Demand Pressure and Export Performance in Turkey

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Abstract: The weakening demand in exports markets has recently struck economic growth in both developed and developing countries following the recent economic crises. Turkey is not exempt from this. Although governments are taking a number of measures to encourage exports, it has become evident that Turkish exports have, so far, become irresponsive to conventional measures, and this has initiated our research on alternative explanations to export dynamics in Turkey. In this study, we examine the impact on export performance of demand factors, both domestic and foreign, and whether there is a substitutability between domestic and export markets. And if so, whether there is any asymmetry in how these factors impact export performance. In order to examine these issues, we employ time series data analysis covering the 1998-2015 period at quarterly level. We find substitution between domestic and foreign markets at both aggregate and manufacturing industry exports. Firms' main concern at periods of domestic demand recessions is keeping the market share in export markets for manufacturing.

Keywords: exports, domestic demand, market share, error-correction

JEL Codes: F13, F14, F43

Introduction

The weakening demand for Turkish exports has recently struck economic growth, and urged the government for taking measures to encourage exports. These measures such as introducing export subsidies and adjusting foreign exchange rate, are mostly based upon the conventional presumption about the determinants of exports, which largely ignores the supply side of the export market, and puts emphasis on the demand side only. Nevertheless, it has become evident that Turkish exports have, so far, become irresponsive to conventional measures, and this has initiated research on alternative explanations to export dynamics in Turkey. A recent study by Günçavdı and Kayam (2016) finds that supply side of the export market plays a critical role in export earnings in Turkey.[1] But, most importantly, domestic demand appears to act as a *substitute* for foreign demand in determining export supply, and booming domestic demand can

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[1] Günçavdı, Ö. and S.S. Kayam (2016) "Unravelling the structure of Turkish exports: impediments and policy". Forthcoming in *Journal of Policy Modelling*; previously presented at the 21th Annual Conference of *Economic Research Forum* in March 2014.

constitute a crucial constraint and discourage exportation in Turkey. Thus accordingly, we can presume that domestic demand pressure is a relevant factor for explaining export dynamics.

However, in Günçavdı and Kayam (2016) substitutability between domestic and foreign demands appear as a by-product of the empirical investigation and no further investigation is performed on this aspect of exports. Based on historical data from early 1980s and controversy on substitutability between foreign and domestic demand, this finding invokes our interest in whether or not the substitutability between domestic and foreign demand (i) really exists; (ii) is asymmetric i.e., stronger and more significant when domestic demand is falling than when it is increasing. This would especially be a crucial finding for policy considerations, and help us explain why exports are irresponsive (or not responsive enough) in some circumstances. If that is so, in the case of high domestic demand, relatively more export subsidies and higher depreciation of domestic currency would be required in order to compensate the profitability loss in the domestic market caused by falling domestic demand and to encourage exports. Therefore, the cost of export stimuli would be higher in the presence of booming domestic demand than the case where it is contracting.

Theoretical discussion

Studies examining export performance have been common for both developed and developing countries, mainly due to the fact that the lack of foreign exchange earnings constitutes financial constraints on economic growth (see Thirlwall and Hussain 1982; Santos-Paulino and Thirlwall, 2004). However, a desire of obtaining high economic growth in the short run, particularly in a period when either domestic or external demand is not adequately available in the world market, leave no option for policy makers other than relying only on the other demand expansion in order to fuel economic growth. The recent outbreak of financial crisis in the world economy has rekindled an interest in understanding export dynamics in developed market economies with the expectation that the weak domestic demand could be compensated with external demand (see Bobeica et al., 2016) to promote economic growth.

The importance of this issue has, not only recently, inevitably paved the way for a policy debate on the choice of the most appropriate economic policy increasing export earnings. The remedy that has been very common in the IMF and World Bank supported structural adjustment and stabilisation programmes of the 1980s and 90s, and been widely advised to the developing countries as an integral component of the entire programme is relaxing the stringency of foreign exchange constraints. Accordingly, expenditure switching polices, by adjusting foreign

exchange rates, and expenditure reduction policies, restricting domestic demand through comprehensive austerity measures attached to the economic programme, have been considered as the short run policy recommendations for this purpose. As a consequence of implementing such a comprehensive economic programme, exports are expected to be increased both by maintaining the domestic currency at competitive levels, and by re-directing the use of production capacity towards external demand. These policy measures however are based upon the *a priori* assumption that domestic and foreign demand are in fact *substitutes*.

The factors that determine exports depends on the approach taken in examining the issue. If the researcher approaches the question from a demand side perspective then the main factors are external (or foreign demand), competitiveness factors represented mostly by relative prices in domestic and foreign markets and the exchange rate. Accordingly, this demand side explanation comes up with *ad hoc* policy recommendations, aiming at stimulating foreign demand via the foreign exchange channel. On this demand side explanation under the constant marginal cost assumption, domestic demand may influence export rather indirectly through price or cost competitiveness channel[2], mostly ignoring the factors on the supply side (Khan, 1974; Bahmani-Oskooee, 1986 and Reinhard, 1994). However, if the question is addressed from a supply side perspective, the researcher focuses on capacity constraint and transaction costs in addition to cost competitiveness factors. An equilibrium perspective on the other hand needs to combine both demand- and supply-side factors and that is where the domestic demand enters the equation. Exports under a given capacity can be regarded as residual of domestic demand and exporters as agents that maximize overall profits in domestic and foreign markets.

Following the supply-side perspective, there are a few questions on the relationship between domestic demand and exports and on which firms export that needs answering. Let us start with the latter: Why do some firms become exporters while others are non-exporters? The main explanation provided by the literature is based on the self- selection mechanism that claims more productive firms become exporters and remain as such. [3] Firms become exporters only if they are able to cover foreign market entry costs (see Melitz, 2003; Helpman, Melitz and Yeaple, 2004 for detailed theoretical models). Market entry (transaction or sunk) costs arise as a significant determinant of market entry-and-exist decisions. Literature have found empirical evidence on the significance of sunk cost of entry to a new market incurred by new

[2] Domestic demand expansions, particularly those associated with inflationary dynamics, cause a loss of competitiveness, and may exhibit a hampering effect on export.

[3] The other widely recognized mechanism in explaining performance of exporting firms i.e., learning-by-exporting is based on the productivity increases observed in exporting firms after they enter and remain in the export markets for some time (see Bernard and Jensen, 1999; Wagner, 2007; Greenaway and Kneller, 2007)

exporters (Das et al., 2007; Roberts and Tybout, 1997). Other additional costs attached to selling goods in foreign markets are transportation costs, costs of setting up a distribution network, costs of acquiring information on consumer preferences etc. and marketing costs, personnel with skill to manage foreign networks, or production costs in modifying current domestic products to fit the local market (Wagner, 2007; Chaney, 2013). Ability to cover these costs actually allow some firms to become exporters and those that cannot remain non-exporters, thus *self-selection*. The sunk-cost hysteresis framework mostly provides a theoretical ground for research (see Dixit, 1989). Relying on this supply-side evidence, it then becomes possible to explain the differences among countries in response of exports to trade and exchange rate policies.

In a paper on export decision of Turkish manufacturing industry (1990-2001), using plant-level data Özler et al. (2009) find strong support for presence of sunk costs at entry and re-entry into export markets. Their analysis reveal that the degree of persistence in export markets is high, which may be due to the sunk re-entry costs plants have to incur when they try to re-enter the export markets. The authors also conclude that the sunk costs are comparatively more important in influencing export market presence for small plants. Large plants, on the other hand, may have more resources and thus have little or no problems in overcoming the high sunk costs of entry or re-entry into the export markets.

Using a different database, Demirhan (2016) examine the export behaviour of Turkish manufacturing firms over the 1989-2010 period with particular emphasis on entry-exit and survival in export markets. In addition to other factors, she finds that presence of sunk costs impacts the exit decision of firms. Exporters already in the market would prefer to stay put through the rough times just to avoid paying the re-entry costs. Similarly, they might rather stay put even if other markets, including the domestic market, become profitable in time. Demirhan also finds that less time is needed for less profitable domestic firms to become exporters. Since costs of exporting requires financing, firms that are less credit constrained take shorter to become exporters. The liquidity needed for financing is generated either through the domestic sales or financial borrowing (Chaney, 2016). Chaney also mentions the significant role played by sunk/fixed costs associated with exporting and liquidity constraints. Even if exporting is profitable firms may be deterred from such activity due to liquidity constraints. He claims “Only those firms that are productive enough and generate sufficient cash flows from their domestic sales are able to export.” Changes in macroeconomic conditions may hinder the export performance of some firms while supporting that of others. For example, increase in domestic demand may lead some export firms to divert their attention to the domestic market and supply

more of their produce locally hence decreasing exports whereas some non-exporters may accumulate resources from domestic sales to finance exporting costs and their export market participation is amplified. As for entry dynamics, Demirhan (2016) finds that the latter is not supported by Turkish manufacturing firms: as profitability in domestic market increases the probability of being exporter declines. Combined with Chaney (2016), this finding implies that non-exporters in Turkey either cannot accumulate the resources to cover exporting costs or they are risk-averse as Demirhan mentions. The exit dynamics show that increase in domestic profitability does not induce exit behaviour. So, as mentioned above, *incumbent exporters stay put, non-exporters do not enter in case of increased domestic profitability/demand.*

So, is domestic demand only a resource generation opportunity for self-selecting firms or are domestic and foreign demands really substitutes in determining export performance? The relationship between domestic and foreign demand can be observed through direct and indirect channels. Considering exports as a demand driven activity, domestic demand can only impact exports through price and competitiveness mechanisms. The debate pertaining to the effect of domestic demand on exports goes back to the 1960s and 70s (Ball et al., 1966; Basevi, 1970 and Artus, 1973). Recognising the indirect demand side effects through the competitiveness channel of domestic demand, Ball et al. (1966) empirically indicate the negative relationship between exports and domestic demand, and accordingly suggested that a rise in domestic demand pressure under a given production capacity may create strong competition for economic resources which would have been devoted to exports if the domestic demand pressure had been lower.

On the theoretical front, supply side factors have been introduced in export dynamics by assuming an increasing marginal cost of exporting firms operating under a given capacity constraint (e.g. McQuoid and Ahn, 2015). On this supply side approach, domestic demand appears as a factor determining exports in two opposite directions. One direction of the relationship points out a complementarity relationship between these two, at least in the long run, with a positive impact of domestic demand on exports. This is theoretically justified by the *learning-by-doing effects* of exporting firms which are experienced in production by producing first for domestic sale and improve their efficiency then start exporting. In fact, Basevi (1970) and Frenkel (1971) show under what conditions domestic demand is a prerequisite of exports. Entry barriers to foreign markets actually determines the decision of a monopoly firm whether it is discriminating between domestic and foreign markets or not.[4]

[4] When the firm is a discriminating monopoly, in the presence of entry barriers to the foreign market, it equates marginal revenues to marginal costs in each market as the theory tells us. In the absence of barriers, marginal

Empirical evidence provided by Bernard and Jensen (1999) reveal that in the run-up to becoming exporters, these firms grow faster than their non-exporting counterparts. Another explanation would be due to the liquidity constraint channel, and export earnings are considered as the source of liquidity and are used to finance domestic production, particularly for the firms which are highly dependent on imported inputs and earnings in foreign exchange.

The other direction is the substitution relationship between domestic and foreign sales. Linder (1961) was the first trade theorist to refer to the relationship between domestic demand and exports. In his overlapping demand and preference similarity hypotheses, Linder (1961) argues that the "range of exportable products" is determined by internal demand and export market participation emerges as the local markets become insufficient for expansion of the firms followed by the awareness from the opportunities in foreign markets. He claims that trade intensity between countries that have similar demand structures are comparatively more. He emphasizes in that respect the similarity of average incomes, income distribution and quality of goods, which represent similarity of preferences. Linder is not the only one who mentions the relationship between trade and preferences/quality of goods. Decades prior to Linder, Frankel (1943) has neatly explained that "adaptation of production process to export requirements" is a significant factor that influences the lower competitiveness of a country with a large domestic market for low-quality goods in high-quality goods export markets. Frankel claims that similarity in the quality of goods between local and foreign markets generates a competitive edge for local firms. As Linder puts it due to the income distribution both low- and high-quality goods are consumed within the same market. So in a country, there will be consumers with low incomes who end-up consuming low-quality goods and consumers with higher incomes that buy high-quality goods. Therefore, exported goods will range from low- to high-quality products. Thus, domestically produced goods represent not only the preferences of domestic households but also the supply structure of domestic producers cum exporters. The overlap of domestic and foreign market demand structures in other words explains why and how domestic demand and exports become substitutes of each other.

Exports in this regard are considered as a smoothing factor of aggregate demand in the absence of adequate domestic demand, and unravelling the role of domestic demand in the export dynamics of these countries has become an appealing task (see Bobeica et al., 2016; Esteves and Rua, 2015; Belke et al., 2014; Sharma, 2003). Recognising the importance of

revenues in each market should be equal. In the non-discriminating monopoly case, free entry means average revenues in the two markets to be equal whereas entry barriers require net average revenues to be equated to each other.

supply side factors, Esteves and Rua (2015), for example, examines the role in domestic demand for the Portuguese economy under a given production capacity constraint, and find domestic demand relevant in the short run. They also find that the effect of domestic demand is negative, and most importantly negative, being stronger and more significant when domestic demand falling than when it is increasing. Bobeica et al. (2016) applied the similar empirical model to a panel of EU countries and revealed a supportive evidence on the negative impact of domestic demand on export. Belke et al. (2015) is another study finding out evidence on the role of domestic demand in export dynamics of EU countries by employing a nonlinear transition regression model estimation method, and confirms the findings of earlier research. Sharma (2003) is a rare occasion in the literature examining the similar issue for a different country other than those in EU, and he finds the similar negative effect of domestic demand operating in the supply side of the Indian export market, indicating that Indian exporting firms are under a given capacity constraint.

Analogously, recent weakness of external demand in the Turkish economy urges the Turkish policy maker to place particular emphasis on various measures stimulating domestic demand without knowing about the exact nature of this relationship. Faini (1994) and Günçavdı and Kayam (2016) are the two exceptions examining this issue, and both, albeit examining different periods, provide a supportive evidence on the negative impact of domestic demand on export. In particular, Faini (1994) note that lower capacity utilisation has a fostering effect on export growth in the 1976-1980 period, but the price and cost competitiveness channel notably becomes a dominant factor afterwards.[5] Günçavdı and Kayam (2016), on the other hand, took into account of both demand and supply side factors being affective at the sectoral level in the Turkish export markets for the 2000-2011 period and found a negative and significant domestic demand effect on exports.

The Theoretical Model and Empirical Specification

In this section, we introduce a simple baseline model to examine the response of exports to domestic and foreign demand and to changes in the exchange rate at macro level. It is assumed that a profit maximising representative firm produces an identical product by using a given technology and capacity, and sells its production (Q) to both domestic and foreign markets. It

[5] This result is not surprising because Turkey undertook a comprehensive structural adjustment programme in 1980 and foreign exchange adjustment and export subsidies became common policy measures to reduce the stringency of foreign exchange constraint by increasing export earnings.

is also assumed that the firm encounters additional costs for selling to foreign markets, such as sunk and other type of transaction costs. It is then necessary for the exporting firm to have *incrementally* higher marginal revenue from exporting than selling the same amount of output domestically (Kohn *et al*, 2016). Otherwise, the exporting firm would benefit nothing from exporting, and would prefer to supply only the domestic market. Domestic market is imperfectly competitive, whereas the firm is a price taker in the export market.

Total revenue of the firm can simply be defined as the sum of revenue obtained from both markets as follows:

$$TR = R + R^* \tag{1}$$

$$R = pD \tag{2}$$

$$R^* = ep^*X \tag{3}$$

$$p = p(D), p' < 0, \tag{4}$$

$$p^* = p^*(D^*), p^{*\prime} < 0. \tag{5}$$

where R: revenue from domestic sales, R^*: revenue from exports; p: domestic prices, D: domestic sales; p^*: foreign prices; e: nominal exchange rate; D^*: foreign sales. Total revenue described in Equation (1) is the sum of revenues from domestic market (equation 2), which is a function of domestic price and domestic demand, and from exportation (equation 3), which is determined by nominal exchange rate, foreign price and foreign demand. Equations (4) and (5) define the domestic and foreign price, both of which are decreasing functions of domestic and foreign demand for the respective prices. The exporting firm is also assumed to have no power to determine foreign prices.

The representative firm uses the same production capacity for domestic and foreign markets and incurs the same production cost. The only difference is that exporting incurs an additional expenditure such as sunk cost and extra transaction costs, which indeed does not exist for domestic sales. All these costs are defined here as exporting costs. Therefore, total cost of selling to domestic and foreign markets consists of production and exporting costs in the short-run are as follows:

$$TC = C + C^* \tag{6}$$

$$C = C(Q), \quad C' > 0, C'' < 0. \tag{7}$$

$$C^* = eC^*(X), \quad C^{*\prime} > 0, C^{*\prime\prime} < 0. \tag{8}$$

$$Q = D + X \tag{9}$$

where C: quadratic cost of production including both domestic and foreign sales; C^*: transaction cost of exports including sunk cost of entering a new foreign market; Q: the quantity of production including domestic and exports. Accordingly, equation (6) describes total cost of producing the amount of Q. The production cost is given by a quadratic cost function in equation (7). We also assume that export cost is quadratic function of the amount of exports as seen in equation (8).[6] Finally, equation (9) is the capacity constraint, which is allocated between domestic and foreign demand.

There is no demand constraint, and any change in domestic demand can be compensated by exporting as long as the firms is willing to pay additional exporting costs. The firm is assumed to continue exporting as long as revenue from a unit export is incrementally higher than these additional costs at the margin.

The optimal behaviour of the firm is defined by profit maximisation, which requires the equality between total revenue and cost at margin.[7] Accordingly, total differentials of revenue and cost function defined above can be used to derive the optimality condition of the firm as follows:

$$dTR = dR + dR^* \tag{10}$$

where

$$dTR = [(p'D + p)dD + Ddp] + (p^*Xde + eXdp^* + ep^*dX) \tag{10a}$$

$$dTC = C'dD + (C' + eC^{*\prime})dX + C^*de \tag{10b}$$

and $dQ = dD + dX$ from capacity constraint given in equation (9). Under the profit maximisation assumption, it is expected that total revenue and total cost are equal at margin:

$$\{[(p'D + p)dD + Ddp] + (p^*Xde + eXdp^* + ep^*dX)\} = C'dD + (C' + eC^{*\prime})dX + C^*de \tag{11}$$

Equation (11) can be called the *optimality condition*. In order to have easy inferences on the export decision, a number of modifications can be proposed in equation (11). First, the term (p^*Xde) in the second parenthesis on the left-hand side of equation (11) can be re-written as a function of the elasticity of exports with respect to exchange rate as follows:[8]

[6] Any intercept term in this cost function can be treated as the term describing the sunk cost, which is indeed not a function of exports.

[7] Some studies in the literature assume a dichotomy between domestic and foreign markets, and respectively maximise profits from each market separately. Since their concern is to find out a threshold for exporting, this assumption gives an equilibrium condition which in turn helps them to reveal an estimable export equation (e.g. see Kohn *et.al*. 2016; Ahn and McQuoid, 2012; Roberts and Tybout, 1997 and Basevi, 1970).

[8] $p^*Xde = p^*Xde(dX/dX)(e/e) = ep^*[(de/dX)(X/e)]dX = ep^*(1/\varepsilon^*)dX.$

$$p^*Xde = ep^*\mu^*dX \tag{12}$$

where $\mu^* = (1/\varepsilon^*)$ and $\varepsilon^*$is the elasticity of exports with respect to exchange rate, which is expectedly positive. Replacing this into the *optimality condition*, equation (11) becomes

$$\{(C' + eC^{*'}) - ep^*(1 + \mu^*)\}dX = [(p'D + p) - C']dD + Ddp - C^*de + eXdp^* \tag{11a}$$

Also substituting

$$(p'D + p) = p[1 + (1/\varepsilon)] \tag{13}$$

where ε: the price elasticity of demand, the *optimality condition* can be written as follows:

$$\{(C' + eC^{*'}) - ep^*(1 + \mu^*)\}dX = \{p[1 + (1/\varepsilon)] - C'\}dD + Ddp - C^*de + eXdp^* \tag{11b}$$

Assuming that $\eta = (1/\varepsilon)$,

$$\{(C' + eC^{*'}) - ep^*(1 + \mu^*)\}dX = \{p(1 + \eta) - C'\}dD + Ddp - C^*de + eXdp^* \tag{11c}$$

where $ep^*(1 + \mu^*) = MR^* = AR^*$, the marginal and average revenue of exports; and $(C' + eC^{*'}) = MC^*$, the marginal cost of exports.

$$-\{MR^* - MC^*\}dX = \{p(1 + \eta) - C'\}dD + Ddp - C^*de + eXdp^* \tag{11d}$$

By assumption, the profit maximising export firm wishes to export only if marginal revenue from exporting begin to exceed the marginal cost of exporting (*i.e.* $MR^* > MC^*$). Otherwise, there would be no point for the firm to export, but rather to sell domestically. This is mainly due to the additional cost in exporting that the firm encounters. (11d) finally allows us to examine the impacts of various exogenous shocks. For example, a marginal increase in domestic sale will affect exports by the following,

$$(\partial X/\partial D) = -\underbrace{\{p(1 + \eta) - C'\}}_{MR-MC}\underbrace{\{(MR^* - MC^*)\}^{-1}}_{+} \tag{14}$$

$$(\partial X/\partial D) < 0 \text{ if } |\eta| < 1 \quad or \quad |\varepsilon| > 1 \tag{14a}$$

and

$$(\partial X/\partial D) > 0 \quad \text{if } |\eta| > 1 \quad or \quad |\varepsilon| < 1 \tag{14b}$$

Intuitively, the last partial derivatives of exports implies that as domestic demand rises the price of domestic sales declines due to the demand function with a declining slope (as defined in the definition of total revenue). Since $|\varepsilon| > 1$, the firm's revenue from domestic sales is expected to decrease after a fall in domestic prices, and selling to foreign markets becomes relatively profitable. Under the ***ceteris-paribus*** assumption, exporting becomes relatively profitable, and the firm that wishes to maximise its profits rather opts for supplying to external market in order to compensate revenue losses due to declining domestic prices. Additionally,

$$(\partial X/\partial e) = \overbrace{C^*}^{+}\{(MR^* - MC^*)\}^{-1} > 0 \tag{15}$$

In order to examine the effects of a change in foreign demand, the optimality condition can be re-written as follows:

$$\{(C' + eC^{*\prime}) - ep^*(1 + \mu^*)\}dX = \{p(1 + \eta) - C'\}dD + Ddp - C^*de + eXp^{*\prime}dD^* \tag{11e}$$

where $dp^* = p^{*\prime}dD^*$. Using this new version of the optimality condition, the following can easily be derived:

$$(\partial X/\partial D^*) = -\overbrace{eXp^{*\prime}}^{-}\{(MR^* - MC^*)\}^{-1} > 0 \tag{16}$$

Conditions given in (14)-(16) allow us to write an implicit export demand function as follows:

$$X^* = X(e, D^*, D) \tag{17}$$

where X^*stands for exports. The first two variables, namely *e* and D^*, on the right side of (17) enters the function via the demand side, whereas the last one, *D*, appears as a supply side determinant. Equation (17) can rather be considered as a function describing the long-run behaviour of exports, and does say nothing on the short run behaviour of exports. However, exports in the short run can be considered as in a disequilibrium, and exports is assumed to adjust itself to its long run level (as described in (17)). We suppose that this adjustment in the short run creates extra costs for the economy. This assumption helps us to justify and derive the dynamic behaviour of exports in the short run. Hence, disequilibrium gives rise to the following penalty function when describing its total cost:

$$E\{\sum_{s=0}^{\infty}\beta^s\theta_1(x_{t+s} - x^*_{t+s})^2 + \Delta x^2_{t+s} - 2\theta_2\Delta x_{t+s}\Delta x^*_{t+s}|\Omega_t\},\ \theta_1, \theta_2 \geq 0 \tag{18}$$

where the lower cases in equation (18) indicate the logarithm of all the relevant variables; x_{t+s}, for example implies the logarithm of X_{t+s}. Equation (18) represents the total costs that the country encounters due to disequilibrium in short-run (Nickell, 1985). This penalty is assumed to be minimised by the choice of x_{t+s} (s=0,...,∞) where Ω_t is the information set at time t; β (0≤β≤1) is the discount factor; x^*_{t+s} is the equilibrium level of exports for the period ($t+s$) as described in equation (17); θ_1 and θ_2 are parameters. The first term in the square brackets represents the cost of distance from the long-run equilibrium level of exports. The second term reflects the costs of changing the rate of exports, whereas the final term indicates that the loss is attenuated if the firm moves in the "right" direction (towards the equilibrium rate of exports); this final term will become zero if the equilibrium level of exports remains constant.

Minimising equation (18) with respect to x_{t+s} yields a second order difference equation. Using only the stable root, λ, of its characteristic equation (λ<1), and assuming that the expected future level of exports follows a random walk with drift (μ), the following familiar error-correction representation can be derived as the dynamic function when describing the short-run behaviour of exports:

$$\Delta x_t = \alpha_0 + \alpha_1 \Delta x_t^* + \alpha_2 (x_{t-1}^* - x_{t-1}) \tag{19}$$

Then, equation (19) can be estimated by substituting (18) for unobservable long-run exports, X^*.

The empirical model includes variables appearing in both supply and/or demand sides of the export market. The dynamic model in (19) is not only convenient to examine the dynamic relationship between domestic and foreign demand and exports, but also allows for distinguishing the asymmetric response of exports to these demand variables. We first start with an unrestricted version of (19):

$$\Delta x_t = a_0 + a_1(L)\Delta d_t^* + a_2(L)\Delta d_t + a_3(L)\Delta e_t + a_4(L)\Delta x_t + a_5(x_{t-1} + \beta_1 d_{t-1}^* + \beta_2 d_{t-1} + \beta_3 e_{t-1}) + \varepsilon_t, \tag{20}$$

where small letters in (20) shows the logarithms of the variables of interest; x_t is exports; d_t^* is the foreign demand potential in the export markets; d_t corresponds to domestic demand; e_t is the real exchange rate as price competitiveness indicator; and finally L represents the lag operator.

The presence of asymmetric response can be tested by using a dummy d_t^- in this unrestricted error-correction model. The dummy variable, d_t^-, here, shows the periods of a *contraction* in domestic demand:

$$d_t^- = \begin{cases} 0 \; if \; \Delta d_t > 0 \\ 1 \; if \; \Delta d_t < 0 \end{cases} \tag{21}$$

The statistical significance of the dummy would give us some insight about the Turkish export behaviour in the different stage of business cycle.

Data and Empirical Results

In this section, the role of demand pressure on Turkish exports is empirically investigated using equation (20). Two demand factors come forward in this research, namely domestic demand on the supply-side and foreign demand on the demand side of the Turkish export market. Our empirical approach involves the use of quarterly time series data. Most of the data used for this empirical investigation is readily available from the website of the TURKSTAT, and covers the period from 1998Q1 to 2015Q4. However, some of the data such as domestic demand, foreign demand and export market weighted real exchange rate are not readily available, an extra calculation becomes necessary to generate them. The detailed explanation of data sources and the calculations of generated data can be seen in Appendix A.

(*Table 1 about here*)

We start our empirical investigation with the determination of the statistical properties of the macroeconomic variables in equation (20). Traditionally the Augmented Dickey-Fuller (ADF) unit root test is first used to check for the non-stationarity of the variables (see Charemza and Deadman, 1992). As seen in Table 1, all variables, except the real exchange rate, appear to have a unit root, and they require the use of their first differences in order to achieve stationarity. This also implies that stationary and non-stationary variables are present in the model, and the *Unrestricted Error Correction Model* (UECM) can be considered an appropriate functional specification if the data allows for it.[9]

[9] The UECM estimation procedure, originally used by Davidson et al. (1978), focus on the short-run dynamics (reducing the possibility of estimating spurious regression) while making them consistent with the long-run information (see Hendry, 1995). The UECM has advantages over other estimation proceduces such as the two-stage Engle and Granger (1987) estimator. Especially in finite samples, the UECM estimator has better overall statistical properties than the two-stage Engle-Granger method. This is because the latter estimates the long-run parameters from a model misspecified through the omission of shorth-run dynamics.

Aggregate Exports

The estimation results for aggregate exports are reported in Table 2. Foreign trade data used in estimating the results in columns (1) and (2) includes gold trade, whereas the results in columns (3), (4) and (5) are based on the trade data excluding gold exports and imports. First, we examine the presence of a co-integration relationship among the real exchange rate, foreign and domestic demand variables by estimating various versions of equation (20). The domestic demand variable in level was initially included in this relationship, but systematically turned up to be insignificant. This then implies that the co-integration relationship exists only between the variables entering into equation (20) from the demand side of the model, and the domestic demand variable defined as the supply side factor (due to the capacity constraint in production) seems not to be co-integrated with others.

The short-run effects of the domestic demand variable is then examined through its first difference in equation (20). Indeed, the domestic demand variable captures the business cycle effect, and it is *a priori* supposed to be significant in the short run. Equation (20) was then estimated by including the domestic demand variable in first difference with its various lags some of which turned out to be significant. However, in order to avoid the *multicollinearity* problem among the lags, we fitted a polynomial distributed lag structure to the domestic demand variable. This estimation also allows us to reveal the long-run effects of changes in domestic demand, as a proxy measure of the business cycle, along with its short run effects. Through the weights of the distributed lag function, we can also see how the effects of changes in domestic demand was distributed over time. Various polynomial distributed lag structures are estimated, and the best performing ones are reported in Table 2 based on improvements in the goodness of fit, *Akaike* information criterion, the significance of t-statistics and other diagnostic tests.

All results in Table 2 seem to be robust, and the suggested empirical specification in equation (20) fits the data fairly well. Explanatory powers of the estimated models are relatively high and they vary between 0.57 and 0.66 for all but the unrestricted model that excludes gold trade, which is 0.89. Estimated diagnostic test results show no sign of the violation of standard OLS assumptions. In addition, estimated equations in Table 2 assure the stability condition.[10] All variables in the short run and the long run appear to be statistically significant, and they have theoretically expected signs.

[10] Basing on the CUSUM of square tests, estimated models in Table 2 appear to be stable. Due to space constraint, we are unble to report these results here, but they are available upon request.

The UECM specification of the model fits the data well and indicates a co-integration relationship between exports, real exchange rate and foreign demand variables.[11] The adjustment coefficient in front of lag of the exports variable is highly significant, and has a negative sign, as expected, pointing out a *slow* speed of adjustment after an external shock. These results do not change the results reported in other columns. It is easily revealed from the long-run relationships in Table 2 that the long-run elasticity of the foreign demand variable is almost 1.6 for the estimation results in column (1) and (2), 1.51 for the results in column (3), implying that foreign demand is a crucial factor in determining export performance of the Turkish economy in the long run. Based upon this result, the presence of depressing foreign demand can be accounted for the recent poor performance of the Turkish exports. The real exchange rate variable also appears to be statistically significant, implying that depreciating domestic currency has, albeit small, a stimulating effect on export performance.

(*Table 2 about here*)

The short-run dynamics of the Turkish export performance seems to be determined by two demand components, namely domestic and foreign demand, and both have statistically significant positive signs. The second-order polynomial function with three lags of the changes in domestic demand variable, which appears to be jointly significant, fitted the data well and this revealed the long run coefficient 0.32. Interestingly, the positive sign of changes in domestic demand in column (1) suggests a complementary relationship between domestic and foreign markets for the Turkish export products. This is theoretically possible (see Basevi, 1970; Frenkel, 1971, Berman et al., 2014 and Bogamelli *et al.*, 2015), but rather unexpected for a country operating under a given production constraint in the short run. Most importantly, it is different from findings of earlier studies.[12] Similarly, Esteves and Rua (2015) for Portugal, Sharma (2003) for India and Bobeica *et al.* (2013) for a number of EU members found negative effects of domestic demand on exports. Next, it is examined whether or not domestic demand exhibits this positive effect on exports symmetrically during the entire phases of domestic business cycle; and a dummy variable identifying only the one side of the business cycle is generated for negative changes in domestic demand (d_t^-). Equation (20) is re-estimated by including this dummy instead of the domestic demand variable itself, and the results are reported in column (2). Surprisingly, the sign of this dummy variable appears to be negative,

[11] Different variants of the model (1) have been estimated, and the domestic demand variable have consistently appeared to be insignificant in the long-run relationship.

[12] In Günçavdı and Kayam (2017), domestic demand was found to be one of the discouraging factors of exports via the supply price of exports and indicated the substitution relationship between domestic and foreign markets.

suggesting that a decline in domestic demand level has an encouraging impact on the export performance of the economy. These contradictory results immediately impel us to pay further attention to the data that we employed in our estimation.

(*Figure 1 about here*)

The recent jump in the volume of gold trade that could have caused an inappropriate effect on the quality of foreign trade data is the first suspect coming to mind. This issue became important particularly after 2010, and gold trade reached 10.2 per cent of total trade in 2012Q3 (see Figure 1).[13] In order to understand and eliminate the distortionary effect of gold trade, the exports and imports of gold were subtracted from the entire data, and estimations were repeated as usual[14]. However, since the data on gold trade is available only after 2001Q1, the sample period of our estimations is inevitably shortened. These results can be seen in columns (3), (4) and (5). With this revision of the data, the sign of domestic demand turned into significantly negative, indicating the presence of the *substitution* relationship between domestic and foreign markets. In column (3), the third order polynomial function with five lags of the Δd_t variable, which are jointly significant, fitted the data well, and the goodness of fit rose to 0.89. The long run effect of Δd_t came up -1.152. Earlier studies also confirm the impact of domestic demand condition on export performance of a country through this channel, and they generally have found relatively higher values for the coefficient of the domestic demand variable. Esteves and Rua (2015) for example report almost 0.70 for this coefficient for Portugal; Sharma (2013) estimated 0.325 for India. Smaller this coefficient, more dichotomy between domestic and foreign markets exists.

Highly significant lag of the export variable in level with the expected negative sign can be considered as an indication of the co-integration relationship between exports, foreign demand and real exchange rate. The long run elasticities of these variables appear to be 1.54 for the foreign demand and 0.70 for the real exchange rate.

[13] Surprisingly, these gold transactions have recently taken place between Turkey and Iran, and various media sources give some hints about the real motive behind these transactions (see http://www.economist.com/news/europe/21700422-did-officials-help-evade-sanctions-golden-squeal and https://www.bloomberg.com/news/articles/2016-10-17/turkish-iranian-gold-dealer-must-face-laundering-sanctions-case).

[14] One also needs to consider the warning in the UNCTAD Statistical Database item summary: "As a consequence of the improved coverage of gold beginning in 2013/2014 in response to the OECD "Recommendation of the Council on Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas" of 25 May 2011 (C/MIN(2011)12/FINAL), the reported trade of gold as well as its share in the total trade may have significantly increased in many countries."
Source: http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=24738, accessed on June 2, 2017.

The change in the sign of the domestic demand coefficient is not the only difference of the results in column (3). The magnitude of the coefficient of the foreign demand variable also increased from 0.551 in column (1) to 0.947 in column (3). This urges a suspicion of whether or not this coefficient is in fact unity.[15] According to the Wald test result reported at the bottom of Table 2 (WT1), the unity restriction cannot be rejected at any significance level. Imposing this restriction yields *the export share in the foreign market* as the dependent variable, and the results are reported in column (4).

(*Figure 2 about here*)

This form of the model also performed well in terms of the goodness of fit and other diagnostic test results. The domestic demand variable was highly significant with the long run coefficient -1.2, which was obtained by imposing third-order polynomial function with five lags of Δd_t. The foreign demand and real exchange rate variables are co-integrated with the long-run elasticies of 0.543 and 0.765 respectively. In order to see how the short run effects of a shock in domestic demand are distributed over time, Figure 2 depicts the coefficients of the distributed lag functions in column (3) and (4). The curves show an effect of a domestic demand shock, which lasts almost five quarters, and this effect in absolute terms first increases until the second quarter; and then declines until the fifth quarter.

Manufacturing Exports

The manufacturing industry possesses the largest share in total exports of the Turkish economy, and it is accordingly important to understand the export behaviour in this industry.[16] The same model used for aggregate exports, namely equation (20), is estimated by using the data on the manufacturing sector (see Appendix A). A number of interesting issues emerges from these estimations, and they are worth mentioning in this section.

The estimation results are reported in Table 3. All results seem to be robust and the suggested UECM specification fits the data well. Various polynomial functions with different lags were imposed on the Δd_t variable in the unrestricted model estimation, but they did not show up to be statistically significant. Explanatory powers of the estimated models vary between 0.60 for the unrestricted and 0.33 for the restricted models. Diagnostic tests show no sign of the violation of OLS assumptions. Almost all variables in the short-run and in the long

[15] Esteves and Rua (2015) and Bobeica et al. (2013) a priori impose this restriction in their research, and they accordingly consider the dependent variable as to be the market share, rather than exports itself.
[16] In 2015, the share of the manufacturing exports is approximately 80 percent of total.

run appear to be statistically significant at the 5 and 10 percent significance levels. The adjustment coefficient in front of the one lagged export variable is highly significant, suggesting the presence of a strong co-integration relationship between exports and the foreign demand variable. However, the pace of adjustment seems to be very slow as it is for aggregate exports. The signs of all variables are in expected directions. In particular, the domestic demand variable in difference is statistically significant only in the short run, albeit at the 10 percent significance level, and the negative sign in all estimations imply the substitutability between foreign and domestic market under the given capacity constraint (-0.115 in column 1). Only the demand side variables, namely foreign demand and sectoral real exchange rate, appear to be co-integrated in explaining the performance of manufacturing exports. The sectoral real exchange rate is also a statistically significant factor affecting the export performance, implying that depreciations in domestic currency provides competitiveness to the Turkish manufacturing sector, and encourage exports.

(*Table 3 about here*)

According to the results in Table 3, the short and long run behaviour of export performance seem to differ from aggregate exports. First, domestic demand does not appear in the long-run relationship, but its first difference (showing the growth rate of domestic demand) is statistically significant. Second, the foreign demand variable statistically appears to be significant in the long run. Besides, its difference capturing the short run effect is also statistically significant with a positive coefficient, which is nearly one. This last result is not different from the findings of previous studies for different countries.

Previous studies in the literature has been interested mostly in whether exports' responses to a shock in domestic demand are symmetric or asymmetric depending on domestic business cycle (e.g. Esteves and Rua, 2015; Bobeica *et al*., 2013). They implicitly assume that export performance show symmetric responses to changes in demand conditions in the foreign market in all phases of domestic business cycle. We also imposed a unity restriction on the coefficient of Δd_t^*, and the Wald test result (WT) reported at the bottom of Table 3 indicates that the unity restriction cannot be rejected for the Turkish manufacturing sector. Esteves and Rua (2016) for Portugal and Bobeica *et al.* (2013) for a group of EU countries *a priori* impose this restriction in their studies and examine the importance of domestic demand pressure on the market share as an indication of export performance.

As the dependent variable becomes the share of exports in foreign demand, the restricted model is estimated by imposing a third-order polynomial function with four lags on the domestic demand variable, Δd_t. Based on the *Akaike* information criterion and the joint significance of the lag variables, the result in column (2) is obtained. In comparison to the estimation results of aggregate export, the goodness of fit for this restricted model is low, and it explains approximately 30 percent of total variation in the dependent variable. The domestic demand variable on the other hand shows a negative and statistically significant relationship, albeit at the 10 percent significance level. But, the size of the long run-effect of domestic demand appears almost to be -0.18, which still remains far lower than those in similar studies for different countries. There also exists a statistically significant lag of the dependent variable, which indicates the presence of co-integration relationship between export, foreign demand and real exchange rate variables. The long-run elasticities of these variables are calculated from the estimated long-run coefficients as 0.787 for foreign demand, 0.80 for real exchange rate.

(*Figure 3 about here*)

In order to examine whether export performance responses to changes in domestic demand symmetrically during the entire period of domestic business cycle or not, the same equation is re-estimated by including the business cycle dummy (d_t^-), instead of Δd_t, in column (3). The business cycle dummy variable also appears to be significant only at the 10 per cent level with the coefficient of 0.02. Its positive sign implies that in case of a decline in the growth of domestic demand, manufacturing firms intend to fill up the given production capacity by inclining to exportation. Based upon the distributed lag function of the Δd_t variable, which is depicted in Figure 3, it appears that the great extent of the short run effects of demand shock takes place in the first and the second quarter.

Conclusion

Weakening domestic and foreign demand has recently been the major concern of the policy maker in Turkey. In particular, this impelled the Turkish government to seek a way of substituting the decline in domestic demand with foreign ones. However, the presence of ongoing economic crises in the major export markets of Turkey has left no option for the government other than inclining on domestic demand and holding it as high as possible to compensate declines in economic growth. This policy measure relies on the presumption that

there is complementary relationship between domestic and foreign demand. However, there is no reason to hold this proposition without any empirical evidence.

In this study, we try to fill this gap by examining the relationship between the domestic and foreign demand components and the export performance for the Turkish case. In addition to aggregate exports, we also adopted our approach to manufacturing industry data. Our findings reveal that there is a substitution relationship between domestic and foreign markets as we have predicted from the theoretical model. We have also observed that the dichotomy between domestic and foreign markets of Turkey is less than those of Portugal (Esteves and Rua, 2015) and India (Sharma, 2013). In other words, the substitution in the long-run is relatively high. Statistical tests reveal that the dependant variable is *the export share in the foreign market* rather than exports in both aggregate and manufacturing export performance. The effect of a domestic demand shock lasts almost five quarters for aggregate exports but it appears to take place only in the first and the second quarters for manufacturing. Manufacturing also seems to have a very slow pace of adjustment similar to aggregate exports. We observe substitutability between domestic and foreign markets for manufacturing exports as well. The manufacturing firms target foreign market share mainly when the domestic market growth is negative.

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Table 1 - Unit Root Test Results

	Level	*First difference*
At the aggregate level		
Exports (x_t)	-1.229 [0.658]	-7.767 [0.000]
Domestic demand (d_t)	-0.436 [0.522]	-7.705 [0.000]
Foreign demand (d_t^*)	-1.794 [0.793]	-5.840 [0.000]
Real exchange rate (e_t)	-2.683 [0.082]	-7.794 [0.000]
Without gold imports & exports		
Exports (x_t)	-2.120 [0.238]	-5.462 [0.000]
Domestic demand (d_t)	-0.465 [0.890]	-7.763 [0.000]
Manufacturing		
Exports (x_t)	-1.360 [0.597]	-6.362 [0.000]
Domestic demand (d_t)	-1.731 [0.411]	-7.772 [0.000]
Foreign demand (d_t^*)	-1.638 [0.458]	-5.647 [0.000]

Notes: All variables are seasonally adjusted, and they are used in logarithmic form. *p-values* are reported in [.].

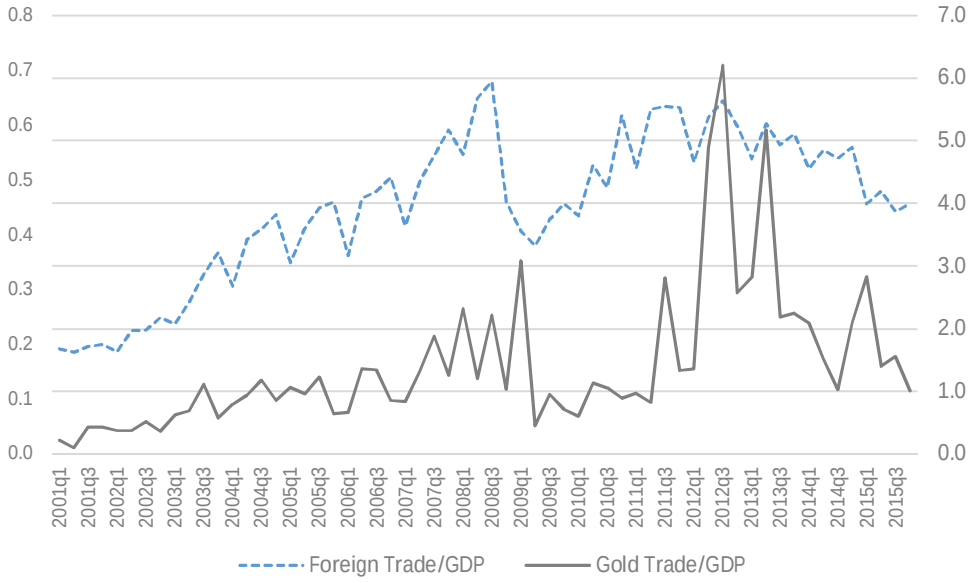

Figure 1 – The Shares of Foreign Trade and Gold Trade in GDP (%)

Table 2 - Aggregate Exports

Unrestricted model: $\Delta x_t = a_0 + \beta_1(L)\Delta d_t^* + \beta_2(L)\Delta d_t + \beta_3\Delta x_{t-1} + a_1 x_{t-1} + \alpha_2 d_{t-1}^* + \alpha_3 e_{t-1} + \varepsilon_t$
Restricted model: $\Delta(x - d^*)_t = a_0 + \beta_2(L)\Delta d_t + \beta_3\Delta x_{t-1} + a_1(x - d^*)_{t-1} + \alpha_2 d_{t-1}^* + \alpha_3 e_{t-1} + \varepsilon_t$
$\beta_{2i}(L) = \delta_1 + \delta_2 L + \delta_3 L^2 \ldots + \delta_p L^p$,
where $i = 1, \ldots, k$, p: the order of polynomial lag function, k:the number of lags with $p < k$.

		Gold trade included		*Gold trade excluded*		
				Unrestricted	Restricted	
		(1)	(2)	(3)	(4)	(5)
Constant		-6.471***	-5.452***	-4.682***	-4.747***	-4.458***
		(-4.313)	(-3.865)	(-3.304)	(-3.583)	(-3.596)
Δd_t^*		0.551***	0.409***	0.947***	--	--
		(3.766)	(3.226)	(7.890)		
Domestic demand	*Distributed Lag Structure*					
	β_{20} Δd_t	0.116***	--	-0.111***	-0.134	--
		(2.203)		(-1.086)	(-1.565)	
	β_{21} Δd_{t-1}	0.092***	--	-0.225***	-0.241***	--
		(2.096)		(-2.028)	(-2.430)	
	β_{22} Δd_{t-2}	0.068	--	-0.278***	-0.288***	--
		(1.635)		(-2.256)	(-2.465)	
	β_{23} Δd_{t-3}	0.044	--	-0.269***	-0.273***	--
		(0.944)		(-2.244)	(-2.330)	
	β_{24} Δd_{t-4}	--	--	-0.200**	-0.198**	--
				(-1.979)	(-1.970)	
	β_{25} Δd_{t-5}	--	--	-0.069	-0062	--
				(-0.805)	(-0.734)	
	$\Sigma \beta_{2i}$	**0.320****	--	**-1.152*****	**-1.196*****	--
		(1.914)		**(-2.010)**	**(-2.286)**	
	Polynomial Lag Function					
	δ_1	0.092***	--	-0.278***	-0.288***	--
		(2.096)		(-2.256)	(-2.465)	
	δ_2	-0.024	--	-0.022	-0.016	--
		(-1.327)		(-0.746)	(-0.598)	
	δ_3	--	--	0.031***	0.030***	--
				(2.175)	(2.182)	
d_t^-		--	-0.018*	--	--	-0.001
			(-1.782)			(-0.189)
Δx_{t-1}		-0.174***	--	--	--	--
		(2.027)				
$(x - d^*)_{t-1}$		--	--	--	-0.234***	-0.226***
					(-4.486)	(-4.413)
x_{t-1}		-0.292***	-0.247***	-0.233***	--	--
		(-5.454)	(-5.110)	(-4.352)		
d_{t-1}^*		0.473***	0.400***	0.358***	0.127***	0.117***
		(4.957)	(4.552)	(3.867)	(3.267)	(3.254)
e_{t-1}		0.111***	0.094***	0.164***	0.179***	0.194
		(3.637)	(4.126)	(2.670)	(3.433)	(3.765)
dum		-0.250***	-0.291***	-0.198***	-0.185***	-0.185***
		(-4.795)	(-5.758)	(-5.254))	(-7.322)	(-6.825)
$Adj - R^2$		0.660	0.633	0.890	0.612	0.574
Diagnostic test results						
N (2)		4.301[0.116]	2.083[0.353]	0.098[0.952]	0.437[0.804]	2.733[0.255]
SC (2)		1.998[0.368]	2.558[0.278]	1.630[0.443]	1.746[0.418]	0.352[0.839]
H (6)		10.118[0.257]	4.980[0.546]	4.780[0.781]	8.337[0.304]	8.113[0.185]
ARCH (1)		0.17 [0.676]	0.036[0.849]	1.124[0.289]	0.107[0.743]	1.761[0.185]
FF (1)		0.22 [0.665]	0.011[0.917]	0.900[0.343]	0.275[0.600]	0.011[0.917]
Unity restriction test on the coefficient of Δd_t^*						
WT1: $\chi^2(1)$		--	--	0.192 [0.662]	--	--

Note: Figures in (.) are t-statistics. These results are obtained from the OLS estimator. Figures in [.] in the diagnostic test results, on the other hand, shows the probabilities of rejecting the null hypothesis of each test. N: Jarque-Bera Normality test of residuals; SC: Breusch-Godrey serial correlation LM test; H: Breusch-Pagan-Godfrey Heteroskedasticity test; ARCH: Autoregressive conditional heteroscedasticity test; FF: Ramsey's RESET test. Figures in (.) next the abbreviation of each test shows the degree of freedoms

x_t : the level of real exports
d_t^* : the level of total demand in the foreign export market
d_t : the level of domestic demand
e_t : real exchange rate
dum : a dummy variable with the value of 1 for 2008q4, zero otherwise.
d_t^- : a dummy variable with the value of 1 for $\Delta d_t < 0$, zero otherwise.
Δ : the first difference operator.
All variables are used in the form of logarithm

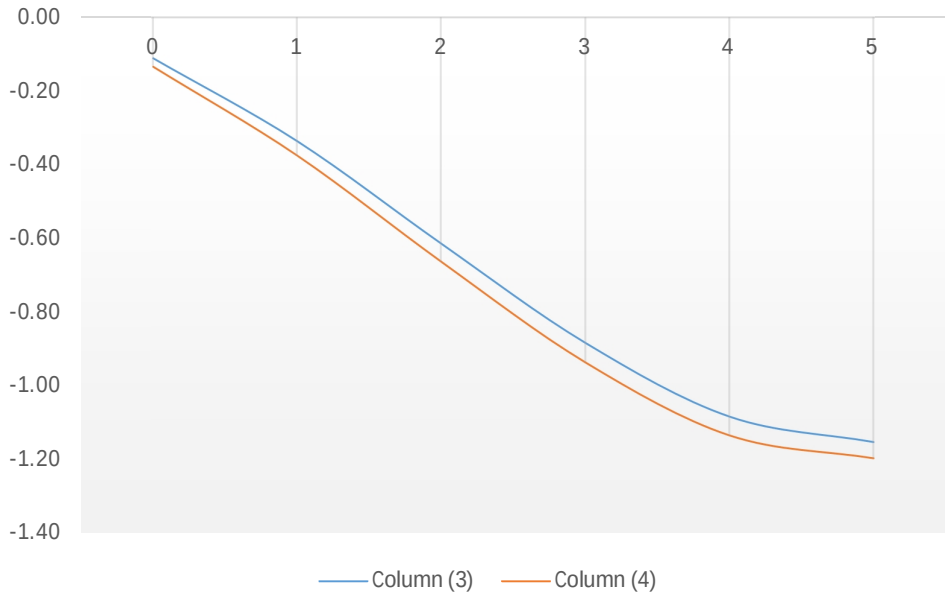

Figure 2 – The cumulative weights of distributed lag functions (β_{2i}) in Table 2.

Table 3 - Manufacturing Exports

Unrestricted model: $\Delta x_t = a_0 + \beta_1(L)\Delta d_t^* + \beta_2(L)\Delta dd_t + a_3\Delta x_{t-1} + a_4 x_{t-1} + \alpha_5 d_{t-1}^* + \alpha_6 e_{t-1} + \varepsilon_t$

Restricted model: $\Delta(x-d^*)_t = \gamma_0 + \gamma_1(L)\Delta dd_t + \gamma_2\Delta(x-d^*)_{t-1} + \gamma_3(x-d^*)_{t-1} + \gamma_4 d_{t-1}^* + \gamma_5 e_{t-1} + \varepsilon_t$

$\gamma_{1i}(L) = \delta_1 + \delta_2 L + \delta_3 L^2 + \cdots + \delta_p L^p$

where $i = 1, \ldots, k$, p: the order of polynomial lag function, k:the number of lags with $p < k$.

	Unrestricted model		Restricted model	
	(1)		(4 →2)	(5 → 3)
Constant	-5.419***		-6.208***	-4.830**
	(-2.566)		(-2.448)	(-2.073)
Δd_t^*	0.764***		--	--
	(4.180)			
Δd_{t-4}^*	--		--	0.126
				(0.916)
Δd_t	-0.115*		--	--
	(-1.891)			
		Distributed Lag Structure		
	--	$\gamma_{10}\,\Delta d_t$	-0.117***	--
			(-2.214)	
	--	$\gamma_{11}\,\Delta d_{t-1}$	-0.049**	--
			(-1.992)	
	--	$\gamma_{12}\,\Delta d_{t-2}$	-0.009	--
			(-0.295)	
	--	$\gamma_{13}\,\Delta d_{t-3}$	0.004	--
			(0.143)	
	--	$\gamma_{14}\,\Delta d_{t-4}$	-0.010	--
			(-0.213)	
	--	$\boldsymbol{\Sigma\,\gamma_{1i}}$	**-0.181***	--
			(-1.771)	
Domestic Demand (Δd_t)		*Polynomial Lag Function*		
	--	δ_1	-0.009	--
			(-0.295)	
	--	δ_2	0.027	--
			(1.764)*	
	--	δ_3	-0.014	--
			(-0.939)	
d_t^-	--		--	**0.022**
				(1.781)*
Δx_{t-1}	-0.080		--	--
	(-0.931)			
$\Delta(x-d^*)_{t-1}$	--		--	-0.204
				(-1.938)*
x_{t-1}	-0.217***		--	--
	(-3.647)			
$(x-d^*)_{t-1}$	--		-0.235***	-0.194***
			(-3.328)	(-3.025)
d_{t-1}^*	0.376***		0.185**	0.142
	(3.049)		(2.282)	(1.898)
e_{t-1}	0.110***		0.118***	0.094***
	(3.981)		(3.266)	(2.639)
dum	-0.237***		-0.188***	-0.164***
	(-3.982)		(-3.762)	(-3.435)
$Adj - R^2$	0.609		0.335	0.333
Diagnostic test results				
N (2)	3.568 [0.168]		3.956[0.138]	4.368 [0.113]
SC (2)	1.319 [0.517]		0.399[0.819]	4.675 [0.100]
H (7)	6.348 [0.500]		9.184[0.240]	8.014 [0.331]
ARCH (1)	0.152 [0.696]		0.017 [0.896]	0.216 [0.642]
FF (1)	0.035 [0.851]		1.641[0.200]	0.011 [0.916]
Unity restriction test on the coefficient of Δd_t^*				
WT: $\chi^2(1)$	1.658 [0.198]		--	--

Note: Figures in (.) are t-statistics. These results are obtained from the OLS estimator. Figures in [.] in the diagnostic test results, on the other hand, shows the probabilities of rejecting the null hypothesis of each test. N: Jarque-Bera Normality test of residuals; SC: Breusch-Godrey serial correlation LM test; H: Breusch-Pagan-Godfrey Heteroskedasticity test; ARCH: Autoregressive conditional heteroscedasticity test; FF: Ramsey's RESET test with the degree of freedom (1, 62). Figures in (.) next the abbreviation of each test shows the degree of freedoms.

x_t : the level of real exports
d_t^* : the level of total demand in the foreign export market
$(x - d^*)_t$: the market shares of exports in foreign market.
d_t : the level of domestic demand
e_t : real exchange rate
dum : a dummy variable with the value of 1 for 2008q4, zero otherwise.
d_t^- : a dummy variable with the value of 1 for $\Delta d_t < 0$, zero otherwise.
Δ : the first difference operator.

All variables are used in the form of logarithm.

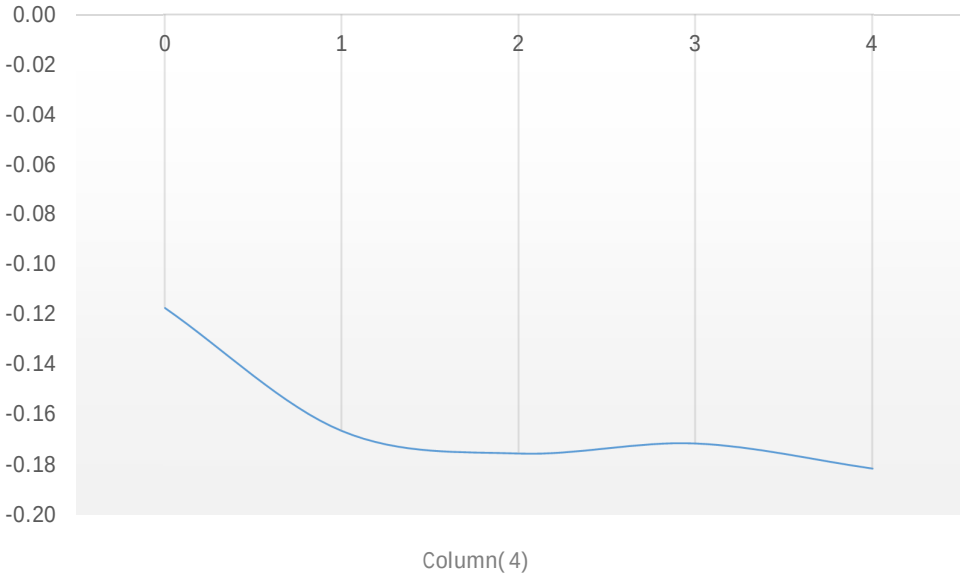

Figure 3 – The cumulative weights of distributed lag functions (γ_{1i}) in Table 3.