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Openness and Productivity Growth in Turkish Manufacturing

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Abstract

This paper examines the dynamics of productivity growth in Turkish manufacturing industry before and after the liberalization of the economy. Using industry level data, the paper shows that the move from import-substituting industrialization to an outward-oriented strategy improved growth performance and it is productivity that is responsible for almost half of the growth in value added. There is also evidence that industries that face stronger competition after reform observed higher productivity growth rates whereas increased exports do not significantly affect productivity.

JEL Codes: F14, F43, O47, O52

Keywords: Trade liberalization, total factor productivity growth, Turkey

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Türk İmalat Sektöründe Dışa Açıklık ve Verimlilik

Öz

Bu çalışma ekonominin serbestleşmesi öncesi ve sonrası Türk imalat sanayisinde verimlilik büyümesinin dinamiklerini inceliyor. Makale, sektör düzeyinde veri kullanarak, ithal ikameci sanayileşmeden dışa yönelik stratejiye geçişin büyüme performansını ve verimliliğini geliştirdiğini ve bunun neredeyse katma değer artışının yarısını sağladığını gösteriyor. Ayrıca, artan ihracat verimliliği anlamlı olarak etkilenmezken, reform sonrası daha güçlü rekabet ile yüz yüze gelen endüstrilerde daha yüksek verimlilik artışının gözlendiğine dair işaretler de bulunmaktadır.

JEL Kodları: F14, F43, O47, O52

Anahtar Kelimeler: Dış ticarette serbestleşme, toplam faktör verimliliği büyümesi, Türkiye.

1. Introduction

It has been forcefully argued that international trade and openness is very effective in promoting growth. There is a long list of literature on the importance of trade in improving economic welfare, however, it is not clear how it interacts with long-run economic growth and productivity. This paper discusses the extent of the effect of international trade on growth performance and productivity dynamics in Turkey by comparing two decades before and after opening the economy.

The ambiguity about the effectiveness of trade is partly due to various theoretical models that often reach conflicting results, and partly due to inconclusive empirical research. Most of the arguments for freer trade developed in the 1970s lacked analytical foundations, "too often, the preferred method of proof is a casual appeal to common sense," (Rodrik, 1995) and are one-sided and incomplete leading to contradictory conclusions once rigorously analyzed[1]. The new trade theory, to remedy the failures of earlier research, provides a more rigorous analysis of the relationship between trade and growth, however, reaches ambiguous conclusions. In static models of international trade, for example, the presence of externalities (imperfect competition and/or increasing returns to scale) may force domestic firms to reduce their mark-ups and to expand their output, thus generating a welfare gain; but it may also cause contraction of import competing industries that are more likely to observe increasing returns to scale, especially in a developing country, and lead to a deterioration in economic growth.

Similarly, the predictions of growth theory vary with the assumptions on which the model is based. In neo-classical growth theory, trade policy has no effect on long-run growth, but speeds up the transition to the steady state. On the other hand, endogenous growth models of learning-by-doing or technological spillovers predict higher long-run growth rates for open economies (Grossman and Helpman, 1991). In general, these models predict that initially backward economies catch up with the leaders when the economy is opened to free trade. Yet, if spillovers are constrained by national boundaries and international trade forces less developed economies to specialize in

[1] Two major arguments have been easily dismissed by Rodrik (1995). It has been argued, for example, that relative-price distortions through tariffs and investment subsidies prohibit learning by increasing the relative-profitability of these industries. Yet, these arguments tend to ignore that it is also true that the opposite holds for industries that are at a disadvantage because of the same policies. Similar arguments for X-efficiency, that tariffs increase entrepreneurial slack in import-competing sectors because they raise the relative price of these industries', overlook that the same tariffs should decrease such a slack in other industries.

primary goods production rather than technology-intensive sectors, the effect of opening the economy to free trade could be disastrous[2].

Since theory does not provide an unambiguous relationship between trade policy and growth, empirical analysis becomes more and more important to bear upon the issue. The existing empirical work, either multi-country case studies of early 1970s or cross-country econometric approach, such as Dollar (1992), Sachs and Warner (1995) and Edwards (1998), while producing a positive link between trade policy and growth, is far from being convincing. Rodriguez and Rodrik (1999) scrutinize the most cited research on the relationship between trade and growth and conclude that they are not persuaded of a significant negative relationship between restrictive trade policy and growth. Both Edwards (1998) and Rodriguez and Rodrik (1999) conclude that more disaggregated country studies are required for further understanding of the relationship between trade and economics of innovation and productivity.

Among an array of recent country studies, Kim (2000), for example, investigates the effects of trade policy on productivity growth in Korean manufacturing and finds a significant negative effect of quantity restrictions on productivity growth, though the importance of this finding diminishes in the face of estimated bleak productivity growth. Pavcnik (2002) uses plant level manufacturing data to evaluate productivity gains from trade liberalization in Chile and concludes, through a careful econometric analysis, in favor of liberalization, especially significantly higher productivity growth in import competing sectors. Nonetheless, she fails to identify any significant effect of trade on the productivity of exporting firms. Similarly, Clerides, Lach and Tybout (1998) using Colombian, Mexican and Moroccon, Aw, Chen and Roberts (1997) using Taiwanese and Bernard and Jensen (1999) using U.S. data find that the correlation between exports and productivity is mostly due to self-selection, that is, exporting does not accelerate productivity growth, instead typically more productive firms are involved in export market.

Earlier studies on Turkey report a positive impact of trade liberalization on productivity. The study by Krueger and Tuncer (1982) report that productivity growth was faster during the periods of liberalization. Similarly, Nishimizu and Robinson (1984) find that productivity growth increases with export expansion. Both of these studies cover the 1963-1976 period, when trade policy in Turkey was ‘a protectionist’s dream’ (Levinsohn, 1993), despite some and rather weak liberalization attempts. The

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[2] In particular, models that emphasize technology transfer also distinguish the channel through which trade affects productivity growth. Some of these models argue that increasing imports enhance productivity growth directly as inputs into production and indirectly through reverse-engineering of these goods (Connolly, 1998); and others claim that exporting sectors experience higher productivity growth in the presence of sector specific learning-by-doing due to specialization forced by trade and thus increased size and sectoral learning (Feeney, 1999).

paper by Levinsohn (1993) is the first one that exploits the reforms of the 1980s, and tests 'imports as a market discipline' hypothesis. His results show that for majority of industries, removing barriers to import decreases market power. Finally, the study by Foroutan (1996) concludes that industries that are classified as export industries grew faster after 1980.

This paper contributes to the same debate by analyzing productivity performance of the Turkish manufacturing before and after trade liberalization. One of the criticisms of the existing empirical literature is that openness measures are not good indicators of trade policy. The empirical analysis starts with an evaluation of the performance of Turkish manufacturing industry under two distinct trade regimes without relying on any openness measure. The long span of data provides evidence whether productivity gains are persistent. It also helps to avoid the problem observed in studies with short time dimensions, namely, that the relationship between trade liberalization and productivity growth is blurred because it is not clear whether the gains are due to trade policy changes or concurrent other shocks. Furthermore, identifying different sub-periods under the same trade regime allows some control for macroeconomic factors, in particular, macroeconomic uncertainty, that are quite common in developing countries and that might also affect results adversely. The paper finds that there is indeed an improvement in the productivity performance of Turkish manufacturing industry after the economy is opened to free trade. Growth accounting exercise shows that improvement in productivity is responsible for almost 50% of value-added growth. The results also hint to a number of potential limitations, namely, that the pace of productivity growth declines somewhat in later years of liberalization and that factor accumulation was faster during the import-substituting industrialization period.

Previous research based on plant level data has well established that exporting firms are more efficient than their domestic competitors, but few, Bernard and Jensen (1999) and Clerides et al. (1998), have tested the causality. This paper attempts to provide evidence for the direction of causality between trade variables, export growth and changes in import penetration, and productivity growth. To overcome the endogeneity problem the paper employs vector autoregressions and Granger-causality tests. The efficiency of the estimation is achieved using the panel structure of the data and consistency is established by the use of the generalized method of moments estimation.

The results indicate that trade share, measured as the share of imports and exports in total output, Granger-causes productivity growth and that the effect is positive, thus supports the hypothesis that increased trade improves productivity performance. Decomposing trade into exports and imports and applying causality tests show that higher import-sales ratio improves productivity in that industry, whereas there is no evidence of causality from exports to productivity, confirming earlier results. The results provide support for models where technology is assumed to diffuse through imports, but indicate that there is no significant learning-by-exporting. Furthermore, the analysis shows that faster growth in productivity improves trade balance by increasing exports and by reducing the level of import penetration.

The rest of the paper is organized as follows: next and the following sections describe the Turkish experience and the data. Section 4 compares the growth of output, factor inputs and productivity before and after trade reforms. The section also provides a growth accounting exercise. Section 5 discusses Granger-causality tests between trade and productivity growth using data after 1980. Finally, section 6 concludes.

2. The Turkish Experience

Turkey, after twenty years of import-substituting industrialization, which came to an end in 1979 following a severe payment crisis that paralyzed the second half of seventies, was forced to move to an outward-oriented growth strategy by liberalizing first trade and then the financial system[3]. In January 1980, Turkish government undertook a major devaluation of the currency and promoted exports through a variety of tools such as tax rebates, credit subsidies and foreign exchange allocations for the imports of intermediate goods. In 1984, an Import Program was initiated. With this program quantity restrictions were eliminated significantly (60 percent of 1983 imports are liberalized) and tariffs for the majority of imports were reduced by 20 percent (Baysan and Blitzer, 1990). As of 1988, major trade liberalization was already established. During the same period a significant cut in real wages was also observed. The share of wages in value added fell down to 17% in 1988 from 30% in 1980. Reduced wages meant cheap inputs for industry as well as a reduction in domestic absorption, both of which contributed to the increase in exports. In 1989, the government moved to financial liberalization by allowing real exchange rate to appreciate and by liberalizing capital account fully. The new policies aimed to increase inflows of funds into the domestic economy in order to ease the financing of public deficit. The financial liberalization reform coincides with populism in Turkey. The removal of barriers in political life in 1987 that were established in 1980 after a coup, strong pressures by trade unions, and defeat of the governing party in 1989 local elections mounted populist pressures on government. Consequently, real wages increased significantly ending almost a decade long low wage period.

Despite successful and rapid liberalization of trade and capital markets, macroeconomic stability could not be established. Inflation was reduced to 35% in the first few years of reform from an over 100% level in 1980, but increased back again to

[3] The nature and effects of liberalization have been discussed in detail in Aricanli and Rodrik (1990), Senses (1994) and Togan and Balasubramanyam (1996), among others.

a plateau above 60% after 1988. Fiscal deficit kept increasing and public sector borrowing requirement reached well above 10% in the early years of 1990s.

Turkish manufacturing observed a rapid export and a modest import growth after 1980. Both the dollar value and volume of manufacturing exports rose drastically. The export-output ratio rose from a mere 4% until 1980 to over 20% in the next sixteen years while the volume of manufacturing exports grew 17% annually. The leading exporters in 1980, textiles, food and clothing industries were later joined by iron and steel, rubber, fabricated metal and electrical machinery industries; these industries' export shares increased from less than 2% in 1980 to more than 10% at the end of the sample period. The volume of imports, on the other hand, rose by 8% per annum, mostly after 1988. Despite an 18% increase in 1984 immediately after liberalization, imports rose very slowly thereafter. The share of imports in total domestic sales of manufacturing industry increased only to 20% in 1995 from 15% in 1980. The composition of imports that consisted of mostly durable goods, particularly chemicals, miscellaneous petroleum products and machinery did not change significantly.

In the empirical analysis the sample period is divided into four sub-periods, two under each trade regime, to avoid any misleading conclusion because of recession years or changes in other policy variables. The sub-periods before 1980 are defined by the balance of payment crisis that began in 1976 and quite apparent in the data. While it is possible to identify different periodizations for the liberalization process, two particular periods are chosen: 1980-1988 as the first phase, when trade liberalization took place, and 1989-1996 as the second phase corresponding to financial liberalization. It should be noted that the second phase also coincides with populism. With the removal of barriers in political life and strong pressures by trade unions, real wages increased drastically in 1988 reaching their pre-1980 level.

3. Data

The data is obtained from Annual Surveys of Manufacturing Industry conducted by the Turkish Institute of Statistics (formerly State Institute of Statistics) and cover private establishments with ten or more persons engaged. The details of the data, construction of price indices and capital stock variables are described in the appendix.

The productivity measure used in the paper is total factor productivity, defined as the residual after the contribution of accumulation of all factors is removed from output growth[4]. More formally, suppose value added is produced by using two inputs[5], labor and capital, and technology, A:

$$Y = F(A,K,L) \tag{1}$$

Totally differentiating this function, assuming Hicks-neutral technology, and with some manipulation one obtains:

$$\frac{dY}{Y} - \frac{dK}{K} = s_L\left(\frac{dL}{L} - \frac{dK}{K}\right) + (\mu - 1)s_L\left(\frac{dL}{L} - \frac{dK}{K}\right) + (\gamma - 1)\frac{dK}{K} + \frac{dA}{A} \tag{2}$$

where s_J is the share of Jth input total revenue, μ is the markup and γ is the returns to scale parameter.

Under the assumption of perfect competition and constant returns to scale, $\mu = \gamma = 1 = s_K + s_L$, Equation (2) reduces to

$$\left(\frac{dA}{A}\right)^{SR} = \frac{dY}{Y} - s_K\frac{dK}{K} - s_L\frac{dL}{L} \tag{3}$$

The term $(dA/A)^{SR}$ is simply the residual growth of value added after the contribution of inputs are removed and is called the Solow residual. The difference between Eqs. (2) and (3) indicates that the Solow residual overestimates the technology when there is imperfect competition and/or when industries operate under increasing returns to scale.

Measurement of trade orientation and openness is a controversial issue. Edwards (1998) and Rodriguez and Rodrik (1999) discuss that most of the indicators are limited in measuring the ‘true’ degree of trade protection. While the former study investigates the robustness of various indices and concludes that there is a positive relationship

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[4] The results using simple non-parametric labor productivity are similar to the ones reported in the paper and available upon request.

[5] Theoretically using gross output and three inputs, using materials in addition to labor and capital, is preferable. The value-added measure assumes that intermediate inputs and other inputs of production are separable. Even if this were the case, the estimate of productivity might be biased depending on the difference between the growth rates of intermediate inputs and output. However, in the absence of a reliable price index for materials, gross-output-based-productivity series might be as biased as value-added-based-productivity series. To test the robustness of the results when value-added-based-productivity measure is used, a gross-output-based-productivity series is constructed by assuming that materials and output pries are identical. In the appendix a plot of both total factor productivity measures are displayed. Despite higher volatility of the value-added based measure, especially during crisis years, the results reported in the paper does not change in any significant way.

between openness and productivity growth regardless of the indicator used, the latter argues that Edwards' results are sensitive to the choice of weighting and identification in estimation, and name simple tariff averages and non-tariff coverage ratios as the most preferred indicators. Togan (1996) calculates the nominal and effective protection rates and quantity restrictions for various industries and selective years in Turkey. Unfortunately, the industries are not compatible with the current study, and the selected years correspond mostly to the early 1980s. Moreover, the estimated protection rates are too different from the reports prepared in State Institute of Statistics (SIS) and State Planning Organization (SPO) in specific years (Togan, undated). Also, average tariff rates reported by Togan (1996) differ from the figures provided by Baysan and Blitzer (1990) significantly[6].

Thus, to test the effects of trade directly, the paper resorts to export and import figures instead of protection rates. The export and import figures in US dollars for each industry are obtained from the World Bank Trade and Production Database. Noting that it is quite possible that a high trade dependency ratio can coexist with heavy trade distortion, and the rate of export growth is endogenous, three variables are used to measure openness. These are TRADE, defined as the ratio of the sum of exports and imports to output, EXPOUT and IMPOUT, the growth rate of export share in total output and import shares in total domestic sales, respectively.

4. Growth in Private Manufacturing Industry

To assess the impact of international conjuncture, the empirical section starts by comparing the performance of the Turkish manufacturing industry with those of successful East Asian economies. The top panel of Table 1 shows the growth rates of value added, factor inputs and total factor productivity for East Asian economies and Turkey between 1970 and 1990. The figures for the East Asian manufacturing industries are taken from Young (1995) and they are much lower than figures provided in traditional 'miracle' accounts. Still, the performance of the Turkish manufacturing industry is nowhere close to those of the East Asian economies.

The second and third panel of the same table shows the relative performance of Turkish manufacturing, before and after trade liberalization. The loss in 1970s is recovered in 1980s to a certain extent. The negative productivity growth of the pre-reform period is reversed, and growth is much higher than the East Asian economies in the latter decade. It should be noted that despite high productivity growth in the latter years, factor inputs grew relatively little, pulling the value-added growth down. High

[6] Togan (1996) calculates an average of 72.2% nominal protection rate in 1984 as opposed to 32.2% and 20.5% in SIS and SPO reports, respectively. Baysan and Blitzer (1990) report that the average tariffs decreased from 38.8% in 1983 to 22.3% in 1984.

factor accumulation of import-substituting industrialization period is almost halved after 1980.

Table 1: Comparison of Turkish manufacturing industry with manufacturing industries of the East Asian countries

		Average Annual Growth Rate of (%)				
		Output	**Capital**	**Labor**	**Total Factor Productivity**	**Total Factor Input**
Korea	***70-90***	12.9	14.1	5.5	2.6	10.3
Taiwan	***70-90***	9.7	11.2	5.6	1.5	8.2
Singapore	***70-90***	8.5	10.7	5.4	-1.0	9.5
Turkey	***70-90***	5.0	7.6	3.5	-1.6	6.6
Turkey (Priv.)	***70-90***	5.7	8.7	4.4	-1.6	7.3
Korea	***70-80***	14.6	17.0	6.6	2.3	12.3
Taiwan	***70-80***	12.1	14.5	10.0	0.1	12.0
Singapore	***70-80***	10.3	12.3	8.6	-0.9	11.2
Turkey	***70-80***	0.6	10.0	4.4	-7.9	8.5
Turkey (Priv.)	***70-80***	1.2	13.8	4.5	-9.5	10.7
Korea	***80-90***	11.2	11.1	4.4	3.0	8.3
Taiwan	***80-90***	7.2	7.8	1.2	2.8	4.4
Singapore	***80-90***	6.7	9.0	2.1	-1.1	7.8
Turkey	***80-90***	9.4	5.2	2.6	4.8	4.7
Turkey (Priv.)	***80-90***	10.1	3.6	4.3	6.2	3.9

Figures for East Asian manufacturing industries are taken from Young (1995). Priv. refers to private manufacturing industry.

Table 2: Annual growth rates of real value-added employment and productivity

Period	Value Added	Employment	TFP
1970-1996	6.35	3.85	-0.82
1970-1980	1.22	4.48	-9.48
1980-1996	9.55	3.45	4.59
1970-1976	7.13	5.34	-7.00
1976-1980	-7.64	3.17	-13.19
1980-1988	9.77	4.91	6.27
1988-1996	9.33	1.99	2.90

4.1. Growth Performance

Table 2 provides annual growth rates of value added, employment and total factor productivity for the sample period 1970-1996 as well as for the four sub-periods. Value added in Turkish private manufacturing industry grew 6.4% per annum on average throughout the sample. Given that manufacturing industry is 'the engine of development', the observed growth rate is too slow. However, the source of low growth rate lies in years before 1980, the value-added growth after trade liberalization reached an annual rate of 9.6%, as opposed to 1.2% prior to liberalization. In fact, it is the years of balance of payment crisis during which the economy observed a dismal growth rate of –7.6% per annum. Otherwise, the growth rate between 1970 and 1976 was a decent 7.1%.

The second column of the table provides annual growth rates of employment. Considering high population growth rates and mass migration from rural areas to urban centers[7], the observed employment growth of 3.9% should be considered relatively low. Earlier research reports that opening the economy to free trade had a negative impact on employment. Indeed, employment growth dropped to 3.5% per annum from 4.5% after liberalization. However, it is after 1988, when real wages increased sharply and capital account is liberalized, that employment growth fell rapidly to 2.0% per annum from 4.9% in the early years of liberalization. Therefore, unsatisfactory employment creation

[7] The population growth rate is 2.6% per annum and the rate of migration is 1.3% per annum between 1970 and 1997.

is due to changes in factor markets rather than being a consequence of opening the economy to free trade.

In sum, relatively slow value-added growth in Turkish manufacturing industry through out the sample period is as a result of severe balance of payment crisis at the end of 1970s. Excluding those years from the calculation, the removal of barriers in front of trade provides a smaller yet significant improvement in growth rate of value added. The suppression of wages at the early phase of liberalization helped the economy to sustain employment growth. Once real wages increased, employment growth slowed considerably.

In the last column of the table, growth rates of total factor productivity, defined as in Equation (3), are provided. The average growth rate for the entire manufacturing industry for the whole sample period is –0.8%. TFP growth was negative throughout the entire 1970s. The 13.2% decline in TFP during the payment crisis years was preceded by a –7.0% annual growth rate in the first half of the 1970s. The continuing bad performance led first to a balance of payment crisis and then to the end of import-substituting industrialization despite high growth rates of output and employment prior to the crisis. TFP growth recovered after 1980, reaching the level as high as 6.3% per annum in the first phase of liberalization and dropping to 2.9% thereafter.

Dismal growth rates for productivity, especially total factor productivity, throughout the 1970s shows the demise of import-substituting industrialization in Turkey. There is very strong recovery after 1980 until 1994 when another major crisis hit the economy. Despite bad performance of the last three years of the sample, the post-1980 performance is still superior.

4.2 Growth Accounting

This section engages in a simple accounting exercise. The growth in value added is decomposed into its components obtained by re-arranging Equation (3). The purpose of the growth accounting exercise is to determine whether the source of growth is factor accumulation or technological improvement, as measured by TFP. Table 3 presents time averaged growth rates of value added and of each factor. It is apparent that growth in value added is only due to factor accumulation for the entire sample. Indeed, the contribution of TFP to value added growth is negative. The picture, however, differs when the exercise is broken down in sub-periods.

As shown in Table 3, the only source of growth throughout the 1970s was factor accumulation. It was more so for the 1970-1976 period than the following sub-period when severe balance of payment crisis made it impossible for firms to import capital goods from abroad. Lack of foreign currency interrupted production process and sharpened the decline in TFP. If the TFP growth rate were simply zero during the first half of the 1970s, the output growth would have reached 14.5%. It should also be noted that it is mostly growth in capital stock that generated output growth; the contribution of labor is rather minimal.

Table 3: Growth accounting, 1970-1996

Period	Value Added Growth	Contribution of (%) Labor	Capital	TFP
1970-1996	6.35	15.68	98.18	-13.86
1970-1980	1.22	117.94	744.87	-762.82
1980-1996	9.55	7.50	44.47	48.04
1970-1976	7.13	24.24	180.26	-104.50
1976-1980	-7.64	13.26	45.66	-158.92
1980-1988	9.77	11.83	24.01	64.16
1988-1996	9.33	2.95	65.91	31.14

After the reforms significant gains in productivity boosted output growth, in spite of further deceleration of factor accumulation until 1988. The contribution of TFP to value added growth in 16 years after liberalization is around 50%. If the sample is limited to the years prior to the 1994 crisis, TFP contributes two thirds of the output growth. The crisis disrupted a spectacular productivity growth, observed especially after 1988: TFP growth is 9.8% between 1988 and 1993 and its contribution to value added growth is around 65%. The major distinction between the two sub-periods, pre- and post-financial liberalization, is that the contribution of factor accumulation is drastically different. The 1988-1989 financial liberalization coincided with populism; real wages increased sharply in 1988 and firms responded by replacing capital for labor. Consequently, capital accumulation accounts for around two thirds of growth in the latter sub-period whereas labor's contribution is limited to a mere 3%.

The growth accounting exercise formalizes that factor accumulation was the main source of growth in the last phase of import-substitution in Turkey. The gloomy performance in terms of productivity, and the slowing down of capital accumulation due to the payments crisis towards the end of the 1970s forced a major change in policy orientation. Productivity recovered and contributed significantly to the growth of value added in the early years of liberalization while factor accumulation slowed down. Financial liberalization that eased the transfer of currency abroad and populism in politics that increased real wages drastically caused substitution of labor with capital. A further negative effect of populism revealed itself in reduced TFP growth after the 1994 crisis and political and macroeconomic instability thereafter.

5. Trade and Productivity Growth

The analysis in the previous section is focused on the dynamics before and after reforms in Turkish manufacturing industry. The significant changes in the productivity levels and growth rates, as well as in the source of value-added growth are quite apparent. Nevertheless, the analysis does not show how much of the observed improvement is caused independently by increasing share of trade in total production. This section is investigating the effects of “openness to trade” on productivity growth.

Since the trade measures available for the analysis are subject to endogeneity, that is, higher (lower) productivity growth may cause increasing exports (imports), contemporaneous correlations would be misleading. Therefore, Granger-causality tests are chosen as the appropriate econometric methodology. However, since the data has limited time series observations for trade variables, from 1981 to 1996, the data is pooled as a panel of individual industries. To overcome inconsistency of the estimates due to the dynamic structure of the estimation equation, short time dimension of the panel, and weakly exogenous regressors, the Arellano and Bond (1991) GMM estimator is applied.

Table 4 provides the regression results. Three different measures of openness measure, trade share, export-output ratio and import-sales ratios are considered in estimation. Holtz-Eakin, Newey and Rosen (1988) emphasize the importance of testing for the appropriate lag length before testing for causality in dynamic panel data models with a short time dimension. The estimation results reported are obtained after such tests have been performed on different choices of lag length specifications.

The first three columns show the effect of lagged trade measures on total factor productivity. Both trade share and import-sales ratios are found to Granger-cause total factor productivity at all conventional significance levels. On the other hand, the coefficients of export-output ratio are insignificant though positive and joint tests also reject the null of Granger-causality. The results indicate that two of the three openness measures Granger-cause productivity, and hence opening the economy to free trade improved total factor productivity in Turkish manufacturing. However, the impact of trade in Turkey is mostly through imports either as inputs to production or indirectly through reverse-engineering. The results support the finding of Pavcnik (2002) for Chile in that productivity in import substituting industries is positively affected by trade liberalization. Lack of evidence in favor of a positive impact of increased exports on productivity is consistent with the conclusion by Clerides et al. (1998) and Bernard and Jensen (1999).

Table 4: Testing Causality: Trade Share and Productivity

Dependent Variable	***TFP***	***TFP***	***TFP***
Explanatory Variable	***Trade Share***	***Export/Output***	***Import/Sales***
Prod(t-1)	-0.0042	-0.0886	-0.0545
	(0.0707)	(0.0722)	(0.0721)
Prod(t-2)	-0.0138	-0.0535	-0.0834
	(0.0767)	(0.0919)	(0.0738)
Pro(t-3)			
Open(t-1)	0.0002	0.0009	-0.0011
	(0.0003)	(0.0007)	(0.0019)
Open(t-2)	0.0034*	0.0023	0.0103*
	(0.0006)	(0.0014)	(0.0024)
Open(t-3)			
Signif. Level of Rest.	0.000	0.242	0.000

All equations include individual effects and a time trend (the coefficients of which are not shown here).
* indicates significance at 1%, ** indicates significance at 5% level.

Table 4 (Cont'd.): Testing Causality: Trade Share and Productivity

Dependent Variable / **Explanatory Variable**	***Trade Share*** / ***TFP***	***Export/Output*** / ***TFP***	***Import/Sales*** / ***TFP***
Prod(t-1)	-4.1592*	-0.2010	-1.7973*
	(0.8471)	(0.6266)	(0.2155)
Prod(t-2)	-3.5093*	3.2976*	-1.8091*
	(0.7724)	(0.3277)	(0.1437)
Pro(t-3)	-4.1409	2.4563*	
	(2.7030)	(0.5732)	
Open(t-1)	-0.1780*	-0.3715*	-0.1862*
	(0.0144)	(0.0079)	(0.0103)
Open(t-2)	-0.1048*	-0.1323*	-0.1193*
	(0.0137)	(0.0069)	(0.0187)
Open(t-3)	-0.2224*	-0.1673*	
	(0.0251)	(0.0052)	
Signif. Level of Rest.	0.000	0.000	0.000

All equations include individual effects and a time trend (the coefficients of which are not shown here).
* indicates significance at 1%, ** indicates significance at 5% level

The regression results about whether TFP growth causes openness measures are provided in the last three columns of Table 4. Growth in TFP was found to have a positive effect on export-output ratio and negative effect on import-sales ratio and the coefficients in both regressions are significant at usual significance levels. TFP in regression of trade share has significant and negative coefficients. That is probably due to the high level of imports throughout the sample period relative to exports.

Finally, productivity growth has been found to increase the competitiveness of domestic industries, as expected. The positive impact of lagged productivity growth on export-output ratio and negative impact on imports-sales ratio show that improvement in productivity reduces imports and increases exports.

6. Summary and Further Research

This paper studies the effects of trade liberalization on productivity in Turkey by analyzing the performance of manufacturing industry before and after trade reform. The results show that after the economy is opened to free trade there are significant improvements in productivity growth. However, the initial productivity growth right after reform declines somewhat in later years of liberalization when relative macroeconomic stability and discipline of the early years is replaced by populism. The analysis here implies that the benefits of trade reform cannot be realized unless a stable environment is not established. The results also show that factor accumulation was faster during the import-substituting industrialization period. The speculated outcome of free trade, that Turkey will specialize in relatively more labor-intensive sectors and thus employment will grow faster, is not actualized. Moreover, there is no evidence for faster capital accumulation, despite financial liberalization. The causes of these failures are left for further research.

Furthermore, increasing share of trade is found to contribute significantly and positively to the performance of the economy primarily through the imports channel rather than exports. This is yet another evidence that protectionism is not the solution to developing economy problems. The results, however, fail out to provide evidence in favor of export promotion.

A few other questions remain unanswered. The analysis here is restricted to the aggregate level. There is evidence that the growth performance of the Turkish manufacturing industry has been very volatile over time. Even year-to-year growth rates show significant variation across industries and across time, generating massive uncertainty about the future forecasts of the growth performance. A detailed analysis of the relationship between trade and the change in the distribution of productivity performance of industries is left for further research. A second question is related to the role played by the state-owned enterprises in Turkish manufacturing before and after trade reform. While their share declined drastically in total output and employment after 1980, public firms kept providing cheap inputs to private firms.

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Appendix: Data and classification of industries

Annual Surveys of Manufacturing Industry define 20 industries until 1973, the classification system has changed afterwards to have 29 industries. To be consistent throughout the entire sample, 29 industries after 1974 are collapsed to matching 20 industries of earlier classification. The surveys also differentiate public enterprises from private ones. It has been noted in early studies on Turkish manufacturing that the performance of public sector differs considerably from the private sector. Thus this paper focuses only on private manufacturing industries.

Real value added is calculated by dividing the nominal value added by sectoral price deflators. Sectoral price deflators exist for 1982-1997 period at a monthly frequency with 1981 being the base year. For each industry the sectoral deflator is extrapolated for the early years using the relation between each deflator and consumer price index, oil prices and a set of time related variables after 1982.

Labor input is total number of persons engaged. Man-hour data is available only after 1980. None of the results related to post-1980 do change qualitatively if man-hour data is used instead of persons engaged. The skill level of workers is not available for this study. Noting that average education level in Turkey rose from 3.3 years in 1975 to 5.0 years in 1990, the lack of information of human capital shall be taken into account when the results are interpreted.

The surveys report current value investment figures for each industry. The finer distinction for newly purchased goods are not available. The nominal investment figures are deflated by an aggregate investment deflator. The deflator values for post-1980 period is taken from Treasury Department. Data on earlier years are reported in OECD National Accounts. Treasury deflator is extrapolated using OECD data for years prior to 1980.

Given the series of real investment, the capital stock is a function of past investment flows. The choice of function is somewhat arbitrary, since information about asset types, asset lives and depreciation patterns across industries are not available. Two different functions are entertained in this paper, both yielding very close estimates. First one is the perpetual inventory method. The initial level of capital stock is approximated by taking the ratio of investment value added in 1950 to the sum of investment value added ratio in the next ten years. Given positive depreciation rates and long investment series prior to the initial date the perpetual inventory approach is fairly robust to the choice of capital stock estimate for the first year. Then investments are added to the capital stock by adjusting for depreciation in the existing stock.

The second approach is to construct capital stock as a delayed linear scrapping rule. This method adds newly purchased capital good to the capital stock and after a period of *s* years a constant proportion, *1/(m+1)*, is scrapped every year.

$$K_{it} = \sum_{n=1}^{s} I_{it-n} + \sum_{n=s+1}^{s+m} I_{it-n}\left[1 - \frac{n-s}{m+1}\right]$$

where K_{it} is the capital stock of industry *i* at time *t*, *I* is real investment. This is the formula used by the OECD in it's Intersectoral Database for international comparisons (OECD,1996). Following Harrigan (1999) *s* is chosen as 3 years and *m* as 7 years and capital stock is calculated from 1960 onward. The capital stock estimates reported in this paper uses the delayed scrapping approach.

Figure A.1: Value added vs. gross output based total factor productivity.

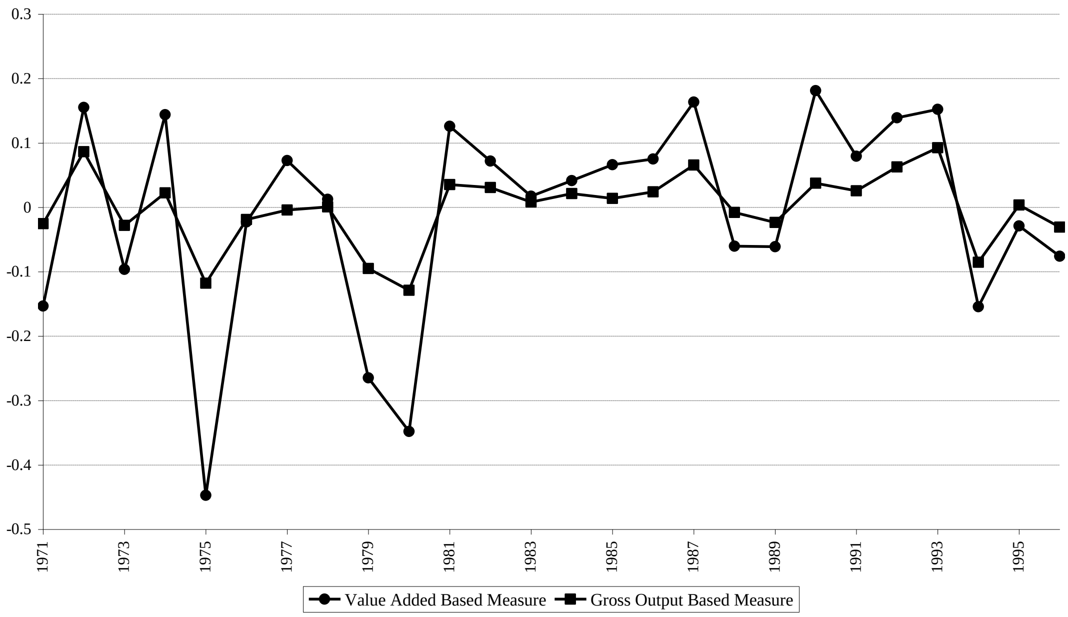

Table A.1: Industry list

ISIC3 Code	Industry	Name used in the paper
311 + 312	Food Manufacturing and Other food manufacturing	Food
313	Beverage industries	Beverage
314	Tobacco manufactures	Tobacco
321	Textiles	Textiles
322 + 324	Manufacture of wearing apparel and footwear	Clothing incl. Footwear
323	Manufacture of leather and products of leather	Leather
331	Manufacture of wood and wood and cork products except furniture	Wood
332	Manufacture of furniture and fixtures, except primarily of metal	Furniture
341	Manufacture of paper and paper products	Paper
342	Printing, publishing and allied industries	Printing
351 + 352	Manufacture of industrial chemicals and other chemical products	Chemicals
353 + 354	Petroleum refineries and miscellaneous products of petroleum and coal*	Misc. Prod. of Petroleum
355	Manufacture of rubber products	Rubber
361 + 362 + 369	Manufacture of non-metallic mineral products except products of petroleum and coal	Pottery, Glass & Minerals
371 + 372	Basic metal industry	Iron&steel,Nonferr. Metals
381	Manufacture of fabricated metal products, except machinery and equipment	Fabricated Metal
382	Manufacture of machinery except electrical machinery	Machinery
383	Manufacture of electrical machinery	Electrical Machinery
384	Manufacture of transport equipment	Motor Vehicles
356 + 385 + 390	Manufacture of plastic products not elsewhere classified, manufacture of professional and scientific equipment and other manufacturing industries	Other Manufacturing

** There are no private refineries.*

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Chinese Economic Expansion, Openness, Resource Curse and Deindustrialization in the MENA Region

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Abstract

The deindustrialization concept is used to define the decline in the share of manufacturing as an economy reaches to a high-income level. Kuznets indicates that a decreasing trend in manufacturing output and employment is a natural outcome of development of a country However, in addition to the structural change *a la* Kuznets, the worldwide shift of manufacturing to China is also shown another factor, which may accelerate the deindustrialization in developed and developing countries. The paper aims to examine the main determinants of the manufacturing development in the selected MENA countries. The Kuznets' structural change hypothesis is taken as the starting point of the empirical model specification in the paper. The model is also designed to capture the effects of openness and resource curse, in addition to the Chinese economic expansion. A panel data estimation is used for empirical models. The results reveal that there is no common Kuznets type invers U curve and resource curse dominates the industrialization in the MENA countries. The model estimated do not detect any impact of Chinese expansion on MENA manufacturing.

JEL Codes: O14, O25, O53

Keywords: Deindustrialization, MENA countries, Chinese economic expansion, openness, resource curse.

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Çin'in Ekonomik Genişlemesi, Dışa Açıklık, Doğal Kaynak Laneti ve MENA Bölgesinde Sanayisizleşme

Öz

Sanayisizleşme kavramı, bir ekonomi yüksek gelir düzeyine ulaştığında imalat sanayinin payının azalmasını tanımlamak için kullanılır. Kuznets, üretim çıktısı ve istihdamdaki düşüş eğiliminin bir ülkenin kalkınmasının doğal bir sonucu olduğunu belirtir. Bununla birlikte, Kuznets'teki yapısal değişime ek olarak, dünya çapında üretimin Çin'e kayması da gelişmiş ve gelişmekte olan ülkelerde sanayisizleşmeyi hızlandırabilecek başka bir faktör olarak gösterilmektedir. Makale, seçilmiş MENA ülkelerinde imalat sanayinin gelişiminin belirleyicilerini incelemeyi amaçlamaktadır. Kuznets'in yapısal değişim hipotezi, makaledeki ampirik model tanımlamasında başlangıç noktası olarak alındı. Model, Çin'in ekonomik genişlemesine ek olarak dışa açıklık ve doğal kaynak laneti etkilerini de yakalayacak şekilde de tasarlandı. Ampirik modellerin tahmini için panel veri kullanıldı. Sonuçlar, MENA ülkelerinde ortak bir Kuznets tipi ters U eğrisinin olmadığını ve doğal kaynak lanetinin sanayileşmeyi belirlediğini ortaya koydu. Tahmin edilen model MENA imalat sanayisi üzerinde Çin yayılmasının herhangi bir etkisini belirlemedi.

JEL Kodları: O14, O25, O53

Anahtar kelimeler: Sanayisizleşme, MENA ülkeleri, Çin'in ekonomik genişlemesi, dışa açıklık, doğal kaynak laneti.

1. Introduction

An increased pace of globalization after 1990 has brought about a debate on the worldwide shift of manufacturing and deindustrialization in many countries. As a matter of course, the shift of manufacturing was not symmetrical at the global level. China was and still is a rising economic star during three of four decades. Thus, China turned into a manufacturing giant. Deindustrialization, which is experienced at different levels in both developed and developing countries, is one of the most important features of this period. At the beginning, this fact was not alarming. However, the consequences of the 2008 Financial Crisis which has deeply affected the world economy, led countries to refocus on protecting their industries. The emergence of this great crisis before ending the first decade of the 21st century changed the paradigm: Industrial policies have regained their reputation in the aftermath of the Crisis whereas industrial policy was a forbidden word under the hegemony of globalization (Doğruel and Doğruel, 2018: 33). Some developing countries have been severely affected from the worldwide shift of manufacturing, and consequently deindustrialization. The paper focuses on how the MENA countries affected by the deindustrialization wave. The countries in the MENA region have heterogeneous character in terms of their natural resources and economic development performances. Some of them have rich natural resources and the region displays varying patterns in terms of economic growth and level of industrialization. Hence the paper aims to examine manufacturing performance in the selected MENA countries under an environment threatening economic development. The paper also intends to identify possible dynamics which can affect the development of the manufacturing sector in the region countries, including Chinese economic expansion.

The deindustrialization concept is used for defining the decline in the share of manufacturing as an economy reaches to a high-income level.[1] Kuznets addresses that a decreasing trend in manufacturing output and employment is a natural outcome of development of a country due to the sectoral shift from manufacturing to services. In addition to the structural change *à la* Kuznets, the worldwide shift of manufacturing to China is also shown another factor which may accelerate deindustrialization in the industrialized countries. Most of the developing economies are also deeply affected by the Chinese expansion.

The Kuznets' structural change hypothesis is taken as the starting point of the empirical model specification in the paper. The model is also designed to capture the effects of other factors, such as the existence of oil resources and openness, in addition to the Chinese expansion. A panel data estimation is used for empirical models. The data source is the World Development Indicators of the World Bank. The paper covers 1975-

[1] Rowthorn and Ramaswamy (1999: 18) provide a more precise definition: "The share of manufacturing employment has declined continuously for more than two decades in most advanced economies—a phenomenon that is referred to as deindustrialization." For recent contributions on the concept of deindustrialization see Rodrik (2016) and Bernard et al. (2016).

2014 period which starts right after 1970's oil shocks and ends before the beginning of world trade volume squeeze.

Model estimates show that the Chines expansion has no effect on the performance of the manufacturing in MENA countries considered. A common Kuznets type invers U curve to describe the development path of the manufacturing is not seen in these countries. However, it seems that resource course shapes the manufacturing performances of the selected MENA countries.

The paper is organized as follows. Following section presents a brief conceptual discussion on deindustrialization and possible dynamics that can affect the development of manufacturing sector. Section three outlines the basic descriptive characteristics of the selected MENA countries. Section four displays empirical model and section five gives the results of the analysis. The last section concludes the paper.

2. Conceptual Background

This section presents the debate on deindustrialization from conceptual and historical perspective. This brief evaluation indicates that Kuznets' facts are at the heart of the debate. Kuznets constructs a link between sectoral reallocation and development stages of countries. A decreasing trend in manufacturing output and employment may be related to increasing income level. The remaining factors which may have effect on deindustrialization are classified by three dynamics. The first one is openness: International convergence in prices may affect domestic production composition, the share of tradable and nontradable goods. The second is the effect of resource abundance which may cause to a resource curse. And the third one is the effect of China or more precisely Chinese economic expansion.

The debate on deindustrialization intensified in the second half of 1970s.[2] Cornwall (1980: footnote 1) argues that the early 1970s are the last "high employment" period in developed economies. He also indicates that, during the period 1973 - 1977, industrial and manufacturing employment decline in in all countries, at all income levels.[3] But, Rowthorn and Ramaswamy (1997) point out that mid-1960s as an earlier date for deindustrialization in the United States: Other early contributions on the discussion of deindustrialization are Lengelle (1966), Boumol (1967), Fusch (1968), and Singht (1977).[4] Rowthorn and Ramaswamy (1997) emphasizes that these contributors "…

[2] The book which was prepared by Blackaby (1979) has very elaborated discussion on this matter. The book covers a collection of papers on the economic difficulties of United Kingdom in the second half of 1970s. The papers are the collection of NIESR's conference which held on June 1978 (See Watson, 1981 book review).

[3]Cornwall (1980) quoted from Brown and Scherif (1979). The evaluation is based on the OECD Manpower Statistics and OECD Labour Force Statistics (See Cornwall, 1980: footnote 1).

[4] Rowthorn and Ramaswamy (1997) also quote Rowthorn and Wells (1987).

provide a unified and formal analysis of deindustrialization by linking it explicitly to the process of economic development and the pattern of foreign trade."

Although the debate on deindustrialization was widespread in 1970s, discussions on sectoral reallocation have a longer history. And the changing pattern of sectoral shares was at the core of the development discussions. Development economists contributed extensively to this matter and most of them were in the first half of the 20th century. Among them, Cornwall (1980) highlights Clark (1940), Kuznets (1958 and 1959), Chenery (1960), Maizels (1970), Chenery and Taylor (1968) and Fusch (1968) as the leading works which focused on "the changing pattern of output." Similarly, Kongsamut et al. (2001) list Clark (1940), Kuznets (1957) and Chenery (1960) as the studies on this matter. Kongsamut et al. (2001) call sectoral reallocations as the-"Kuznets facts". It is also called as "structural changes".

One of six characteristics of modern economic growth in Kuznets (1973) defines the sectoral reallocation. The third one, which is directly related with our discussion, maintains the changes in sectoral composition:

> "Major aspects of structural change include the shift away from agriculture to nonagricultural pursuits and, recently, away from industry to services; a change in the scale of productive units, and a related shift from personal enterprise to impersonal organization of economic firms, with a corresponding change in the occupational status of labor" (Kuznets, 1973: 248).

The above debate reveals that economic growth which causes an increase at income level is the main factor behind changes in sectoral composition. Therefore, the income level will be taken as the main indicator (explanatory variable) in empirical models. However, we think that sectoral reallocation and therefore a decline in the share of manufacturing may be elucidated by other factors related to the economic dynamics of a country. We will stress three other dynamics behind the structural change: the first is the increasing trend in openness during the last two decades; the second is resource endowment of a country (country would be a resource rich or poor one in terms of natural resources); and the third is the rising share of Chinese manufacturing in the World trade. Potentially, these three dynamics may have effects on the sectoral reallocation of the resources, and consequently on the path of industrialization.

First, we try to identify the link between openness and deindustrialization. We think that the degree of openness increases as globalization intensifies. During the last three decades openness became a strong trend as a development strategy,[5] and the international institutions advised the developing countries to open their boundaries. Therefore, trade liberalization and globalization wave deeply affected the trade and the

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[5] O'Rourke and Williamson (2002) argue that "Globalization was a defining term of the 1990s."

production structure of the countries. The spatial characteristics or location of firms changed due to the pressure of globalization. The questions at this point are whether openness affect deindustrialization and if so, it happens earlier than expected. Furthermore, it is possible also to ask whether deindustrialization was only outcome of globalization or of a natural development path. Saeger (1997: 580) states that "Is the contraction of manufacturing employment merely the result of the increasing maturity of developed economies? Or have the forces of globalization contributed to the shift of labor from manufacturing sector into services?" Same questions also may be raised on the industrialization path observed in the developing economies. Rodrik (2016) asserts that since 1980s, except from some Asian countries, low- and middle-income countries have faced deindustrialization. We control this dynamic by employing openness indicators in the empirical model.

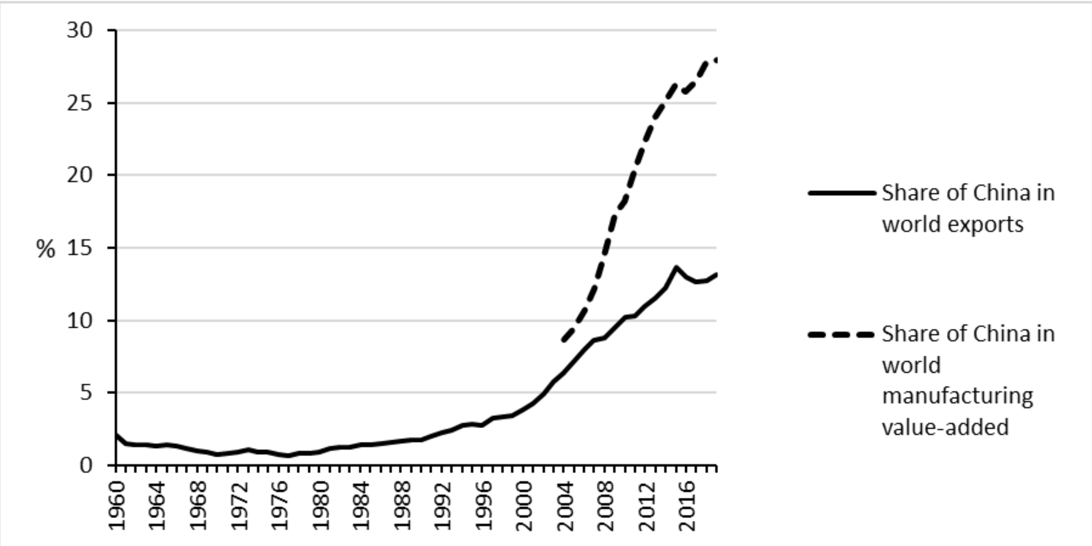
Resource curse is another critical concept in development economics and the second dynamic considered in this study, which can affect manufacturing sector. Auty (1995: 66) explains how the resource curse mechanism works. Sachs and Warner (2001) focus on the link between economic growth and resource abundance empirically and they reveal that "curse [of natural resources] is a reasonably solid fact." Auty and Furlonge (2019: 9) discuss the link between the resource based (primary) sector considering the Dutch disease, rent-seeking and dominancy of related interest groups, political factors, such as institutions, and price volatility in the international resource markets. Frankel (2012: 9) also discusses six channels of natural resource course including the Dutch disease.[6] However, Frankel's focus is on overall economic performances of countries rather than interaction between industrialization or deindustrialization and natural resource course. Corden and Neary (1982) examine the Dutch disease and deindustrialization phenomena together. We may also emphasize Neary (1982) and Wijnbergen (1984) for the Dutch disease discussion. In our study, the role of the natural resource abundance as the capacity to create a curse, especially via Dutch disease effects, is also controlled in the empirical model as in the previous dynamic "openness".

The third dynamic considered in this study is Chinese expansion. China became a manufacturing and trade giant during the last three decades, in which globalization has forced global economic players and games to change. Figure 1 shows that the share of China in the World export has strikingly raised by 1990s: The Chinese export share has fluctuated horizontally below 2 percent for three decades until 1990s, and then this share started to rise and exceeded 10 percent during the last decade. This observation at the same time indicates the growing power of Chinese manufacturing as it is seen in Figure 1: The share of China in the World Manufacturing value-added tripled in the period 2004-2019. Chinese phenomenon created a growing interest in discovering the effects of this economic expansion on both developed and developing countries. The recent

[6] Beyond the Dutch disease, other channels of natural resource course in Frankel (2012: 9) are decreasing path of world commodity prices, volatile movement of commodity prices, crowding out of manufacturing, and institutional failures which may be defined as autocratic/oligarchic or sometimes anarchic institutions.

literature covers some interesting observations on this matter.[7] Worldwide shift of manufacturing to China accelerated deindustrialization in the industrialized countries and some of the developing countries. However, the effect of Chinese boom on developing countries is not uniform. Hanson and Robertson (2010) emphasize the mix characteristics of this effect, based on the share of the manufacturing industry in merchandise exports for each country. They conclude that the countries specialized in manufacturing and their share of manufacturing exports in total export is higher than 80 percent are adversely affected by the Chinese expansion (Hanson and Robertson, 2010: 140). None of the countries in the MENA Region does not fit to this condition.

Table 1: China in the World Economy



Source: The World Bank, WDI

3. Industrialization Performance of MENA Region

As we discussed earlier, manufacturing output and employment levels are considered to identify sectoral reallocation or structural change. Therefore, mainly two indicators represent the pattern of industrialization: Sectoral distribution of employment and sectoral distribution of value added. Since the empirical model covers the composition of sectors by value added and limited sectoral employment data for the MENA countries, this section covers only sectoral distribution of value added. The sectors are manufacturing, agriculture, and services.[8] First, to understand the structural change in MENA countries better, we compare the patterns of industrialization in the MENA

[7] For example, among others see Wan (2005), Dimaranan et al (2009) and Wood and Mayer (2011).

[8] Due to rich natural gas and petroleum resources in MENA region, share of industry in GDP as, the sum of manufacturing, mining and energy in statistical classification, exceeds 40 percent over the period of 1975-2014. To emphasize the development in manufacturing we use share of manufacturing in GDP rather than share of industry.

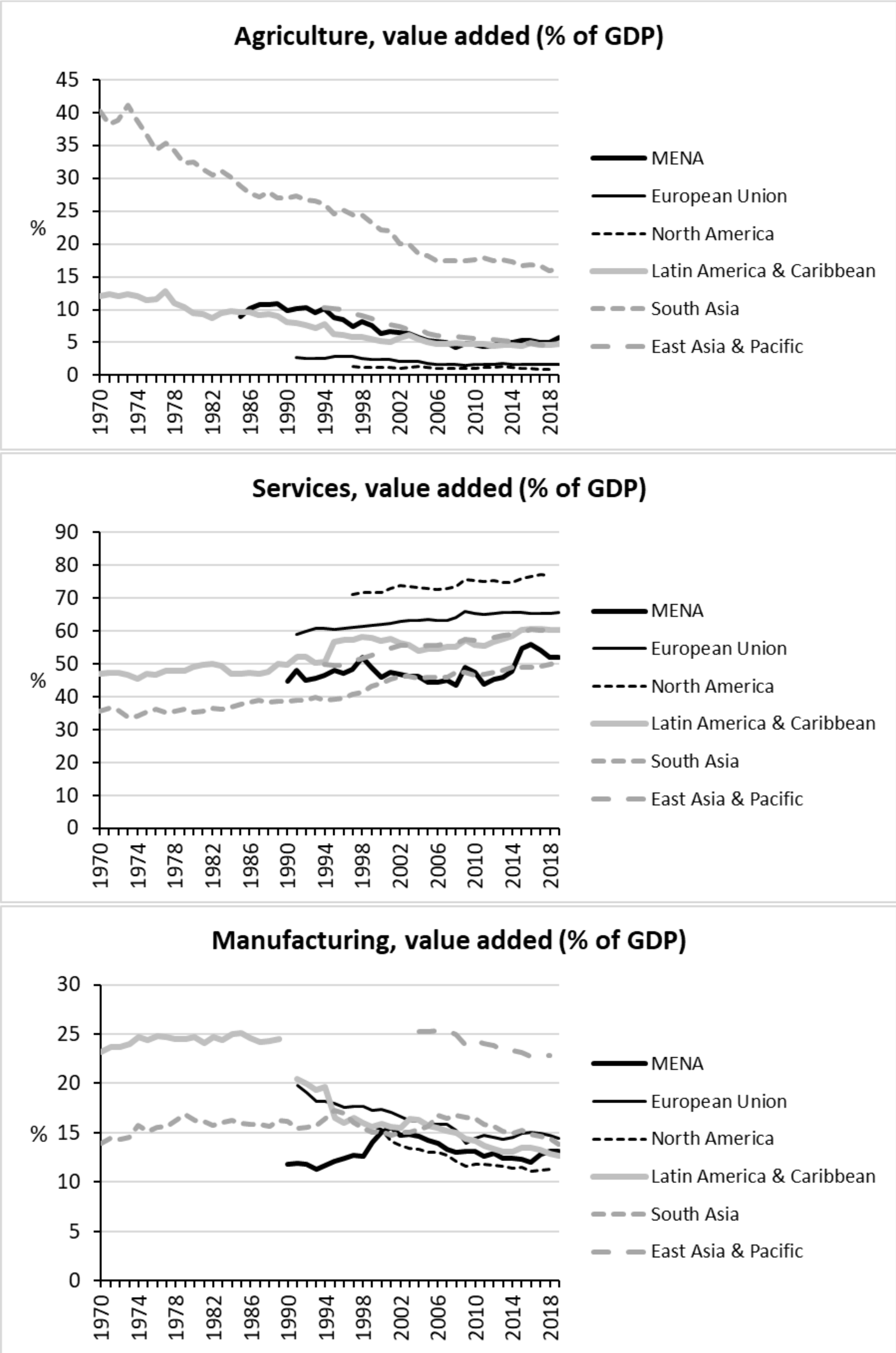
region with selected regions in the world. Then, we focus on the countries in the MENA region. The data for all regions start from 1960s. The MENA region value added data starts from 1975. The data source is the World Development Indicators of the World Bank.

Table 1: Manufacturing per capita value-added (constant 2010 US$)

	Algeria	Egypt	Jordan	Morocco	Oman	Tunisia	Saudi Arabia
1975	301	149	154	186	29	174	1284
1976	349	154	189	227	56	215	1249
1977	347	157	207	222	78	223	1171
1978	417	160	236	234	90	241	1162
1979	425	154	261	240	74	262	1337
1980	382	149	278	267	64	276	1082
1981	383	159	378	271	105	282	1257
1982	416	175	369	286	159	255	1075
1983	450	182	353	300	314	342	1195
1984	540	188	375	314	431	363	1340
1985	538	199	337	326	368	378	1237
1986	601	195	466	334	558	377	1206
1987	550	242	480	344	523	374	1300
1988	529	267	384	370	548	409	1355
1989	445	279	298	364	591	408	1256
1990	404	282	353	378	437	428	1289
1991	392	260	311	378	522	444	1356
1992	419	266	398	378	576	462	1451
1993	428	270	369	373	670	486	1425
1994	391	284	441	379	694	524	1443
1995	371	296	428	369	764	538	1441
1996	298	310	387	390	674	548	1481
1997	286	318	397	397	696	510	1525
1998	337	339	452	395	840	529	1612
1999	317	377	458	403	785	549	1527
2000	264	387	471	407	1084	558	1448
2001	284	387	490	394	1712	591	1476
2002	294	403	546	402	1629	584	1469
2003	282	382	567	434	1587	575	1594
2004	266	387	637	456	1521	598	1630
2005	254	385	656	442	1523	613	1570
2006	237	386	740	452	2059	630	1622
2007	230	385	842	439	2021	699	1736
2008	204	409	855	454	2084	781	1659
2009	247	428	829	487	2346	749	1991
2010	242	451	777	497	2107	751	2071
2011	244	439	777	499	2061	713	2020
2012	247	425	749	498	1876	701	2032
2013	249	430	770	530	1725	705	2067
2014	254	435	757	572	1571	707	2278
Average annual growth rate	0.05	2.93	4.97	3.02	13.95	3.90	1.78

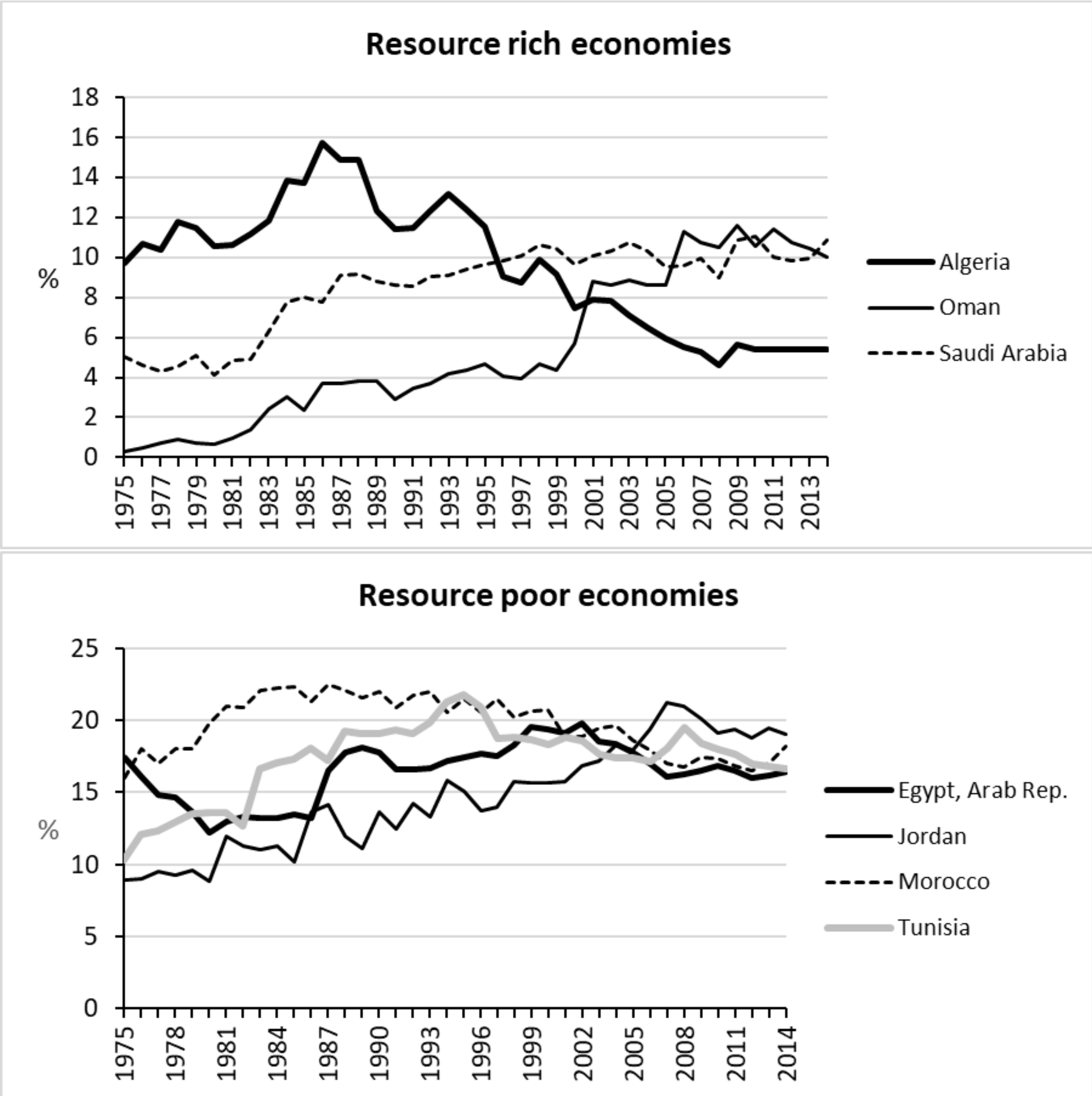
Source: The World Bank, WDI

Figure 2: Sectoral Value-Added Shares MENA



Source: The World Bank, WDI

Figure 3: Share of Manufacturing Value Added in GDP



Source: The World Bank, WDI

Value added share by sectors reflects more accurately the patterns of sectoral reallocations over the period considered. The share of agricultural value added has a decreasing trend in the developing regions as well as in the developed regions including MENA countries (Figure 2). We also observe increasing trends in the share of service sector in GDP in all regions. Service sector shares of the MENA region are close to the level of the regions dominated by middle income countries. Increase in manufacturing value-added share in MENA region reversed after 2000 and spans between the North America Region and the Latin America and Caribbean region. Figure 2 shows that the turning in the share of manufacturing value-added started at around 15 percent.

Figure 3 displays the manufacturing value added share in GDP for resource poor countries and for resource rich countries in the MENA region. Except Jordan, inverse U curves for the share of manufacturing are observed in resource poor countries during 1975-2014 period. Jordan has highest per capita manufacturing growth rate during this period among resource poor economies in the MENA region (annual average is 9.8 percent) (Table 1). Industrialization trends in the resource rich countries are diversified: Invers curve for Saudi Arabia, steady increase in Oman and stagnant trend after the mid of 1980's in Algeria. Algeria also has lowest per capita manufacturing value added figures after the mid of 1990's among the countries presented in Figure 3. In contrast to Algeria, per capita manufacturing value added levels two-fold higher than the other countries in Saudi Arabia for the entire period covered and in Oman after 2000 (Table 1). However, it should be noted that the high manufacturing value added in these countries is due to petroleum and petroleum products sectors in manufacturing which is strongly associated with high oil and natural resource production.

Table 2: Resources and Income Levels in Selected MENA Countries

2000-2011 average				
	Total natural resources rents (% of GDP)	GDP per capita (constant 2005 US$)	Rank of natural resource rents	Rank of GDP per capita
Kuwait	52.18	31896.57	1	2
Saudi Arabia	50.12	13381.02	2	3
Oman	47.81	12945.79	3	4
Iran, Islamic Rep.	41.28	2693.63	4	7
Algeria	33.65	2876.85	5	6
Yemen, Rep.	32.74	819.44	6	11
United Arab Emirates	23.28	40726.82	7	1
Egypt, Arab Rep.	15.17	1277.64	8	10
Tunisia	5.56	3196.94	9	5
Morocco	1.59	1946.94	10	9
Jordan	1.35	2315.69	11	8

Source: Calculated from The World Bank, WDI

Industry, or more precisely manufacturing, is accepted as the engine of the economic growth in economic development literature. Observations outlined above show that the share of manufacturing sector in GDP is low in the MENA countries comparing with the countries at similar income levels. Therefore, industrialization has limited role in explaining the income differences in the MENA region. Table 2 exhibits the relation between natural resource rents and GDP per capita in the selected MENA countries as 2000-2011 averages. Table 2 shows that, except United Arab Emirates, Yemen and

Tunisia, order of total natural resources rents as the percentage of GDP is quite similar to the order of per capita GDP. In other words, oil, natural gas, and similar natural resource incomes have important contributions to the formation of national income in most of the MENA countries. United Arab Emirates diversifies its economy in the last decade and targeted to be a finance and trade hub in the region. This policy may explain its higher per capita income in the United Arab Emirates. High but reverse deviation is observed in Yemen. This is probably outcome of long-lasting political unrests which impede the development of the economic activities other than resource extracting. Rank deviation in Tunisia is relatively smaller than deviations in these countries.

This rough descriptive analysis reveals that the MENA region countries have different patterns: their sectoral reallocations and income formations have unconventional characteristics. Therefore, deindustrialization in the region countries may occur differently than other country experiences.

4. Model and Data

The model used for the analysis of the deindustrialization in MENA countries specified to capture the effects of Chinese expansion, openness, and natural resource abundance (mainly petroleum) on the level of deindustrialization. Econometric model is based on the interaction between economic development and industrialization *á la* Kuznets: It assumed that there is invers U shape relationship between per capita income and industrialization:

$$MAN = \beta_0 + \beta_1\,GDP + \beta_2\,GDP^2 + \beta_3\,OPEN + \beta_4\,RES + \beta_5\,CHINA + \varepsilon \qquad [1]$$

Natural resources (RES), Chinese expansion in the World market (CHINA) and openness (OPEN) are the control variables, which we assume, may have direct effect on the industrialization level in the MENA countries.

Dependent variable MAN indicates the industrialization level. In the deindustrialization literature, industrialization level is measured by the share of manufacturing employment in total employment. However, for the estimation of the model presented here, we prefer to use manufacturing sector value added as the proxy for the manufacturing output because of two reasons. Data limitation is the first reason: It is not possible to construct a sufficient time series manufacturing employment data for the MENA countries. Second one is related with the discussions on to what extend the change in the employment share is an appropriate indicator for the deindustrialization: Decrease in the share of manufacturing employment may also indicate the increase in labor productivity in manufacturing. Rowthorn and Ramaswamy (1997), state that “The main reason for deindustrialization is the faster growth of productivity in manufacturing than in services”. For the estimation of the model, manufacturing value added per capita is used.

Figures 3 displays the change in the share of manufacturing value added in GDP for the MENA countries. For both resource rich and resource poor MENA countries, the change in the manufacturing share do not present uniform trend during four-decade period. However, historical data for the industrialized countries show that the share of manufacturing in total employment and total value-added increases as the income level increases, and as the income level reaches to some level the share of manufacturing in the total economy tends to decline due to expansion of the service sector as it is discussed in the second section. The inverse U shape curve generally observed in the evolvement of the manufacturing is captured by the quadratic form in the model. GDP per capita (GDP) is used for the economic development. Following Kuznets facts, it is expected that β_1 is positive and β_2 is negative.

Effect of the openness on the domestic economy is a controversial topic in economics. Assuming that the MENA countries are also affected by the globalization through openness, the variable OPEN is added to the model as a control variable. There is no consensus on how to measure the openness or to determine an appropriate indicator for the openness. We employ a commonly used indicator which is defined as the ratio of trade volume to GDP:

[Merchandise Exports + Merchandise Imports] / GDP

RES is the total natural resources rent as the percentage of GDP. Considering the literature on the resource curse, it is expected that β_4 should have negative sign.

As it is discussed in the second section, immense expansion of manufacturing in China caused a global shift of manufacturing to China from rest of the world. Chinese expansion may directly affect a country through mutual economic relation, and we observe an increasing trend as the share of imports from China in total imports and the share of FDI from China in total FDI inflow in the MENA region. In addition to this direct impact, the region countries may be indirectly affected through the effects of Chinese expansion on the other trade partners of them. To capture direct and indirect effects together we employ share of the Chinese merchandise exports in the world export volume as the third control variable CHINA.

Model-1 is redefined by adding the interaction terms:

$$MAN = \beta_0 + \beta_1\, GDP + \beta_2\, GDP^2 + \beta_3\, OPEN + \beta_4\, RES + \beta_5\, CHINA + \beta_6\, OPEN*CHINA + \beta_7\, OPEN*GDP + \varepsilon \qquad [2]$$

The World Bank, World Development Indicators is used for constructing the panel data set of the estimations. Panel covers Algeria, Egypt, Jordan, Morocco, Oman, Tunisia, and Saudi Arabia and the years 1975-2014.

5. Estimation Results

Manufacturing sector is usually represented by the share of manufacturing value added and of employment in an empirical research. However, in this study, we used per capita manufacturing value added as the dependent variable. The reason behind this is related with the potentially strong linearity between the value added as the percentage of GDP and one of the explanatory variables, namely the total natural resources rent as the percentage of GDP (RES). Particularly for resource rich countries, the changes in the percentage share of natural resource rents due to the fluctuations in oil prices in the international market directly transmitted to the percentage share of the manufacturing value added. Using per capita manufacturing value added as the dependent variable eliminates this sort of linear dependency between explanatory and dependent variables.

It is possible to use two alternative indicators for openness: Ratio of trade volume to GDP and ratio of domestic prices to international prices. One of the typical characteristics of the oil rich countries is that they have high openness ratio if it is measured as the trade volume. Alternative openness indicator also suffers from same problem: Oil export revenues are used for financing the imported product to meet the domestic demand in the oil rich countries, which in turn, yield to decrease in the gap between domestic and international prices. Since the data for the relative prices is limited, we preferred ratio of trade volume to GDP.

The correlation coefficients of RES and OPEN measured as the trade volume are displayed in Table 3. The coefficients of correlations are significant most of the countries in the sample, and they are remarkably close to one in Algeria and Tunisia. Therefore, in addition to complete model (Model-A1), Model-1 is modified by using RES and OPEN separately as the explanatory variable (Model-A2 and -A3). Additionally, to consider potential correlation between RES and OPEN with GDP, only CHINA is used in Model-A4. Interaction terms in the Model-B are respecified accordingly.

Table 3: Correlation between RES and OPEN

Countries	Coefficient of correlation
Algeria	**0.86**
Egypt, Arab Rep.	**0.38**
Jordan	**0.30**
Morocco	0.25
Oman	**0.34**
Tunisia	**0.90**
Saudi Arabia	-0.20

Source: Authors' own calculation

Most of the variables in the model are non-stationary.[9] Therefore, first differences of all variables are used for the model estimations.

Table 4: Estimation Results without Interaction Terms

Dependent variable: Per capita manufacturing value added - constant 2010 US$

Period: 1975-2014

	Model A1				Model A2			
	Random		Fixed		Random		Fixed	
Constant	8.858332				8.882603			
T-Stat	*1.312200*				*1.320170*			
GDP	0.070479	**	0.071598	**	0.072840	**	0.074242	**
T-Stat	*2.075490*		*2.080190*		*2.14175*		*2.158080*	
GDP*2	-0.000001		-0.000001		-0.000001		-0.000001	
T-Stat	*-0.657160*		*-0.672330*		*-0.745330*		*-0.768780*	
RES	-2.969793	***	-2.904466	***	-3.213019	***	-3.156149	***
T-Stat	*-3.695270*		*-3.574900*		*-4.10419*		*-3.99653*	
CHINA	11.778713		11.852625		10.486065		10.508504	
T-Stat	*0.753510*		*0.751040*		*0.670130*		*0.666480*	
OPEN	-0.855155		-0.886820					
T-Stat	*-1.259220*		*-1.290880*					
Hausman	5.6497				5.5229			
Significance	0.3418				0.1373			

	Model A3				Model A4			
	Random		Fixed		Random		Fixed	
Constant	8.258183				8.212341			
T-Stat	*1.179130*				*1.173490*			
GDP	0.077262	**	0.077903	**	0.082555	**	0.083538	**
T-Stat	*2.224240*		*2.217050*		*2.361950*		*2.367410*	
GDP*2	-0.000001		-0.000001		-0.000001		-0.000001	
T-Stat	*-1.014750*		*-1.013810*		*-1.222310*		*-1.231130*	
RES								
T-Stat								
CHINA	15.684326		15.685473		13.926487		13.898003	
T-Stat	*0.981910*		*0.974550*		*0.865300*		*0.858630*	
OPEN	-1.455790	**	-1.476179	**				
T-Stat	*0.675459*		*-2.165300*					
Hausman	1.2642				0.1065			
Significance	0.7377				0.9911			

(*) significant at <10%, (**) significant at <5%, (***) significant at <1%,

[9] ADF- Fisher and LLC (Levin, Lin, and Chu) first generation panel unit root tests, and Pesaran's CADF second generation panel unit root test are used to check unit root. Estimations ignoring unit root result high t values for all coefficients.

Table 5: Estimation Results with Interaction Terms

Dependent variable: Per capita manufacturing value added - constant 2010 US$

Period: 1975-2014

	Model B1				Model B2			
	Random		Fixed		Random		Fixed	
Constant	8.007200				9.539272			
T-Stat	*1.142180*				*1.366130*			
GDP	0.089487	***	0.091266	***	0.072516	**	0.073887	**
T-Stat	*2.613550*		*2.615980*		*2.13201*		*2.143520*	
GDP*2	0.000000		0.000000		-0.000001		-0.000001	
T-Stat	*-0.152900*		*-0.150990*		*-0.733470*		*-0.754490*	
RES	-2.335499	***	-2.246885	***	-3.183110	***	-3.123405	***
T-Stat	*-2.805900*		*-2.654020*		-4.04444		-3.92643	
CHINA	15.855398		15.954712		8.392692		8.205974	
T-Stat	*0.887180*		*0.879080*		*0.502310*		*0.486470*	
OPEN	0.761275		0.801994					
T-Stat	*0.855390*		*0.885950*					
OPENCHINA	-0.228866		-0.236866					
T-Stat	*-0.804900*		*-0.820180*					
OPENGDP	-0.000363	***	-0.000378	***				
T-Stat	*-2.821770*		*-2.890180*					
RESCHINA	-0.174577		-0.192792		-0.239019		-0.262890	
T-Stat	*-0.260470*		*-0.283260*		*-0.356640*		*-0.388490*	
Hausman	5.9761				5.5306			
Significance	0.5425				0.3546			

	Model B3			
	Random		Fixed	
Constant	8.353493			
T-Stat	*1.125910*			
GDP	0.101147	***	0.102355	***
T-Stat	*2.93612*		*2.927310*	
GDP*2	0.000000		0.000000	
T-Stat	*-0.309670*		*-0.298770*	
RES				
T-Stat				
CHINA	17.102515		17.331877	
T-Stat	*0.973840*		*0.975560*	
OPEN	0.835654		0.873971	
T-Stat	*0.926870*		*0.956810*	
OPENCHINA	-0.131084		-0.141045	
T-Stat	*-0.465060*		*-0.494540*	
OPENGDP	-0.000470	***	-0.000481	***
T-Stat	*-3.769920*		*-3.813650*	
Hausman	5.8761			
Significance	0.3185			

(*) significant at <10%, (**) significant at <5%, (***) significant at <1%,

Estimation results are displayed in Tables 4 and 5. For all specifications coefficients of GDP are positive and significant, coefficients of GDP^2 are insignificant. Same result obtained in the model which is specified only by Kuznets fact. These results indicate that there is no common nonlinear relation between GDP per capita and per capita manufacturing value added. Different patterns displayed in Figure 3 support these results. Small coefficients for GDP (around 0.01) indicate that one US dollar increase in GDP per capita produces less than one US dollar increase in manufacturing valuer added. Consequently, it is possible to conclude that the higher GDP per capita is associated with lower per capita manufacturing value added in the countries included in the panel.

Estimated coefficients for share of natural resource rent in GDP (RES) are also significant and the signs of the coefficients are negative in all models either with or without OPEN. This result shows that resource curse has a strong impact on the manufacturing performances of sample countries. On the other hand, the coefficients found for openness (OPEN) are significant only in the model when RES is not included. Considering the resource rich countries have also high openness ratio due to dominance of oils and natural gas exports in the trade, significant and negative signs for the coefficients of OPEN can be considered as the disguised effect of the resource curse rather than policy preference. Negative and significant coefficient for the interaction term OPENGDP also can seen as the indirect effect of natural resource on the development of the manufacturing.

The models estimated do not detect any effect of Chinese expansion on manufacturing value added. Estimation result shows that the industrialization of China, at least, does not block the industrialization in the MENA countries.

6. Conclusion

Estimation results of the econometric models specified in the paper reveal that–rich natural resources such as oil and natural gas are the main obstacles on the manufacturing development in the region. However, it seems that the Chinese expansion in the world economy which is considered as main source of the deindustrialization in the developed and the developing countries has no impact in the selected MENA countries.

One salient result of the estimated models is negative impact of natural resource abundance. However, strong resource curse on the development of the manufacturing in the MENA country may be misleading. Natural resource poor countries also do not display sound performance in industrialization during 1975-2014. The analyses presented in the paper do not sufficient to understand what would happen if resource curse absented in the MENA region.

The result founded for the Chinese expansion in the empirical analyses is a result that needs to be careful about. We should be prudent when making inferences based on econometric results. However, we should focus on more deeply the changing nature of Chinese economic policies from longer term perspective. There is a growing concern and literature on the Chinese rising interest in the Middle East Region. Ambitious "Belt and Road Initiative" project of China draws attention. These investment initiatives might have a potential to affect the manufacturing in the region countries in future.

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Appendix

Table A1: FDI inflow to MENA countries

	Algeria			Egypt			Iran			Jordan		
	World	China	%	World	China	%	World	China	%	World	China	%
2001	1112.6	0.6	0.1	509.9	0.0			0.0			0.0	
2002	1071.5	5.3	0.5	646.9	0.0			0.0			0.0	
2003	853.7	2.6	0.3	237.4	0.0			7.8			0.0	
2004	721.6	27.1	3.8	2157.4	0.0			17.6			0.0	
2005	1095.2	49.9	4.6	5375.6	0.7	0.0		11.6			1.0	
2006	1795.4	91.0	5.1	10042.8	8.2	0.1		65.8			-6.2	
2007	1661.8	36.6	2.2	11578.1	12.3	0.1		11.4			0.6	
2008	2593.6	86.0	3.3	9494.6	24.1	0.3		-34.5			-1.6	
2009	2760.9	62.5	2.3	6711.6	53.5	0.8		124.8			0.0	
2010	2237.5	124.6	5.6	6385.6	48.1	0.8		511.0			0.0	
2011	..	..		-482.7	47.8	-9.9		615.6			0.0	
2012	..	..		5757.7	71.7	1.2		702.1			9.8	

	Kuwait			Morocco			Oman			Saudi Arabia		
	World	China	%	World	China	%	World	China	%	World	China	%
2001		0.0		2874.1	0.0		..	..		504.0	0.0	
2002		0.0		533.2	0.0		..	..		453.0	1.0	
2003		0.0		2429.1	0.0		..	..		778.0	0.0	
2004		1.7		1069.5	1.6		..	..		1942.0	1.0	
2005		0.0		3012.7	0.0		..	..		12097.0	0.0	
2006		4.1		2964.0	0.0		1587.8	-16.4	-1.0	17140.0	1100.0	6.4
2007		-6.3		4633.5	0.0		3431.5	9.4	0.3	22821.0	1428.0	6.3
2008		2.4		3608.0	3.4		2528.5	49.4	2.0	38151.0	1323.0	3.5
2009		2.9		3133.8	0.0		1461.9	26.5	1.8	32100.0	3605.0	11.2
2010		22.9		4166.3	0.0		1177.1	33.3	2.8	28105.0	1961.0	7.0
2011		42.0		3221.3	0.0		1050.5	-7.0	-0.7	..	..	
2012		-11.9		0.0	0.0		..	..		..	..	

	Tunisia			Yemen		
	World	China	%	World	China	%
2001	486.5	0.0	0.0		0.0	
2002	821.0	0.0	0.0		0.0	
2003	583.6	0.7	0.1		0.0	
2004	639.0	0.0	0.0		3.4	
2005	782.9	1.2	0.2		35.2	
2006	3307.9	73.1	2.2		7.6	
2007	1616.1	12.4	0.8		43.5	
2008	2758.4	17.7	0.6		18.8	
2009	1687.6	4.3	0.3		1.6	
2010	1512.5	11.6	0.8		31.5	
2011	1147.9	5.7	0.5		-9.1	
2012	1603.2	2.6	0.2		14.1	

Source: UNCTAD

Table A2: Share of China in Imports of Selected MENA Countries

	Algeria	Egypt	Iran	Jordan	Kuwait	Morocco
2001	2.0	4.0	4.5	4.9	4.4	
2002	2.8	4.5	4.7	6.7	5.2	
2003	3.8	4.9	5.5	8.0	5.7	3.4
2004	5.0	5.1	4.9	8.4	6.8	4.2
2005	6.5	4.6	6.1	9.2		5.1
2006	8.0	5.8	6.0	10.4	9.2	5.4
2007	8.6	6.0		9.7	11.5	5.9
2008	10.3	8.4		10.4	11.7	5.7
2009	12.1	8.7		10.9	12.4	7.8
2010	11.2	9.2	10.4	10.8	12.5	8.4
2011	10.0	9.2	10.3	10.0	14.8	6.5
2012	11.8	9.4		9.4	13.2	6.6
2013	12.4	10.5		10.4	13.4	6.9
2014	14.1	11.3		10.5	14.1	7.6
2015	15.9	13.1		12.9	16.0	8.4
Rank	**1**	**1**		**2**	**1**	**3**
from	**2014**	**2012**		**2003**	**2007**	**2014**

	Oman	Saudi Arabia	Tunisia	UAE	Yemen
2001	1.7	4.6	1.4		
2002	1.6	5.3	1.5		
2003	0.6	5.9	1.7		
2004	1.7	6.6	2.3		7.1
2005	2.4	7.4	2.9	8.5	6.2
2006	3.3	8.6	3.3	9.7	7.2
2007	3.0	9.7	3.4	9.9	9.1
2008	4.6	11.0	3.7		7.5
2009	4.8	11.3	5.0		9.3
2010	4.8	11.6	6.1		7.9
2011	4.6	13.1	6.1		6.5
2012	4.9	12.6	6.9	12.2	7.4
2013	3.1	12.8	6.3	12.3	7.8
2014	4.8	13.7	7.2	15.1	11.3
2015	5.0	14.6	8.4		
Rank	**4**	**1 -2**	**3**	**1**	**1**
from	**2014**	**2011**	**2014**	**2012**	**2014**

Source: UN COMTRADE