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Effects of trade liberalization on the welfare of the agriculture sector via double factorial domestic terms of trade in Turkey: 1990-2010

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The effect of the agricultural support policies on the prices of the agricultural commodities has been declining in Turkey since 1990s. The prices of the agricultural commodities approximate to the world prices. The employment in the agriculture sector has been declining due to the transfer of labor from the agriculture sector to the non-agriculture sector. In this paper, the effects of the trade liberalization on the welfare of the agriculture sector in Turkey at the period of 1990-2010 are estimated by the double factorial domestic terms of trade indicator. The findings of the estimation denote that the welfare of the agriculture sector is increased related with the labor productivity increase triggered by the labor transfer from the agriculture sector at the trade liberalization process while the domestic terms of trade is developed in the expense of it. The welfare is transferred from the agriculture sector to the industry sector via relative price scissor. Even though the relative productivity of the agriculture sector is increased at the examination period, the welfare of the agriculture sector is negatively affected from the domestic terms of trade.

JEL Classifications: F14, I31, O13

Keywords: Double factorial domestic terms of trade, domestic terms of trade, trade liberalization, agriculture sector, inter-sectoral income distribution

Introduction

Though the diminished share in production, exports and employment, the agriculture sector still retains its strategic importance for the Turkish economy in 2000s. The agriculture sector constitutes almost 10 percent of the gross domestic product while one fourth of the active population are employed within this sector. The exports of the sector was 7.4 percent of the total exports of Turkey and had been giving trade surplus in 1990s. However, the share of the sector within the total exports decreased to almost 4 percent and the sector has begun to give trade deficits in 2000s.

Trade liberalization leads to the equalization of the market prices in agriculture. According to Kıymaz (1980), prices of the agricultural commodities have been decreasing in Turkey with trade liberalization while the world prices have been increasing and this fact might lead to a tremendous decrease in the income of the producers in the agriculture sector.

Income distribution between the agriculture sector and the industry sector is deemed as one of the determinants of the income inequality in an economy. Derviş and Robinson (1980) find out the effects of relative price and relative productivity development of the sectors on the income distribution. Celasun (1986) remarks the importance of the domestic terms of trade (DTOT) which has been developed in the expense of agriculture sector while he is explaining the income inequality in Turkey. Pamuk (2005) attributes the income inequality to the efficiency differences between sectors while he is explaining the

developments in the income distribution depending on the average income differences between agriculture and non-agriculture sector.

The studies which examine the income distribution between the agriculture sector and the industry sector mostly refer to the DTOT index (Pamuk, 2009, p.74; Tezel, 1994, pp.425-431; Dağdemir, 2011, pp.123-125; Boratav, 2009; Bilginsoy, 1997). Although the DTOT index is accepted as an indicator of the income transfer between sectors via relative prices, it is not regarded as the only satisfactory determinant in explaining the income distribution (Wu, 1985; Tyagi, 1987; Ghosh, 1988). It is not possible to understand the effect of the productivity on the income distribution depending only on the DTOT index.

On the other hand, there are studies in Turkey which explain the income distribution between the agriculture sector and the industry sector via labor productivity differences (Pamuk, 2005; Üngör, 2011, İmrohoroğlu, İmrohoroğlu, and Üngör, 2013). Nevertheless, it is also insufficient to accept the labor productivity differences as the only explanatory variable of the income distribution.

According to Boratav (2009), the relative price changes could reflect the changes in the income distribution when they are taken into consideration together with the DTOT index and the productivity differences between the agriculture sector and the industry sector. The DTOT index might be deteriorated while the productivity of the agriculture sector relatively increases. It would be inadequate to acknowledge such a case as an income distribution development against the agriculture sector. Thus, in order to examine the changes in the income distribution between the agriculture sector and the industry sector, the changes in the relative prices should be adjusted from the effects of the sectoral productivity differences. For this purpose, double factorial domestic terms of trade (DFDTOT) index is developed from the DTOT index. The DFDTOT index is calculated taking into consider the DTOT index and the productivity indexes of the agriculture sector and the industry sector and accepted as an indicator of the changes in the income distribution. Therefore, the DFDTOT index is regarded as a more adequate indicator than the DTOT index in analyzing the income distribution between agriculture sector and the industry sector.

This paper aims to determine the changes in the purchasing power of the agriculture sector via DFDTOT index within the trade liberalization process in Turkey. The structure of the paper is as follows. First, a brief introduction is given and there is the analytical framework in which the DFDTOT index is explained. Then, the development of the DFDTOT index under the sway of the agricultural policies in Turkey at the 1990-2010 period is analyzed. Next, the effects of the trade liberalization and the openness on the DFDTOT index are inquired so as to assess the income distribution between the agriculture sector and the industry sector. Afterwards, the model which explains the factors defining the income distribution via the DFDTOT index are evaluated. The paper ends up with the discussion of the findings and the conclusion.

Analytical framework

According to Kuznets, income distribution changes in favor of the agriculture sector when the productivity of the agriculture sector increases more than the productivity of the industry sector. Kuznets (1966) defines an Inter-Sectoral Productivity Ratio depending on the productivity of the agriculture and non-agriculture sector¹ and refers to it as an indicator of the inter-sectoral income inequality. The Inter-Sectoral Productivity Ratio which is also expressed as the Kuznets ratio might be used as a sectoral income distribution indicator which comprises the average labor productivity ratio of the industry sector (I) and the agriculture sector (A).

¹ Although the non-agricultural sector covers the services sector as well as the industry sector within the Kuznets ratio, it represents only the industry sector in this paper.

The Kuznets ratio which is admitted as an indicator of the inter-sectoral income distribution incorporates the real production and the prices of the sectors as well as the sectoral employment. In other words, the Kuznets ratio is determined by the prices in the agriculture sector (P_A) and the industry sector (P_I), the real production in the agriculture sector (Q_A) and the industry sector (Q_I) the labor employment in the agriculture sector (L_A) and the industry sector (L_I).

$$\text{Kuznets ratio: } K_t = \frac{P_I Q_I / L_I}{P_A Q_A / L_A}$$

If the Kuznets ratio is expressed as $1/K$, it will be possible to see the effects of the changes in the prices and the productivity of the agriculture sector and the industry sector on the inter-sectoral income distribution.

$$1/K = \frac{P_A}{P_I} \frac{\frac{Q_A}{L_A}}{\frac{Q_I}{L_I}}$$

The agriculture sector prices relative to the industry sector prices are defined by the DTOT index while the productivity of the agriculture sector relative to the productivity of the industry sector is expressed as the Inter-Sectoral Real Productivity Ratio (ISRPR) index.

$$\begin{aligned} \text{DTOT} &= P_A / P_I \\ \text{ISRPR} &= PRO_A / PRO_I \\ PRO_A &= Q_A / L_A \\ PRO_I &= Q_I / L_I \end{aligned}$$

The $1 / K$ ratio represents the DFDTOT index which is the indicator of the inter-sectoral income distribution. The DFDTOT index is determined by multiplying the DTOT index by the ISRPR index.

$$\text{DFDTOT} = \frac{P_A PRO_A}{P_I PRO_I}$$

The DFDTOT index explains the increases in the welfare of the agriculture sector by the relative productivity and relative price increases. When the DFDTOT index > 1 , it is understood that the income distribution is changed in favor of the agriculture sector because of the price and productivity increases. On the other hand, when the DFDTOT index < 1 , the income distribution is changed in favor of the industry sector.

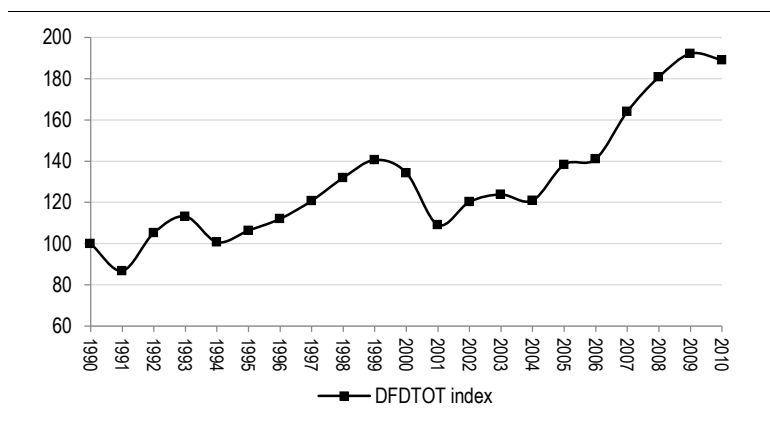
Development of the DFDTOT index under the sway of the agricultural policies in Turkey

In the paper, the DFDTOT index is constituted in order to examine the income distribution between the agriculture sector and the industry sector in Turkey at the period of 1990-2010. Seasonally adjusted sectoral wholesale price index, production and employment data are collected from the Turkish Statistical Institute (TÜİK). The development of the DFDTOT index at the 1990-2010 period can be followed from Figure 1.

According to Figure 1, the DFDTOT index which represents the productivity and price changes in the agriculture sector relative to the industry sector is increased during 1990-2010. For a proper assessment of the changes in the welfare of the agriculture sector, the effects of the agricultural policies pursued in Turkey should also be taken into consideration.

The DFDTOT index is developed under the influence of the agricultural support policies in Turkey. The Turkish agricultural support policies are substantially changed in 1980s (Narin, 2008). The agricultural supports are diminished and the prices of the agricultural commodities are started to be determined by the market forces. However, the agricultural production is negatively affected from this policy shift. After the experience of the decrease in the agricultural production, Turkish governments started to support the agriculture sector in 1990s and thus, the DFDTOT index is developed in favor of the agriculture sector from 1992 on.

FIGURE 1. THE DEVELOPMENT OF THE DFDTOT INDEX IN TURKEY: 1990-2010



The DFDTOT index is developed in the expense of the agriculture sector in 1994 which is the economic crises year for Turkey. The agricultural supports are diminished in accordance with the package of economic relief. Nevertheless, they are introduced once a more in 1995. The DFDTOT index is developed in favor of the agriculture sector during 1995-1999 period in conjunction with the agricultural support policies.

The 1995-1999 period also witnessed the conclusion of the World Trade Organization (WTO) Agriculture Agreement and entering into force of the Customs Union between Turkey and the European Union (EU). The WTO Agriculture Agreement is a commitment to decrease the quantitative restrictions and export subsidies gradually which are implemented on to the agricultural commodities (Dağdemir, 2009, p.78). Regarding the WTO Agriculture Agreement, Turkey has no responsibility in diminishing the domestic market and export subsidies but she has to lower the import tariffs on the agricultural commodities. Moreover, the permission system which had been applied on to the imports of the agricultural commodities is terminated in 1996 (Kıymaz, 2008, p.48; Günaydın, 2006, p.18).

A new era has begun for the agricultural policies of Turkey in 2000s under the guidance of the WTO, the EU, the International Monetary Fund (IMF) and the World Bank. Following the 2001 economic crises, Turkey has left the price support mechanism and instead has initiated the direct income support policy in the agriculture sector. The government subsidies given to the agriculture sector has been diminished via privatization of the public corporations. The direct income support policy implemented during 2000-2007 was not very successful and thus a new support policy is initiated in 2008. The new policy is designed to support the productivity and the regional product features and the premium system is converted into the area-based support. Regarding the DFDTOT index, it is changed against the agriculture sector in the economic crises year of 2001 once a more. The agriculture sector had to wait until 2006 so as to compensate the income losses.

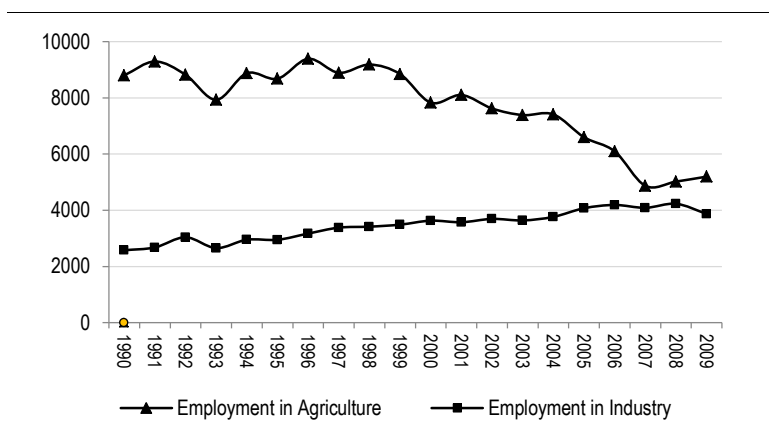
According to Kazgan (2003), the reason of the income losses of the agriculture sector in 2000s is the devastating effects of the discharge of the agriculture support institutions and administrations which are established during 1930-1980 and the relinquish of the price support policy. Regarding the DFDTOT index, it is developed in favor of the agriculture sector in 2006-2009 period.

Income distribution between the agriculture sector and the industry sector in Turkey

The income distribution between the agriculture sector and the industry sector might be evaluated via employment, prices and production. According to the economic indicators of the Turkish economy at the 1990-2010 period, the income distribution between these two sectors has been affected by the labor transfer from the agriculture sector to the non-agriculture sector. The labor transfer from the agriculture sector to the non-agriculture sector is an anticipated outcome of the economic development. This labor transfer in Turkey endorses the study of Harris and Todaro (1970) in which they explain the development of the employment in the agriculture sector and the industry sector. According to their study, the main reason of the labor transfer from the agriculture sector to the industry sector is the increase in the population and labor productivity.

Figure 2 displays the development of the employment in the agriculture sector and the industry sector in Turkey at the 1990-2010 period. The employment in the agriculture sector which is 9 million at the beginning of 1990s declines to 5 million at the end of 2000s. The employment in the agriculture sector increases parallel to the subsidy policies of the governments and starts to decrease together with the implementation of the market mechanism in the agriculture sector. However the employment in the industry sector steadily increases from 2.5 million to 4 million at the same period.

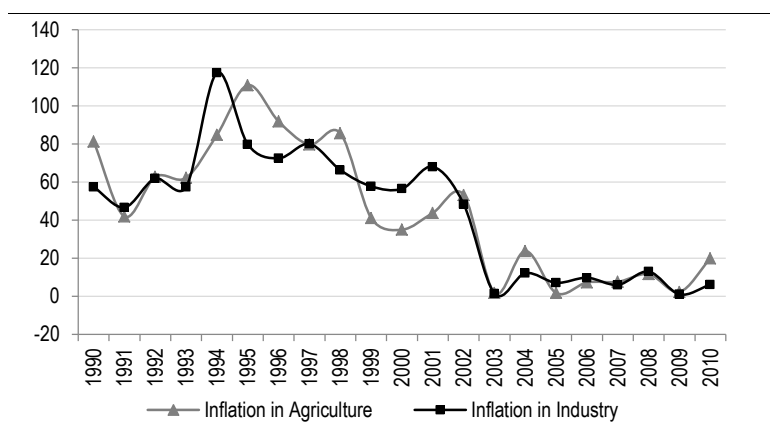
FIGURE 2. EMPLOYMENT IN THE AGRICULTURE SECTOR AND INDUSTRY SECTOR: 1990-2010 (THOUSAND)



Another determinant of the income distribution between the agriculture sector and the industry sector is the prices. The inflation rates within the agriculture sector and the industry sector at the 1990-2010 period in Turkey are given at Figure 3. It should be noted that, the producer prices comprise the subsidized prices. The inflation rates which are high in 1990s start to decrease in 2000s. The increase of the prices of the agricultural commodities are more than the increase of the prices of the industrial commodities in 1990s except some years. However, the so-called trend which is in favor of the prices of the agricultural commodities in 1990s is reversed in 2000s and the prices of the industrial

commodities are increased relatively more than the agricultural commodities. The inflation within the industry sector is more than the agriculture sector in 2000s except some years. According to Harris and Todaro (1970), there would be an accelerated labor transfer from the agriculture sector to the other sectors when the prices of the agricultural commodities are relatively decreased. Thus, the relative decrease in the prices of the agricultural commodities could be a factor in encouraging the labor transfer from the agriculture sector to the industry sector in Turkey.

FIGURE 3. INFLATION IN THE AGRICULTURE SECTOR AND INDUSTRY SECTOR IN TURKEY: 1990-2010



The other important determinant of the income distribution between the agriculture sector and the industry sector is the production which affects the income level. Figure 4 displays the real production in both sectors at the examination period. The real production of the industry sector is remarkably increased in 2000s compared with the agriculture sector. The production in the agriculture sector which is 15 billion TL at the beginning of 1990s with constant prices is increased to 17 billion TL at the end of 2000s. However, the production in the industry sector is increased to 48 billion TL from 22 billion TL at the same period. Another explanatory determinant of the model of Harris and Todaro (1970) is the development of the production in the agriculture sector and industry sector. The Turkish agriculture sector which has a relative decrease in production solves the problem of increased population by labor transfer to the non-agriculture sector. Henceforth, the change in the sectoral re-distribution of the employment positively affects the productivity of the agriculture sector. As a sum up, the income of the industry sector is developed under the sway of the increase in the employment, prices and the production. On the other hand, the income of the agriculture sector is affected by the relative decrease in the employment and prices rather than the production.

In the paper, the development dynamics of the DFDTOT index are determined by the DTOT index and the ISRPR index. The DFDTOT index represents the productivity and price differences between the agriculture sector and the industry sector. In other words, the DFDTOT index explains the inter-sectoral income distribution via productivity and price differences. In order to analyze the sources of income distribution between the agriculture sector and the industry sector, the DTOT index, the ISRPR index and the Transfer (T) index are developed besides the DFDTOT index and their trends are given at Figure 5.

According to the Figure 5, the DTOT index is in favor of the agriculture sector except the economic crises year of 1994 at the 1990-1998 period. However, it is in favor of the industry sector after 1999 and has its lowest level in 2001. Though it is in favor of the

agriculture sector at the 2001-2004 period, it is continued to be lower than the base year index after 2004 on.

FIGURE 4. PRODUCTION IN THE AGRICULTURE SECTOR AND INDUSTRY SECTOR: 1990-2010 (CONSTANT PRICES OF 1987, MILLION TL)

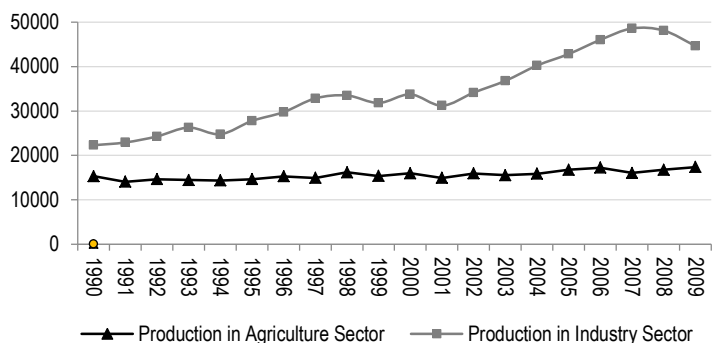
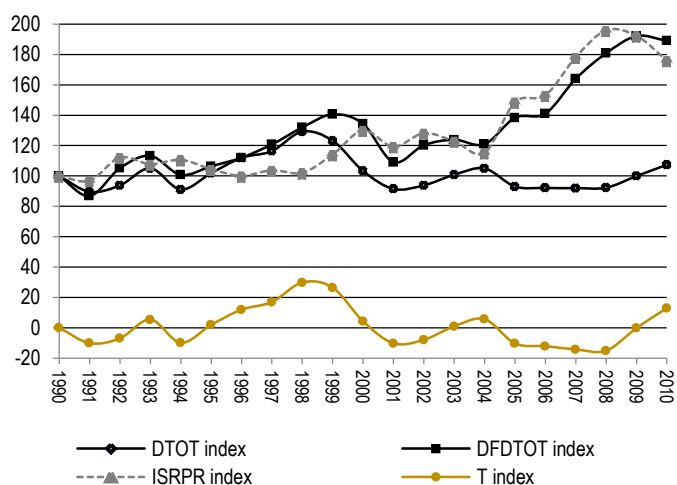


FIGURE 5. TRENDS OF THE INDEXES AND INCOME TRANSFER TO THE AGRICULTURE SECTOR IN TURKEY: 1990-2010



It is also essential to take into consideration of the ISRPR index at the 1990-2010 period. When the Figure 5 is examined, it is understood that the ISRPR index is steady at the 1990-1998 period despite some minor fluctuations. Nevertheless, the agriculture sector is experienced productivity increases relative to the industry sector after 1999 together with the policy shifts in favor of the agriculture sector except the economic crises years of 2001 and 2008. We have already determined that the main reason of the productivity increase in

the agriculture sector is the labor transfer from the agriculture sector to the non-agriculture sector.

In order to determine the changes in the welfare of the agriculture sector, the development dynamics of the DFDTOT index should also be taken into consideration. The DFDTOT index has a trend parallel to the DTOT index until 1998. From 1999 on, the DFDTOT index is increased under the influence of the ISRPR index which is in favor of the agriculture sector. Moreover, the difference between the DFDTOT index and the DTOT index is expanded until 2009.

The other index which is examined in Figure 5 is the T index. The T index displays the direction of income transfer between the agriculture sector and the industry sector and represents the annual difference between the DFDTOT index and the ISRPR index. According to the T index, there is an income transfer from the agriculture sector to the industry sector via prices at the 1990-1995 period except 1993. At the 1995-2000 period, the income transfer from the industry sector to the agriculture sector via prices has an increasing trend until 1998 and then it starts to decrease. The income is transferred from the agriculture sector to the industry sector via prices at the 2000-2009 period except the economic crises year of 2004.

Though the overall trends of the DFDTOT index are detected at the 1990-2010 period in which the trade liberalization process gained a momentum in Turkey, a more analytical analysis is required so as to explain the dynamics and effects of the DFDTOT index.

Model

The paper aims to answer the question of the effects of the trade liberalization on the distribution of income of the agriculture sector and the industry sector at the 1990-2010 period. The dependent variable of the model is the DFDTOT index. The first independent variable of the model is the agriculture sector production relative to the industry sector production. As the commodity prices are determined by supply and demand at the market economy, the ratio of the production of the agriculture sector to the industry sector (QA_t/QI_t) is taken as one of the explanatory variables of the model. The (QA_t/QI_t) ratio represents not only the relative production of the two sectors but also the domestic and the foreign demand. All other things held constant, the increase in the production of the agriculture sector relative to the industry sector would represent an increase in the income of the agriculture sector relative to the industry sector. However, it should be kept in mind that the elasticity of supply of the agricultural production is lower than the industrial production and this peculiarity affects the agricultural commodity prices and the industrial commodity prices differently. Nonetheless, the increase in the (QA_t/QI_t) ratio is expected to affect the DFDTOT index positively.

Once the economy is opened up with trade liberalization, the supply is determined not only by the domestic production but also by the imports and the exports of the commodity. Hence, the identification of the effects of the trade liberalization on the income of the agriculture sector and the industry sector becomes a significant issue at a process in which the commodity prices are being affected. In order to clarify the effects of the trade liberalization on the DFDTOT index, the volume of trade/gross domestic product (X_t+M_t / GDP_t) ratio which is considered as an indicator of the openness of the Turkish economy is taken as another explanatory variable.

If the openness ratio (X_t+M_t / GDP_t) affects the DFDTOT index positively, it means that there is an income transfer in favor of the agriculture sector by virtue of the trade liberalization.

The previous year's DTOT index ($DTOT_{t-1}$) is identified as the other explanatory variable of the model. Market failures mostly lead to a time lag in the equilibrium price setting. Thus, the previous year's price might influence the setting of the following year's price. It is anticipated that the sign for coefficient of the DTOT index should be positive if the previous year's relative prices affect the following year's DFDTOT index positively.

The last explanatory variable of the model is the labor transfer ratio from the agriculture sector to non-agriculture sector (EL_t/EA_t). If the (EL_t/EA_t) is positive, the DFDDTOT index and thus the relative income of the agriculture sector would be positively affected.

The TÜİK quarterly data at the period of 1990-2010 is used in the estimation of the models. The number of observations is 80. According to the Akaike Information Criterion (AIC), the equation given below is selected as the most appropriate model among the alternative models and tested (Equation 3).

$$DFDTOT_t = \alpha + \beta_1\left(\frac{QA_t}{QI_t}\right) + \beta_2\left(\frac{(X+M)_t}{GDP_t}\right) + \beta_3(DTOT_{t-1}) + \beta_4\left(\frac{EL_t}{EA_t}\right) + U_i$$

(Equation 3) ¹

Stationary review of all the explanatory variables are tested by the Unit Root Test and it is found that all the variables have unit roots. So as to provide the stationarity of the variables, the first difference of the series are taken. According to the Granger causality test results, the DFDTOT index is not the reason of the explanatory variables. However, all the explanatory variables are found as the variables which affect the DFDTOT index. The results of the Granger causality test enable the usage of the Least Squares Method (LSM). Depending on the AIC, the most appropriate model is selected among the three models which are estimated to explain the DFDTOT index.

Findings

The estimation results which explain the effects of the trade liberalization on the DFDTOT index in Turkey at the 1990-2010 period are given at Table 1. The values of the diagnostic tests display the proficiency of the empirical results of the model. The F-test proves the significance of the model. The Jarque-Bera (JB) test which is implemented to the residuals demonstrates that the residuals have a normal distribution. Moreover, the result of the Breusch-Pagan-Godfrey (BPG) test shows that there is not a heteroscedasticity problem. However, the Breusch-Godfrey (BG) test highlights a serial correlation. Though the lagged values of the dependent variable are used so as to eliminate the serial correlation, the problem is continued. In order to eliminate the serial correlation, the standard errors are estimated by Newey-West heteroscedasticity and the serial correlation by robust Markov matrices.

¹ AIC results for the DFDTOT*

Model	Variables	AIC
1	(QA_t/QI_t) $(X_t + M_t/GDP_t)$	-1.612
2	(QA_t/QI_t) $(X_t + M_t/GDP_t)$ $DTOT_{t-1}$	-1.617
3	(QA_t/QI_t) $(X_t + M_t/GDP_t)$ $DTOT_{t-1}$ (EL_t/EA_t)	-1.832

Note: * The best model which is chosen by the AIC is mentioned in bolt.

According to the estimation results, the (QA_t/QI_t) affects the DFDTOT index positively and statistically significant and the $(X_t + M_t / GDP_t)$ negatively and statistically significant. The effect of the previous year's DTOT ($DTOT_{t-1}$) index on the DFDTOT index is statistically significant and negative. On the other hand, the effect of the labor transfer from the agriculture sector (El_t/EA_t) on the dependent variable is statistically significant and positive.

TABLE 1. THE ESTIMATION RESULTS FOR THE DFDTOT INDEX
IN TURKEY BY THE LSM: 1990-2010

Variables	Coefficients	Standard Deviations of the Estimations	t-values
Constant Term	0.0007	0.010	0.074 **
(QA_t/QI_t)	0.128	0.040	3.203 *
$(X_t + M_t / GDP_t)$	-2.244	0.127	-1.923
$DTOT_{t-1}$	-0.049	0.048	-1.027
(El_t/EA_t)	0.368	0.085	4.328 **

$\bar{R}^2 = 0.737$

F-test: 55.104(0.000), AIC=-1.832, JB=1.400(0.495), BPG=1.695(0.160), BG=21.370 (0.000). * Refers to the 10% significance level and ** refers to the 5% significance level. The values in brackets are the probability values. The standard errors for serial correlations are estimated by Newey-West heteroscedasticity and the serial correlation by robust Markov matrices.

As the β_1 coefficient has a positive sign, the relative increase in the agricultural production leads to an increase in the welfare of the agriculture sector. This relationship is also supported by the β_4 coefficient. The β_4 coefficient displays not only the positive relationship between the ISRPR index and the DFDTOT index but also the welfare increase effect of the productivity increase. The β_4 coefficient displays the positive relationship between the DFDTOT index and the labor transfer from the agriculture sector. It also refers to the labor productivity increase effect of the labor transfer. Certainly, this labor productivity increase leads to a welfare increase.

The β_2 coefficient denotes the negative effect of the increased volume of trade through trade liberalization on the welfare of the agriculture sector. The finding regarding the negative effect of the trade liberalization on the agriculture sector can be explained via β_3 and β_4 coefficients. Trade liberalization not only endorses the relative production increase within the agriculture sector but also facilitates new employment opportunities out of the agriculture sector. The increase in the productivity of the agriculture sector affects the welfare of the agriculture sector positively. Nevertheless, trade liberalization triggers the relative price scissor in the expense of the agriculture sector. There is an income transfer from the agriculture sector to the industry sector via prices which are developed in the expense of the agriculture sector. The net effect is that the income distribution is developed in the expense of the agriculture sector within the trade liberalization process in Turkey.

According to the β_3 coefficient, the current year's DFDTOT index is negatively affected by the previous year's relative prices. The industry sector prices are determined by the current year's production and demand in the market period but the case can be slightly different for the agriculture sector. Due to the asymmetric information between the

producers and the consumers, the current year's production decisions in the agriculture sector are taken by considering the previous year's prices while the consumers take into account the current year's prices. The production in the agriculture sector which is designated by the previous year's prices affects the current year's prices adversely. The adverse effect of the previous year's DTOT index on the current year's DFDTOT index limits the welfare increase of the agriculture sector. The effect of the DTOT index on the DFDTOT index is negative though it is lagged and there is an income transfer from the agriculture sector to the industry sector via prices.

Depending on the estimation results, the negative welfare effect of the trade liberalization on the agriculture sector via prices is bigger than the positive welfare effect of the labor productivity increase triggered by the labor transfer. When these two effects are evaluated together, it should be concluded that the income distribution is developed in the expense of the agriculture sector at the 1990-2010 period in Turkey in which the trade is more liberalized and the structural transformation within the agriculture sector is more accelerated.

Conclusion

In this paper, the welfare of the agriculture sector in Turkey at the period of 1990-2010 is analyzed depending on the average income differences between the agriculture sector and the industry sector and the DFDTOT index is determined as the main indicator. The DFDTOT index is developed in favor of the agriculture sector until 1999 and a significant decrease is occurred at the economic crises years of 1999-2001. It should be reminded that these are also the years of policy changes in the agriculture sector in Turkey. After 2001, the DFDTOT index is started to increase representing a better-off for the agriculture sector. Despite some significant declines, the DFDTOT index is generally flourished in favor of the agriculture sector at the 1990-2010 period.

In order to evaluate the effects of the positive trend of the DFDTOT index on the welfare of the agriculture sector, the price and the productivity differences between the agriculture sector and the industry sector are examined. The DTOT index and the ISRPR index are developed as the main components of the DFDTOT index and the analysis is made depending on these indicators. It is determined that the reason of the change in the DFDTOT index in favor of the agriculture sector is the ISRPR index. Due to the labor transfer, the agriculture sector is experienced relatively more productivity increase than the industry sector and this relative difference in the productivity increase is reflected on the welfare of the agriculture sector positively.

On the other hand, the DTOT index which is developed in favor of the agriculture sector until 1998 is evolved in favor of the industry sector afterwards. The relative price scissor is accrued in favor of the industry sector at the years of the economic crises leading to a decrease in the DTOT index. The T-index which represents the difference between the DFDTOT index and the ISRPR index refers to an income transfer from the agriculture sector to the industry sector for the years examined except the 1995-2000 period. The welfare increase of the agriculture sector which is generated by the relative productivity increase is transferred to the industry sector via prices.

The model of the paper which is used to determine the factors affecting the DFDTOT index at the 1990-2010 period in Turkey is estimated via LSM. The findings denote that the effect of the trade liberalization on the DFDTOT index is statistically significant and negative. In other words, the trade liberalization negatively affects the welfare of the agriculture sector. According to the DFDTOT index which has a positive relationship with the labor productivity increase triggered by the labor transfer, the trade liberalization brings about productivity and welfare increase for the agriculture sector. Nonetheless, the DTOT index is developed in the expense of the agriculture sector at the same period in which the price support system is abolished under the policies of the structural

transformation within the agriculture sector. Trade liberalization triggers the equalization of the market prices of the agricultural and industrial commodities with the world prices. The interaction of the prices of the agricultural commodities with the world prices negatively affects the purchasing power of the agriculture sector. The relative price scissor is developed in favor of the industry sector and the effect of the DTOT index on the DFDTOT index is negative.

The findings of the paper exhibit important assignments for the researchers and the policy makers. The average income difference between the agriculture sector and the industry sector has an essential emphasis regarding the income distribution within an economy. In Turkey, the prices of the agricultural commodities which were relatively low had been subsidized by the protectionist government policies until 2000s and the average income difference between these two sectors were tried to be compensated in this wise. But together with the trade liberalization and the concurrent economic transformations in the Turkish economy in 2000s, the gains of the agriculture sector by virtue of the market interventions have been limited. Thus, the only way of increasing the welfare of the agriculture sector in Turkey is to increase the agricultural production and the productivity. Implementation of the modern agricultural techniques should be spread all over the agriculture sector so as to increase the production and the productivity and thus the welfare of the agriculture sector.

The model which is estimated in the paper refers to the labor productivity as the sole indicator of the average income. Referring only to the labor productivity can be regarded as one of the limitations of the paper. In the subsequent studies, the productivity of the agriculture sector might be determined referring to the cropland and the capital used. Moreover, the importance of the distribution of the agricultural income within the sector might also be taken into account while considering the welfare of the agriculture sector. Another limitation of the paper is the identification of the openness for the agriculture sector and the industry sector with the same indicator. An analysis referring to a relative openness ratio for the agriculture sector and the industry sector would support the findings of this paper or expose contributive findings and outcomes.

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