on the developing countries. We think that the degree of the effects of the crises on the developing economies is closely related with the structures of trade and industry.

Turkey is an interesting case regarding product diversification and growth performance in the developing world. The purpose of the paper is to scrutinize the link among the product diversification, the trade diversification, and trade partners. Emphasis is given on export diversification.

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1. Introduction

The expansion in the World economy over the last two decades had many positive effects on the growth performances of developing countries. The growth performance can be related to the increasing industrial productive capacities and product diversification in these countries. However, industrial progress is not identical over the developing countries. The rapid and aggressive expansion of the Chinese and Indian economies can be taken as an important factor which hinders the industrialization of the other developing economies. In addition to these contradictory developments experienced during the last two decades, recent financial crisis and the decline in the world economy created new obstacles on the developing countries. We think that the degree of the effects of the crises on the developing economies is closely related with the structures of trade and industry. The discussions on these issues rest on the growth and development literature. The sources and the consequences of the income differences between countries have been widely discussed during the last two decades. The determinants of the successful growth are the main concerns of the recent literature. Following the contributions of Romer (1986), Romer (1990) and Lucas (1998) on technology and human capital, Grossman and Helpman, (1991) emphasized the role of trade on diffusion of technology. The effects of trade partners on diffusion of technology are introduced by Coe and Helpman (1995) and Coe et al (1997), and Acemoğlu and Zilibotti (2001) emphasized the importance of factor endowments and institutions in growth theory.

As trade placed at the heart of growth theory, the structure of trade and the improvement in the trade structure have become another center of attraction in the discussion of growth puzzle. Turkey is an interesting case regarding product diversification and growth performance in the developing world. The purpose of the paper is to scrutinize the link among the product diversification, the trade diversification, and trade partners.

The paper is organized as follows. In Section 2 we introduce a brief theoretical background of the paper. Section 3 provides highlights of the manufacturing industry in Turkey. Section 4 devoted to the finding of the empiric model. Section 5 concludes the paper.

2. Background literature

The background literature of the paper is mainly based on development economics. There is an extensive debate on the causes behind the growth success of the countries, which have displayed strong growth performance. The literature of the debate can be classified under three broad categories: i) The mantra is that there is a positive link between growth and openness over the last three decades. Following this mantra there emerges a question: the positive relationship between the openness and growth fail? In other words, is this the end of the unlimited/unbounded

trade globalization? ii) Is there a new path in changing economic environment in the aftermath of the last crisis in 2008? Is this the return to protectionism? iii) What will be the new trend in economic policies? International economic policies keep trying to restore the old financial system. However, the focus already moved to the real sector at the national economic policy level. The structure of industry and trade began to attract attention more than ever. Furthermore, the old development literature revisited and the importance of having a strong industrial sector rediscovered. Industrial policies, product diversification and trade diversification are the new concepts of recent contributions.

The relationship between growth and openness was the first part of the debate. Going back from the present to the early years of 1980s, the common view is that openness is one the leading factor behind the successful growth performances. Dani Rodrik emphasizes the role of G7 countries and multilateral lending agencies as the defender of this view.[1] Here, it is possible to refer Balassa (1989) and Edwards (1993) as supporters of the view (or the academia behind this view). Winters (2004) also publish a comprehensive work which covers the related literature. Winters (2004: F18) highlights that openness strongly affects economic performance. However, the link between openness and growth is remained a controversial issue in the last decade. Rodriguez and Rodrik (2001) criticize the existence of the link between trade and growth by referring some econometric problems in many related empirical literature. Lucas (2009) may be shown the last work on the growth performances and convergence issue of the open economies.

However, the severe world economic crisis in the 2008 raised the protectionism as a new alternative economic policy. This fact, to return to protectionism, is a counter policy which has been implemented during the last three decades. Literature on openness - economic growth nexus does not give clear signals to the post-crisis developments. Therefore, we think that, it is necessary to consider the literature focused on structure of industry, structure of trade and effect of trade partners, rather than the literature on direct link between openness and growth performance.

Here, the literature has two focuses: First is the diversification of the manufacturing composition. Rodrik (2007: p.9 in UN report) claims that "*economic development requires diversification, not specialization*" However, the efforts to link the trade diversification and economic growth should also consider the stages of development. Imbs and Wacziarg (2003) state that "*(...) economies grow through two stages of diversification. At first, sectoral diversification increases, but there exists a level of per capita income beyond which the sectoral distribution of economic activity starts concentrating again. In other words, sectoral concentration follows a U-shaped pattern in relation to per capita income.*"

The quality of export is another issue that the paper will focus. The countries which their exports have high quality goods have better growth performance (Hidalgo, Klinger, Barabási and

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[1] "*The prevailing view in G7 capitals and multilateral lending agencies is that integration into the global economy is an essential determinant of economic growth*" (Rodrik, 2001: 10).

Hausmann, 2007). Rodrik (2006b) and Hausmann, Hwang and Rodrik (2006) also found similar results.

There are number of studies which focus on the Turkish manufacturing and trade structure. Among others, for the structure of the Turkish manufacturing Doğruel and Doğruel (2008), for the structure of the Turkish manufacturing exports Erlat and Erlat (2005 and 2006), Erlat, Erlat and Şenoğlu (2007) can shown as the examples of these studies.

3. The Structure of Turkish Manufacturing

Manufacturing has been accepted as the crucial sector during the republican era. Industrialization has been one of main targets since the early years of the Republic. Import substitution was the main industrialization strategy before the 1980. To open up the economy was the main target of governments after 1980. The share of industry in the Turkish exports gradually increased from 36.6% in 1980 to 93.8% in 2006.

The share of industry in GDP has displayed an inverse U-shape pattern in industrialized countries. It seems that Turkey is increasing part of this pattern (Figure-1). I spite of growing share of Turkish manufacturing, its product composition is far from being satisfactory comparing with the other industrializing upper-middle income countries. Turkish manufacturing sector is still dominated by low and medium-low technology product (Figure-2). Similar structure can be seen for the Turkish manufacturing exports (Figure-3).

Figure 1: The share of manufacturing in total employment and GDP (%)
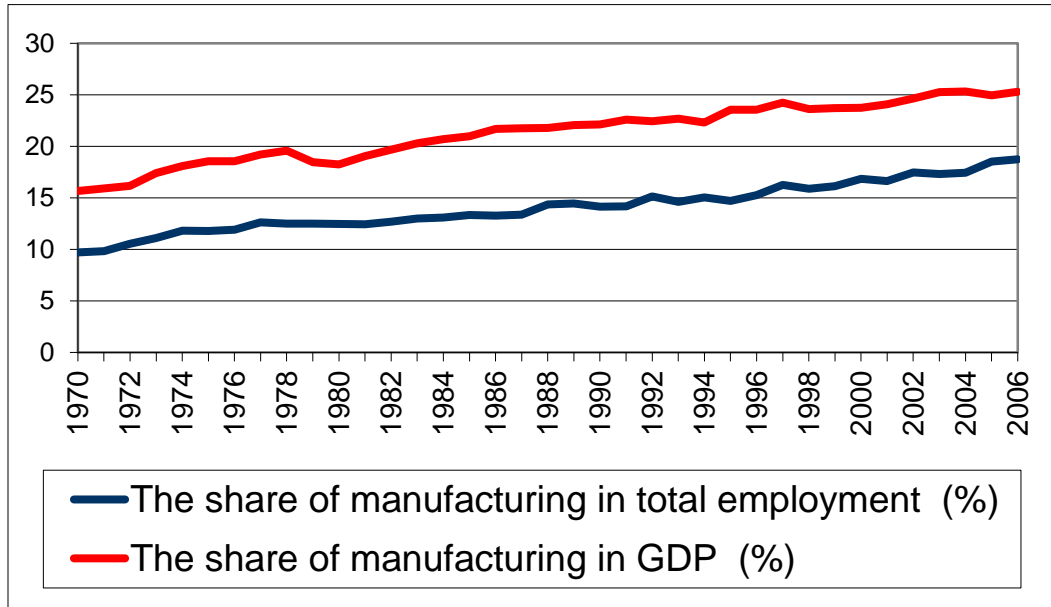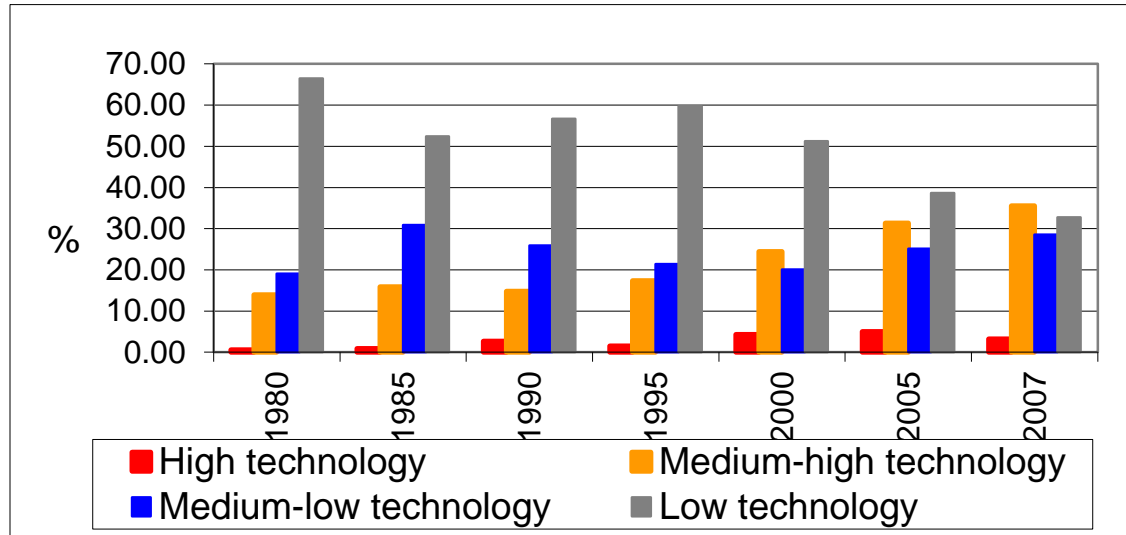

Source: Dogruel and Dogruel (2008).

Figure 2: Production composition of the Turkish manufacturing sector
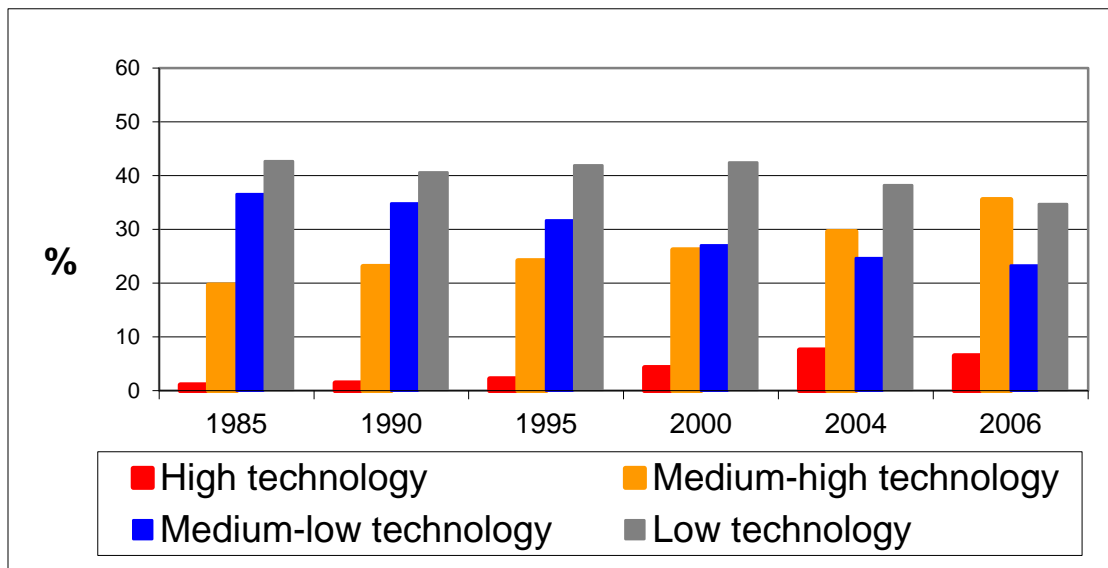
Source: Dogruel and Dogruel (2008).

Figure 3: Composition of the Turkish manufacturing exports

Source: Dogruel and Dogruel (2008).

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4. Methodology and Analysis:

Although, the paper is based on the mainstream literature in development and growth theories, it can be defined as a study in the empirical growth economics. In this sense, the empirical model given below can be defined as "informal growth regression" (Temple, 1999). In other words, specification of the model is drawn from some stylized facts of the Turkish economy rather than as a reduce form of a theoretical model. We think that the model can be applied to other economies which have similar industrial structure and development level with Turkey.

The model identified in this section intends to explain the determinants of the diversification. Growth performance, industrial structure, trade partners and domestic market size are considered as the common factors to explain diversification of manufacturing exports. The main assumption of the model is that economic growth stimulates sectoral diversification at some income level. Imbs and Wacziarg (2003) show that *"Poor countries tend to diversify, and it is not until they have grown to relatively high levels of per capita income that incentives to specialize take over as the dominant economic force."* They also claim that "… *increased sectoral specialization, although a significant development, applies only to high-income economies. Countries diversify over most of their development path."* Following *"the approach of Imbs and Wacziarg (2003)"* Klinger and Lederman (2004) found that *"similar to total*

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production, a country's export basket becomes more diversified as income rises until a relatively high level, at which point the process reverses itself and specialization occurs." [2]

Mutual interaction between growth and diversification is the main obstacle to the construction of an econometric model. This difficulty can be solved by selecting explanatory variables which do not create endogeneity problem. Under these considerations, the econometric model for export diversification is as follows:

EXD = f(GROW, DM, TP OPENN, MAND)

Export diversification in manufacturing (EXD) is the dependent variables of the model. Average growth rates of past 10 years (AV10) and growth volatility (STDEV10) are the variables of the growth performance vector (GROW). Growth volatility as one of the growth performance indicators can also control the effect of the macroeconomic stability on the depended variables. The effects of the domestic market size on the export performance of an economy are widely discussed in economic literature. Clougherty and Zhang (2008) state that the *"impact of domestic market structure on export performance has received a good deal of scholarly attention since the 1970s."*[3] Domestic market size has also effects on product diversification trough scale effect. Therefore, size of domestic market (DM) is employed as the explanatory variable in the model. DM is typically defined as DM = GDP + IMPORTS – EXPORTS. Considering that the interaction between level of income and diversification, the conventional definition of domestic market size is not used in the model in order to eliminate endogeneity problem. Therefore, growth rate of GDP (GROWTH) is employed as an explanatory variable in the model to control the effects of the change in domestic market on export diversification.[4] Structure of trade partner has important effects on the economic performance as a whole. In addition to the historic ties with the partners, transportation cost (à la Marshal, 1920 and Krugman, 1991) and the role of the trade partners on the diffusion of technology are widely discussed in recent years. Considering the discussions on structure of trade partner which emphasize the diffusion of knowledge from rich technology producing countries to developing countries, distribution of trade partners (TP) is employed as the explanatory variable in the model. Focusing on the discussions on diffusion of technology[5], TP is defined as the share of EU or OECD in Turkish total exports. Interaction between openness and growth is widely discussed in the growth literature. It is possible to assume that openness (OPEN) can affect the export diversification indirectly through its effect on growth and through competition directly. Openness and trade partner can be considered as the external determinants of the export diversification.

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[2] Klinger and Lederman (2004) "use GDP per capita rather than the log of GDP per capita to remain consistent with the approach of Imbs and Wacziarg (2003)."
[3] Clougherty and Zhang (2008) survey the related literature.
[4] Use of growth rate rather than level also solves the unit-root problem.
[5] See for example Coe et al (1997), and Coe and Helpman (1995).

Considering the interaction between export diversification and product diversification, we use product diversification in manufacturing (MAND) as an explanatory variable in the model specified above. Similar regression model can also be defined and estimated to explain the product diversification. In order to eliminate endogeneity problem due to the similarity of the determinants of these two indicators, lagged value of MAND is employed for estimations.

Main data source is TURKSAT. Herfindahl–Hirschman Index (HHI) is used as the measure of diversification. ISIC Rev3 4-digit level manufacturing export data is used for calculation of HHI index. To calculate product diversification of the manufacturing sector ISIC Rev3 2-digit level manufacturing output data is used. As the first stage, manufacturing sector is taken as a whole. As the second stage, the model is estimated for each four subgroups of manufacturing sector. These subgroups are high technology, upper-medium technology, lower-medium technology and low technology.[6] OLS estimation method is employed for the first stage estimation after necessary corrections made for removing the unit roots. Since the subgroups are interrelated through allocation of resources within an economy, SUR is used for estimating the model at subgroup level simultaneously.

OLS estimation results of the regression model for export diversification are displayed in Table-1. The models 1 to 4 basically have same structure in terms of the characteristics of the explanatory variables. All models have growth rate (GROWTH), 10 year average growth rate (AV10) and standard deviation of growth rate during the last 10 years (STDEV10) to control the effects of change in domestic demand, long run economic growth and growth volatility on export diversification respectively. For the structure of trade partners one of the two indicators are used in each models. These indicators are share of EU countries and share of OECD members in Turkish manufacturing exports. Two alternative indicators are used also for openness: Simple openness indicator as the ratio of trade volume to GDP (OPENN1), and import penetration ratio (OPENN2) which is defined as Imports / (GDP– Exports). In order remove unit root first differences of these indicators are calculated.[7] Considering that not only present degree of openness but the trend of openness may affect the export diversification, last three year average of first differences is employed in model estimation.

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[6] For definition of subgroups (Classification of manufacturing industries based on technology) see OECD (2003: 156, Annex 1).
[7] All variables used in the model are tested by Augmented Dickey-Fuller unit-root test and Phillips-Perron unit-root test

Table 1: Estimation Results – OLS(*)

Model 1	Coeff	Signif	Model 2	Coeff	Signif
Constant	*-0.0286*	*0.5889*	*Constant*	*-0.0948*	*0.1019*
EU	0.0008	0.0137	OECD	0.0009	0.0679
OPEN2	0.0066	0.0020	OPEN2	0.0053	0.0187
GROWTH	-0.0011	0.0065	GROWTH	-0.0010	0.0148
AV10	0.0126	0.0019	AV10	0.0133	0.0024
STDEV10	*-0.0110*	*0.0489*	*STDEV10*	*-0.0068*	*0.2009*
MAND(-1)	0.6898	0.0299	MAND(-1)	0.9778	0.0026
R2	0.914		R2	0.898	
D-W	1.796		D-W	1.512	

Model 3	Coeff	Signif	Model 4	Coeff	Signif
Constant	*-0.0805*	*0.1408*	*Constant*	*-0.0123*	*0.8057*
OECD	0.0009	0.0435	EU	0.0008	0.0076
OPEN1	0.0048	0.0055	OPEN1	0.0058	0.0005
GROWTH	-0.0008	0.0186	GROWTH	-0.0008	0.0114
AV10	0.0143	0.0008	AV10	0.0137	0.0004
STDEV10	-0.0091	0.0867	STDEV10	-0.0134	0.0158
MAND(-1)	0.8536	0.0052	MAND(-1)	0.5452	0.0654
R2	0.911		R2	0.926	
D-W	1.638		D-W	1.922	

*) Italics indicate that the significance level is lower than 10 percent.

Estimation results show that trade structure and openness indicators have significant coefficients in all models. If we consider that increase in the level of openness open up the economy to international competition, this result reveals that the increases in the openness stimulate the specialization in the manufacturing exports. Long run economic growth (AV10) also displays similar effect on manufacturing exports. Growth volatility, on the other hand, shows opposite effect on exports: Increase in volatility results export diversification, probably through firms' tendency to reduce the risk factor. However, growth volatility coefficients are significant only in Model 3 and 4. Estimation results also show that there is a strong correlation between export diversification and product diversification.

Interaction between export quality and economic growth is another issue widely discussed in the literature. One way to include export quality into analysis is to use an index.[8] In this paper we prefer an alternative approach: The model is estimated for each four technology

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[8] For the examples of the indexes to measure export quality see Desroches et al (2006) and Hausmann et al (2007).

subgroups of manufacturing sector. These subgroups are high technology, upper-medium technology, lower-medium technology and low technology. Since the allocation of the resources in the manufacturing sector across sub sectors are interrelated, SUR method is employed. Considering that the diversification within the subgroups is affected by the diversification in whole manufacturing sector, simultaneous equation system includes the equation for total manufacturing along with the equations for four subgroups. In order to control interdependency between subgroups, share of each subgroup in total manufacturing (SA, SB, SC and SD for the share of high, upper medium, lover medium and low technology groups respectively) is used as a explanatory variable in the equations specified for subgroups. HHI index is calculated for each subgroup considering the share of 4 digit level sectors in sum of subgroup sector's exports (EXDA, EXDB, EXDC and EXDD for high, upper medium, lover medium and low technology groups respectively). SUR results are displayed in Table-2.

Considering significant coefficient estimates, the sign of the coefficients for subgroups are same as the OLS results excluding high technology subgroup. In high technology subgroup, it seems that openness and long-run economic growth lead product diversification and expansion in domestic demand increases specialization. Another variation between OLS and SUR estimates can be observed in high and low technology groups: For all model specifications, coefficients of STDEV10 are insignificant. This results show that growth volatility has no effect on diversification of these groups' exports. Estimation results also show that the change in trade partner has no effect export diversification in lover medium group.

Table 2: Estimation Results - SUR

Model 1	Coeff	Signif	Model 2	Coeff	Signif
Dependent Variable EXD			**Dependent Variable EXD**		
Constant	*-0.0286*	*0.5128*	Constant	-0.0948	0.0400
EU	0.0008	0.0011	OECD	0.0009	0.0205
OPEN2	0.0066	0.0000	OPEN2	0.0053	0.0020
GROWTH	-0.0011	0.0002	GROWTH	-0.0010	0.0013
AV10	0.0126	0.0000	AV10	0.0133	0.0000
STDEV10	-0.0110	0.0117	STDEV10	-0.0068	0.1139
MAND(-1)	0.6898	0.0049	MAND(-1)	0.9778	0.0000
Dependent Variable EXDA			**Dependent Variable EXDA**		
Constant	*0.2880*	*0.6007*	*Constant*	*-0.3302*	*0.5562*
EU	*0.0015*	*0.6336*	OECD	0.0166	0.0106
OPEN2	*-0.0127*	*0.5190*	OPEN2	-0.0457	0.0495
GROWTH	*0.0055*	*0.1454*	GROWTH	0.0083	0.0327
AV10	*0.0008*	*0.9822*	*AV10*	*-0.0448*	*0.2509*
STDEV10	*0.0010*	*0.9861*	*STDEV10*	*0.0164*	*0.7493*
MAND(-1)	*-0.9477*	*0.7659*	*MAND(-1)*	*-2.4996*	*0.3688*
SA	*0.0149*	*0.1558*	*SA*	*-0.0102*	*0.4444*
Dependent Variable EXDB			**Dependent Variable EXDB**		
Constant	-0.2365	0.0097	Constant	-0.3277	0.0007
EU	0.0022	0.0001	OECD	0.0028	0.0001
OPEN2	0.0114	0.0010	*OPEN2*	*0.0041*	*0.2203*
GROWTH	-0.0016	0.0144	*GROWTH*	*-0.0008*	*0.2042*
AV10	0.0116	0.0413	*AV10*	*0.0076*	*0.2013*
STDEV10	-0.0290	0.0015	STDEV10	-0.0156	0.0474
MAND(-1)	0.8901	0.0708	MAND(-1)	1.0877	0.0243
SB	0.0113	0.0000	SB	0.0097	0.0000
Dependent Variable EXDC			**Dependent Variable EXDC**		
Constant	*-0.1082*	*0.6539*	*Constant*	*-0.0291*	*0.9131*
EU	*0.0011*	*0.3545*	*OECD*	*-0.0017*	*0.3501*
OPEN2	0.0326	0.0000	OPEN2	0.0338	0.0000
GROWTH	-0.0050	0.0001	GROWTH	-0.0052	0.0001
AV10	0.0196	0.1263	AV10	0.0286	0.0242
STDEV10	-0.0463	0.0198	STDEV10	-0.0374	0.0473
MAND(-1)	3.4558	0.0032	MAND(-1)	3.8436	0.0007
SC	0.0035	0.0503	*SC*	*0.0024*	*0.1430*
Dependent Variable EXDD			**Dependent Variable EXDD**		
Constant	*-0.1129*	*0.3305*	Constant	-0.3334	0.0000
EU	0.0024	0.0005	OECD	0.0046	0.0000
OPEN2	0.0070	0.1025	*OPEN2*	*-0.0006*	*0.8297*
GROWTH	*-0.0005*	*0.5299*	*GROWTH*	*-0.0001*	*0.8420*
AV10	0.0204	0.0082	AV10	0.0141	0.0090
STDEV10	*-0.0040*	*0.7299*	*STDEV10*	*0.0026*	*0.7135*
MAND(-1)	1.3565	0.0490	MAND(-1)	1.6267	0.0003
SD	*0.0000*	*0.9272*	*SD*	*0.0004*	*0.1423*

Italics indicate that the significance is lower than 10 percent.

Table 2: Cont.

Model 3	Coeff	Signif	Model 4	Coeff	Signif
Dependent Variable EXD			**Dependent Variable EXD**		
Constant	*-0.0805*	*0.0664*	*Constant*	*-0.0123*	*0.7666*
OECD	0.0009	0.0095	EU	0.0008	0.0003
OPEN1	0.0048	0.0002	OPEN1	0.0058	0.0000
GROWTH	-0.0008	0.0020	GROWTH	-0.0008	0.0008
AV10	0.0143	0.0000	AV10	0.0137	0.0000
STDEV10	-0.0091	0.0307	STDEV10	-0.0134	0.0014
MAND(-1)	0.8536	0.0001	MAND(-1)	0.5452	0.0193
Dependent Variable EXDA			**Dependent Variable EXDA**		
Constant	*-0.6595*	*0.2511*	*Constant*	*0.1768*	*0.7509*
OECD	0.0201	0.0019	*EU*	*0.0018*	*0.5813*
OPEN1	-0.0535	0.0055	*OPEN1*	*-0.0187*	*0.2500*
GROWTH	0.0077	0.0258	*GROWTH*	*0.0056*	*0.1075*
AV10	-0.0660	0.0966	AV10	-0.0028	0.9393
STDEV10	*0.0549*	*0.3114*	*STDEV10*	*0.0203*	*0.7266*
MAND(-1)	*-1.6014*	*0.5596*	*MAND(-1)*	*-0.4462*	*0.8894*
SA	*-0.0205*	*0.1414*	*SA*	*0.0125*	*0.2398*
Dependent Variable EXDB			**Dependent Variable EXDB**		
Constant	-0.3298	0.0007	Constant	-0.2153	0.0291
OECD	0.0029	0.0001	EU	0.0021	0.0006
OPEN1	*0.0023*	*0.3815*	OPEN1	0.0072	0.0165
GROWTH	*-0.0006*	*0.3148*	GROWTH	-0.0010	0.1275
AV10	*0.0079*	*0.2000*	AV10	0.0128	0.0393
STDEV10	-0.0153	0.0686	STDEV10	-0.0272	0.0087
MAND(-1)	1.0299	0.0341	*MAND(-1)*	*0.6917*	*0.1950*
SB	0.0097	0.0000	SB	0.0108	0.0000
Dependent Variable EXDC			**Dependent Variable EXDC**		
Constant	*0.1033*	*0.6765*	*Constant*	*0.0067*	*0.9758*
OECD	*-0.0016*	*0.3076*	*EU*	*0.0011*	*0.3382*
OPEN1	0.0292	0.0000	OPEN1	0.0285	0.0000
GROWTH	-0.0041	0.0002	GROWTH	-0.0040	0.0004
AV10	0.0336	0.0037	AV10	0.0252	0.0285
STDEV10	-0.0518	0.0036	STDEV10	-0.0594	0.0014
MAND(-1)	2.9100	0.0061	MAND(-1)	2.6353	0.0147
SC	0.0019	0.2258	SC	0.0031	0.0629
Dependent Variable EXDD			**Dependent Variable EXDD**		
Constant	-0.3304	0.0000	*Constant*	*-0.1017*	*0.3875*
OECD	0.0046	0.0000	EU	0.0024	0.0004
OPEN1	*0.0005*	*0.8238*	OPEN1	0.0059	0.0896
GROWTH	*-0.0002*	*0.6867*	*GROWTH*	*-0.0002*	*0.7331*
AV10	0.0147	0.0075	AV10	0.0218	0.0046
STDEV10	*0.0016*	*0.8277*	*STDEV10*	*-0.0060*	*0.6187*
MAND(-1)	1.6755	0.0002	MAND(-1)	1.2497	0.0715
SD	*0.0003*	*0.2619*	*SD*	*-0.0001*	*0.8331*

Italics indicate that the significance is lower than 10 percent.

5. Conclusion

Growing importance of trade in growth literature basically stresses the external dimensions. In this respect, role of trade partners is an important determinant of the output and quality. On the other hand, trade diversification is linked nonlinearly to economic growth. The results of the paper show that external factors have strong effects on the diversification in the total manufacturing exports and exports of the technology groups except lower medium technology group. Econometric model estimations show that the structure of the trade partner has no effect on the degree of export diversification in lower medium technology products. The findings reveal that internal factors also have large effects on the trade diversification in Turkey. Long run economic growth and open up the domestic market to international competitiveness through trade liberalization stimulate the specialization in manufacturing exports. Increase in the share of developed market in Turkish manufacturing export also leads to specialization. On the other hand, growth volatility has opposite effect. However, these results are not identical across technology subgroups.

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