SCHRIFTEN DER GESELLSCHAFT FÜR WIRTSCHAFTS- UND SOZIALWISSENSCHAFTEN DES LANDBAUES E.V.

Grethe, H., Siddig, K., Götz, L., Ihle, R.: How Do World Agricultural Commodity Price Spikes Affect the Income Distribution in Israel? In: Bahrs, E., Becker, T., Birner, R., Brockmeier, M., Dabbert, S., Doluschitz, R., Grethe, H., Lippert, C., Thiele, E.: Herausforderung des globalen Wandels für Agrarentwicklung und Ernährung. Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Band 48, Münster-Hiltrup: Landwirtschaftsverlag (2013), S. 111-122.

HOW DO WORLD AGRICULTURAL COMMODITY PRICE SPIKES AFFECT THE INCOME DISTRIBUTION IN ISRAEL?[1]

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Abstract

We assess the distributional effects of the transmission of world market price shocks for the highly import dependent economy of Israel. We combine a CGE simulation with an empirical cointegration analysis for assessing the direction and extent of the connectedness of Israeli and world market prices. The Israeli and the world market for wheat are found to be integrated. Price shocks are completely transmitted from the world market to the domestic Israeli market. We find negative effects on domestic household income, consumption and welfare. Regressive expenditure effects dominate progressive income effects so that the resulting domestic income distribution appears to be more unequal.

Keywords

Agricultural trade, CGE, commodity prices, income distribution, Israel, Middle East, price transmission.

1 Introduction

This study investigates the welfare effects of high agricultural prices on income distribution in Israel. We explicitly analyse price transmission from the world market to the domestic market and use the retrieved price transmission parameter as an input in a single country CGE model.

International commodity prices have been highly volatile in recent years. Israel as a small and open economy which is highly dependent on imports of agricultural commodities and food products has been exposed to high price spikes in 2007/2008 as well as 2010/2011 and food price inflation has been heavily discussed in the public. In the short run, options to adjust to high food prices are limited: the expansion of production capacity needs time. Short run effects of high price spikes could involve negative effects on the economy as a whole (less growth and international competitiveness), negative welfare effects on households especially for low income households due to high expenditure shares for food products, but also positive income effects for labour employed in agriculture.

Examples for studies explicitly accounting for the actual degree of price transmission from the world to the domestic market in the analysis of welfare effects are DE JANVRY and SADOULET (2010) and CUDJOE et al. (2010). DE JANVRY and SADOULET analyze the impact of the global food crisis 2007/2008 on welfare and poverty in Guatemala. The simulation is based on the observed changes in the prices of major staple foods affected by the crisis and finds that consumer prices increase by 8.5% compared to a 40.1% increase in international prices, which would transmit completely to the domestic market in case of perfect price transmission. CUDJOE et al. (2010) analyse the local impacts of the global food crisis in Ghana. Using a threshold vector error correction model, price transmission from the world market to regional mar-

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kets and between regional markets is analysed. The analysis of consumer welfare is based on the obtained estimates for price transmission.

Tracing back to the Law of One Price (TAKAYAMA and JUDGE, 1971), many simulation model analyses generally assume that price changes are transmitted fully from the world market to the domestic markets by assuming ad valorem wedges among international and national prices. This means that a 1% increase in the world market price leads to a 1% increase in domestic prices. However, the resulting welfare effects may differ substantially depending on the pass-through of the price increase on world markets to the domestic market. An example for assessing the welfare effects of the recent world market price peak is IVANIC and MARTIN (2008), assuming full price transmission. However, the degree to which price developments from international markets are transmitted to national markets is country specific and product specific. The degree of price transmission may be influenced by various factors, e.g. trade restrictions (GÖTZ et al., 2010), trade costs (GOODWIN and PIGGOTT, 2001) and imperfect competition (MEYER and VON CRAMON-TAUBADEL, 2004). Also, price changes in world market prices might be transmitted more fully to central than peripheral markets thus may be transmitted at different speed across regional markets. NICITA (2006) is an example of explicitly accounting for imperfect regional price transmission in case of international shocks to the Mexican economy.

Wheat markets in Latin America seem to be highly influenced by world market price developments, whereas rice markets in China and India, which are characterized by strong political market interventions, seem to be shielded from price movements on international markets. In Africa maize prices even increased beyond the world market level in some countries for domestic reasons (GIEWS, 2011). Thus, the assumption of full price transmission might imply strongly biased welfare assessments: if the domestic prices increase at a lower degree than world market prices the welfare effects might be overstated.

The integration of econometric price transmission and CGE analyses is not trivial for several reasons. One of them being that price transmission is endogenous to CGE models and determined by a wide range of model parameters and specifications and their interaction such as trade shares, share of the sector concerned in the economy, Armington elasticities, elasticities of substitution among value added and intermediate inputs as well as within these input categories and factor market closures in general (SIDDIG and GRETHE, 2012). In this paper, we use the approach developed by Siddig and Grethe in order to calibrate a CGE for Israel to empirically determined price transmission parameters.

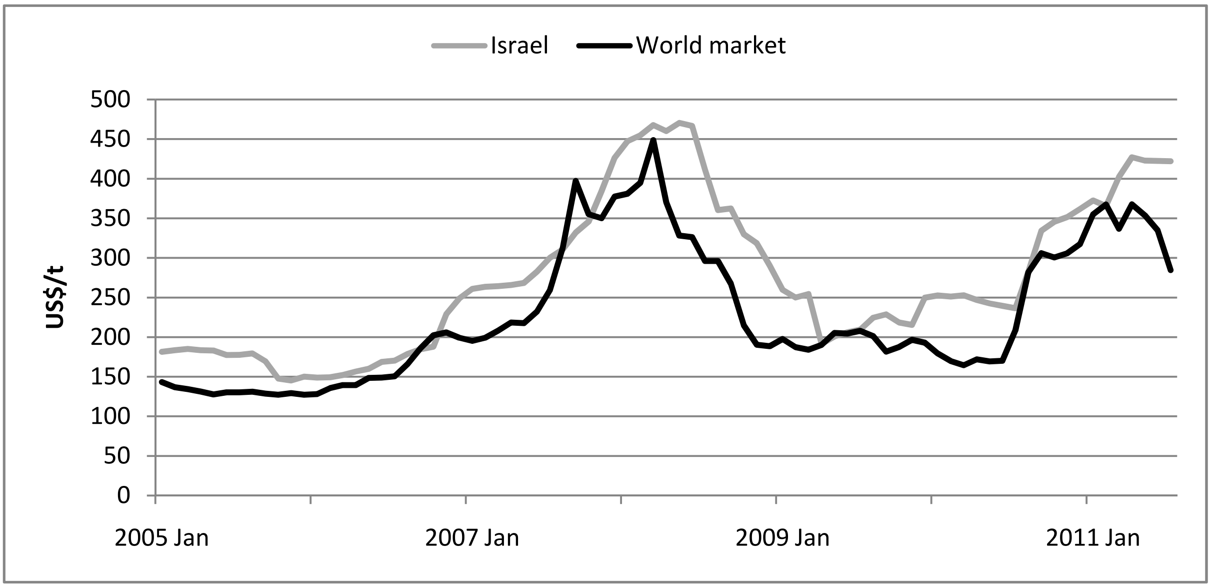
The paper is structured as follows: Section 2 presents the empirical price transmission analysis and Section 3 presents the CGE analysis. Finally, the paper concludes in Section 4 with a discussion on the appropriateness of the chosen approach and the relevance and implications of the results.

2 The Transmission of Price Shocks between the World Market and Israel

The empirical model for assessing the connectedness of domestic Israeli prices with world prices, technically spoken, the degree of long-run price transmission from the world market to the domestic Israeli market is estimated for wheat. Wheat is among the most important staple food in the country although Israel has barely own wheat production and is thus heavily dependent on imports. Hence, price developments on the world market for wheat and the degree of their transmission to the domestic Israeli market are of high interest for the country. In 2010 Israel imported about 390,000t of wheat. According to foreign trade data of the ICBS (2011), Israel's main sources of wheat imports were Switzerland, the Netherlands and the USA on average accounting for 30%, 26% and 22%, respectively, of the annual wheat imports between 2007 and 2010.

We use 77 monthly observations of the average domestic wheat price in Israel (ICBS, 2011) and monthly FOB prices (HGCA, 2011) of wheat (classification "other wheat") in Rouen (France) as the corresponding world market price. All prices are transformed to US$/t and are in logarithms.

Figure 1: Wheat price series 2005 - 2011



Sources: HGCA (2011) and ICBS (2011).

The empirical analysis of the connectedness of domestic Israeli prices with world prices is carried out with cointegration methodology using a vector error correction model (VECM). This model typically takes the form:

(1) $$\Delta p_t = \alpha\beta' p_{t-1} + \sum_{i=1}^{k} \Gamma_i \Delta p_{t-i} + \varepsilon_t = \alpha\, eqe_{t-1} + \sum_{i=1}^{k} \Gamma_i \Delta p_{t-i} + \varepsilon_t$$

We consider a vector $p_t = \{p_t^{Israel}, p_t^{Rouen}\}$' of price series each of which represents the wheat price in one of the two locations considered. The difference operator Δ denotes the first differences of the prices in time, i.e., $\Delta p_t = p_t - p_{t-1}$. The rationale of the model is to split current price change Δp_t into two determinants. The first term $\alpha\beta' p_{t-1}$ represents the influence of the past deviations from equilibrium (the equilibrium errors $\beta' p_{t-1} = eqe_{t-1}$) exerted on the current price changes. The matrix β estimates the long-run price transmission coefficients of the prices and α quantifies the feedback coefficients which quantify the adjustment speed by which deviations from the equilibrium are corrected from period to period. The term $\sum_{i=1}^{k} \Gamma \Delta p_{t-1}$ measures the partial impact of past price changes by the autoregressive parameters Γ_i on current price movements. Last, ε_t and k denote Gaussian white noise and the autoregressive lag length, respectively.

We find clear evidence that both time series are integrated of order one (I(1)) based on the Augmented Dickey Fuller Test (DICKEY and FULLER, 1981) and the KPSS test (KWIATKOWSKI et al., 1992) as shown in Table 1.

Table 1: Results of the unit root tests

Price series	ADF - levels		KPSS - levels		ADF – levels		KPSS – levels	
	lags[a]	stat.[b]	lags	stat.[c]	lags[a]	stat.[d]	lags	stat.[e]
Israel	3	-2.07	4	0.70**	2	-3.15	4	0.11
World market	5	-2.71	4	0.61**	6	-2.83	4	0.09

Notes: ** Significance at the 5 per cent level.
[a] Lag length selection according to the Akaike Information Criterion (AIC).
[b] The critical value for the test with trend at the 5 per cent significance level is -3.41.
[c] The critical value at the 5 per cent significance level is 0.46.
[d] The critical value for the test without trend and constant at the 5 per cent significance level is -1.94.

Source: Authors' calculations.

The results of the Johansen trace test in Table 2 confirm that the series are cointegrated of order one, which is the precondition for a vector error correction model representation of our data since a linear combination of the series will be stationary. We hence conclude that the domestic Israeli market and world market for wheat are integrated.

Table 2: Results of the cointegration test (p-values)

Price pair	Cointegration rank 0	Cointegration rank 1
Israel –world market	<0.01	0.58

Notes: Lag length selection according to AIC.

Source: Authors' calculations.

The results of the VECM obtained by Johansen's maximum likelihood estimator (JOHANSEN, 1995) are given in Table 3. Based on the results of the unrestricted model, we do not obtain evidence against restricting the slope coefficient of the world market price to unity in absolute value (the p-value is 0.91). Hence, we focus our interest on the restricted model. Its estimates are very similar to the ones of the unrestricted model. The Israeli price is on average by roughly 21% higher than the world market price. In the long run, a price change in the wheat world market is fully transmitted to the domestic Israeli market since the price transmission elasticity β^{World} can be restricted to unity in absolute value.

Table 1: Estimates of the cointegration relationships

Model	β^0	β^{Israel}	β^{World}	α^{Israel}	α^{World}	p-value of Wald test
Unrestricted	-0.18	1	-1.01	-0.28**	0.09	-
Restricted	-0.21	1	-1	-0.29**	0.06	0.91

Notes: β^0, β^{Israel} and β^{World} denote the constant and the long-run equilibrium coefficients of the Israeli and the world market prices, respectively. α^{Isreal} and α^{World} denote the rate of the responses of the Israeli and the world market price, respectively, to deviations from this equilibrium. Two asterisks signal significance at the 5 per cent level.

Source: Authors' calculations.

The Israeli demand for wheat represents only a small part of the quantities traded on the world market. Hence, Israeli importers will tend to be price takers. This supposition is confirmed by the estimated adjustment speeds. Only the Israeli price significantly responds to deviations from the above mentioned 21% price spread and corrects almost one third (29%) of the equilibrium error each month while the much larger world market does not react. This points to the fact that the transmission of price shocks from the world market to the domestic wheat market of Israel tends to be very strong, that is, both markets are tightly connected.

The analysis of the transmission of wheat price shocks suggests that price changes on the world market for wheat are completely transmitted to the domestic market of Israel. Therefore, we use this level of price transmission in the following Computable General Equilibrium (CGE) analysis which is described in the next section.

3 CGE Analysis

The single country Computable General Equilibrium (CGE) model STAGE developed by McDonald (2009) is used to investigate the domestic implications of increases in the world price of agricultural commodities. CGE models are suitable tools to analyse the economy-wide effects of external shocks such as changes in the world prices of imports and exports. They represent simulation laboratories in which the entire economy including producers, consumers, and institutions are included. They also show the linkages among those actors in terms of monetary flows. Hence, changes occurring in any of the components generate ripple effects on the economy at large. In this study we are particularly interested in the effects generated by increases in the world price of selected agricultural commodities on Israeli households, industries, and trade. This section also provides overviews on the applied model, its database and the analysed scenarios.

3.1 Description of the Applied CGE Model

STAGE is a Social Accounting Matrix (SAM) based model with a mix of non-linear and linear relationships that depict the behaviour of the economy's agents. It is a static model with households maximizing their utility according to their preferences represented by Stone-Geary utility functions. They consume commodities available in the domestic market from both domestic production and imports. The substitution between domestic and imported goods is governed by the Constant Elasticity of Substitution (CES) function, following Armington (1969). Israel is a small country in the world market of agricultural products, which are the focus of this study; hence world market prices for imports and exports are fixed.

Domestic production is modeled as a two stage production process with a CES function at the top, where intermediate inputs and value added are combined to generate the output of each activity. At the second stage, intermediate inputs are combined according to Leontief technology, while value added (land, labour, and capital) is composed according to CES technology, with the optimal ratio being determined by relative prices. The domestic production of commodities is sold in the domestic or export market according to relative prices on each market and modeled as a Constant Elasticity of Transformation (CET) function. The model[5] is solved in General Algebraic Modeling System (GAMS) and adapted to use an Israeli SAM of the year 2004 (Siddig et al., 2011).The Israeli 2004 SAM is a detailed SAM that comprises one account for capital, one for land, and 36 accounts for labour.

Price System

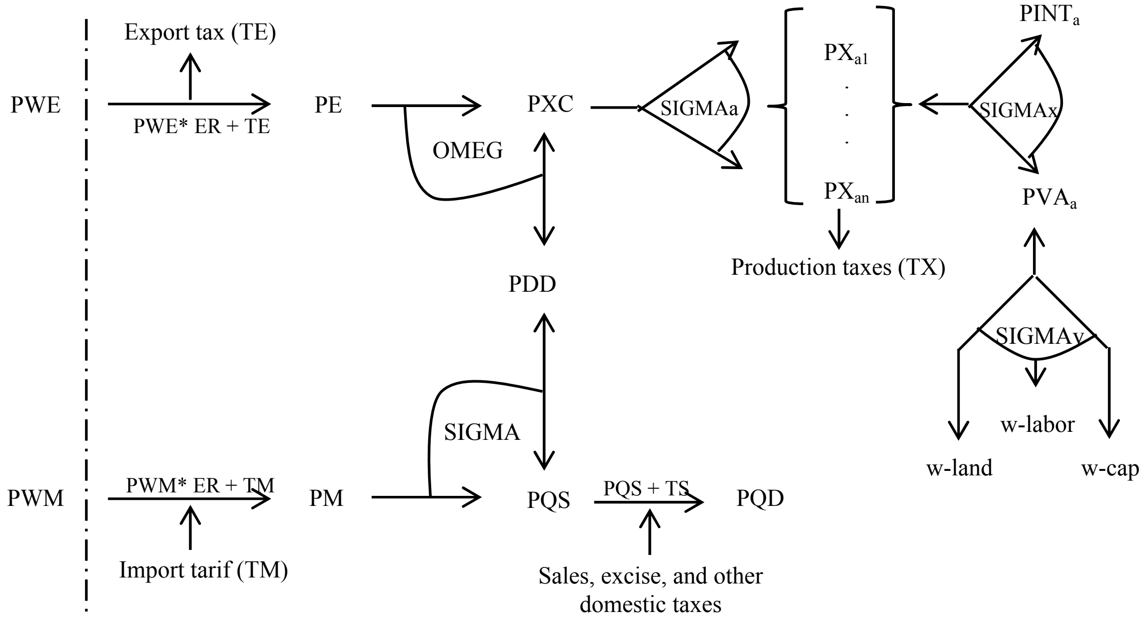
Figure (2) shows the interrelationships between the prices for commodities, activities and production factors as depicted by the model. Note that the price definitions, their abbreviations, and tax accounts are those of the standard model. The supply prices of the composite commodities (PQS) are defined as weighted averages of the domestically produced commodities that are consumed domestically (PDD) and the domestic prices of imported commodities (PM), which are defined as the product of the world prices of commodities (PWM) and the exchange rate (ER) uplifted by ad valorem import duties (TM). These weights are updated in the model through first order conditions for optima. The average prices exclude sales taxes, and hence must be uplifted by (ad valorem) sales taxes (TS) and excise taxes (TEX) to reflect the composite consumer price (PQD).

The producer prices of commodities (PXC) are similarly defined as the weighted averages of the prices received for domestically produced commodities sold on domestic (PQS) and export (PE) markets. These weights are updated in the model through first order conditions for optima. The prices received on the export market are defined as the product of the world price

[5] Refer to McDonald (2009) for a detailed description of the model.

of exports (PWE) and the exchange rate (ER) less any exports duties due, which are defined by ad valorem export duty rates (TE).

Figure 2: Price relationships in the STAGE model



Source: SIDDIG and GRETHE (2012).

Throughout this price system, changes in international prices transmit to a stronger or lesser degree to the domestic market dependent on a wide range of model parameters and specifications and their interaction such as trade shares, share of the sector concerned in the economy, Armington elasticities, elasticities of substitution among value added and intermediate inputs as well as within these input categories and factor market closures in general. The impact of these determinants is analyzed in SIDDIG and GRETHE (2012) and we use their approach to calibrate the CGE for Israel to a price transmission elasticity close to 1 for agricultural commodities based on the results of Section 3. To this purpose, we set the Armington elasticities for the shocked products to 5 instead of 2 for other products and the substitution elasticities among value added and intermediate inputs as well as among production factors to 0.5 instead of 0.8 for all other products.

Closure Rules

The model closure has two objectives: 1) it aims at depicting the functioning of the Israeli economy in the short run as realistically as possible and 2) it aims at assuring the resulting level of price transmission to be close to 1 in accordance with the results of Section 2. Especially the immobility of land and capital in the short run is a substantial ingredient in achieving a high degree of price transmission (SIDDIG and GRETHE, 2012). The model is investment driven with the share of investment in domestic final demand being fixed. In the government account, all tax rates, government consumption expenditures and transfers are assumed fixed with the equilibrating variable being the government savings. For the factor market, the amount of capital, semi-skilled labour, skilled labour and land is fixed and activity specific, while unskilled labour is fully mobile and fully employed. The exchange rate floats and the current account balance is fixed in the default closure. International prices are fixed, i.e. changes in Israeli trade have no impacts on international prices as suggested by the cointegration analysis (Section 2).

3.2 Database

The Israeli SAM that represents the Israeli economy in the year 2004 is the main database used in this study. It incorporates 43 sectors, 36 labour accounts, 10 household groups, and 18 tax categories other than taxes on production factors (SIDDIG et al., 2011). The SAM was developed based on data obtained from different official sources in Israel including the Israeli Central Bureau of Statistics (ICBS), the Central Bank of Israel (BOI), and the Israeli Tax Authority (ITA). In addition, non-Israeli sources were used to fill-in gaps in domestic reports such as the World Trade Organization (WTO), the Organization for Economic Co-operation and Development (OECD), and the World Bank.

Agriculture in the SAM is represented by 9 sectors, namely: wheat; cereals; other crops; raw milk; bovine cattle, sheep, goats, and horses; other animal farming; fruits and vegetables; fishing; and gardening, and mixed and unclassified farming.

Households are represented by 10 groups classified according to ethnic composition (Jews and non-Jewish), with each of the two ethnic groups being divided into 5 income quintiles. The first quintiles are those with the lowest income, while the fifth quintiles receive the highest. Based on this disaggregation, the changes in income, expenditure, and welfare levels of these groups due to price changes will be shown. Moreover, as the SAM provides data on 36 labour accounts besides land and capital, changes in household income from these factors will also be discussed.

3.3 Scenarios

The model is firstly solved using the described database and closure rules and the model performance is checked for consistency and the reproduction of the original database. In addition, two simulation scenarios are formulated as follows: PW100, which simulates the world price of selected agricultural imports and exports to increase by 100% and PW050, which simulates the world price of selected agricultural imports to increase by 50%. Based on the observed international price pattern in the period 2007/2008, the selected agricultural raw commodities included in the simulation are wheat, cereals, other crops, and milk. In addition, the first stage processed product groups edible oils, products of the milling industry, and dairy products are also exposed to the international price shock.

3.4 Simulation Results

As the severity of the impact of the simulated shocks depends on the level of price transmission, this section starts by showing the price changes after the shocks in Table 4. The shock is applied to the world price of imports (PWM), which connects to domestic prices through the domestic price of imports (PM). The latter is the result of currency conversion using the exchange rate and an addition of any tariffs (Figure 2). Furthermore, the shock is applied to the world price of exports (PWE), which connects to the domestic price of exports (PE). If not mentioned otherwise, the simulation results discussed in the following are those where PWM and PWE increase by 100% (PW100).

Table 4 shows that the pass-through of the shock is most pronounced for cereals and wheat, followed by other crops, milk, edible oils and milling industry products, while it is smaller for dairy products. The level of pass-through for the raw agricultural products depends on several characteristics of the commodity and its producing sector. The most important characteristics are the shares of imports and exports in the total domestic market of the respective commodity, the level of substitutability between the imported and the domestically produced commodity, the level of substitutability between the exported and the domestically sold commodity, and the levels of substitutability of factors and intermediate inputs in the production nesting structure (SIDDIG and GRETHE, 2012). The elasticities of substitution for all selected commodities are equal in our model; but the pass-through is strongly influenced by import and export shares, which rank the agricultural raw commodities similar to the level of pass-through in Table 4.

Table 4: Changes in prices (%) due to 100% increase in the world price of imports and exports (ranked according to pass through from PM to PDD

	PM, PE	PQS	PQD	PDD	PXC	PX	PINT	PVA
Wheat	92.79	93.15	93.15	94.07	94.05	93.27	-1.38	301.35
Cereals	92.79	92.22	92.22	90.59	90.67	89.12	1.31	353.00
Other crops	92.79	90.84	90.84	89.20	90.97	89.41	8.96	235.66
Milk	92.79	80.55	80.55	80.37	80.88	80.20	46.95	178.68
Edible oils	92.79	79.09	79.09	76.67	77.23	73.61	38.55	342.94
Millingind. products	92.79	78.58	78.58	76.27	78.98	75.57	51.43	322.49
Dairy Products	92.79	60.39	60.39	59.81	62.61	61.45	44.96	114.07

PM: domestic price of imports; PE: domestic price of exports; PQS: price of composite supply; PQD: composite purchaser price; PDD: consumer price for domestic supply of commodity; PXC: producer price of commodity; PX: composite producer price; PINT: intermediate input price by activity; and PVA: value added price by activity.

Table 4 also shows that all the price series from the borders until the domestic consumer and producer prices including value added and intermediate input prices increase except the intermediate price for wheat. The intermediate prices of milk and the first stage processed products (plant oils, milling industry products and dairy products) increase much more than those for raw agricultural products, because raw agricultural products constitute a substantial share of their total intermediate costs.

In the remaining part of this section, the impact of these price shocks on producers and consumers as well as the economy at large is analysed in the following order: starting with the impact on macroeconomic indicators, the impact on domestic production, household income, consumption expenditures and welfare is discussed.

Macroeconomic Indicators

The impact of the two simulations on selected macroeconomic indicators is small. Table 5 shows the base values of the selected macro indicators in NIS billions in the second column and % changes under the two simulated scenarios. GDP slightly declines despite the increasing output of the shocked agricultural sectors and the NIS appreciates by 3.6%.

Table 5: Changes in real macroeconomic indicators (%)

	Base period (NIS billion)	PW050	PW100
Exchange rate NIS/US$		-1.82	-3.60
GDP by value added	563.71	-0.11	-0.06
GDP by expenditure	555.55	-0.20	-0.09
Total absorption	558.21	-0.42	-0.24
Household consumption	315.86	-1.52	-0.80
Government expenditure	149.37	1.02	0.50
Total investment	92.98	1.00	0.47
Total supply	1,091.46	-0.51	-0.26
Total use	603.88	-0.89	-0.45

As production and imports of most sectors decline, total supply consequently falls, resulting in declining household and intermediate input demand, with both of them driving the total use of commodities in the country as well as total absorption to decline.

Domestic Production

Domestic production of the sectors included in the shock increases most by 7% for edible oilsand least by 2.1% for dairy products (Table 6). The substantially lower increase in production of milk and dairy products than for crops can be explained by the fact that the dairy sector heavily depends on cereals and other crops as intermediate inputs and therefore faces strong increases not only in output but also in input prices. Furthermore, the pass through of the commodity prices for milk and dairy products is lower than for crops (Table 4).

Table 6: Changes in domestic production (%)

	Base (NIS billion)	PW050	PW100
Edible oils*	2.29	5.06	6.97
Milling industry products*	5.59	4.65	6.52
Cereals*	0.55	3.54	4.76
Wheat*	0.36	3.38	4.55
Other crops*	3.91	2.60	3.59
Milk*	2.86	1.99	2.91
Dairy products*	6.33	1.38	2.12
Fruits and vegetables	12.50	-1.42	-2.76
Other food products	12.62	-5.90	-10.83
Other animal farming	4.54	-8.58	-14.43

* Sectors included in the price shock.

Related food and manufacturing sectors are also included in Table 6. Sectors such as other animal farming and other food products display strongly declining production because these sectors heavily rely on the shocked agricultural commodities as intermediate inputs which drive up their production cost. Other sectors such as fruit and vegetables decline because of production factors and intermediate inputs moving to the products experiencing the world market price increase. The majority of the sectors other than those displayed in Table 6 show slightly declining production due to mobile unskilled labour and intermediate input prices increasing as these inputs move into the agricultural and food sectors which experience increasing prices.

Household Income, Expenditure and Welfare

Both, producers and consumers belong to Israeli households unless they are foreign enterprises investing in Israel, foreign workers or foreign residents. Therefore, all of their gains and losses due to changes in factor prices, transfers or commodity prices can finally be assigned to a specific household group. Ten household groups are included in the model SAM. They are classified according to ethnic group as Jewish and non-Jewish and according to five income quintiles for each ethnic group.

The results of the two scenarios show that all groups are negatively affected by the shocks relative to their base income (Table 7). But differences exist among household groups which result from different income composition per group. On average, total household income is composed of 69% from factor income, 1% from transfers from other households, 18% from government transfers, 8% from enterprises and 4% from the rest of the world. Results show that households' income from enterprises deteriorates by averages of 2.45% and 4.76% under PW050 and PW100, respectively, while their income from other households declines by 0.76% and 1.44%, respectively. Despite the increase in the income to land by 51.1% and 100.1% under to the two scenarios, total factor income declines by 0.01% and 0.02%. Transfers from the government remain constant. As low income households receive a significantly higher share of their income from stable government transfers than high income households, their income decline is lower in relative terms (e.g. -1.75% for Jewish quintile 1 in contrast to -2.25% for Jewish quintile 5).

What can be concluded here is that household income is negatively affected by increases in food prices with the higher burden in absolute as well as relative terms being borne by the richer household groups.

Households are not only affected by changes in income, but also by changes in commodity prices which affect their consumption expenditures. For all households groups, domestic consumption of all food and agricultural commodities declines. The highest percentage change occurs for edible oils declining by 6.95% for Non-Jewish households (quintile 5) and 6.97% for Jewish households (quintile 5), while the lowest percentage decline in food commodities consumption is recorded for grain milling products declining by 1.1% for Jewish households (quintile 4), all in the case of a 100% increase in international prices.

Table 7: Changes in income per household group (%)

	Base (NIS million)	PW050	PW100
Non-Jewish households (quintile 1)	14,488.96	-0.22	-0.38
Non-Jewish households (quintile 2)	13,348.06	-0.10	-0.13
Non-Jewish households (quintile 3)	10,885.70	-0.28	-0.48
Non-Jewish households (quintile 4)	7,074.58	-0.50	-0.92
Non-Jewish households (quintile 5)	5,258.68	-1.09	-2.08
Jewish households (quintile 1)	27,747.85	-0.91	-1.75
Jewish households (quintile 2)	43,665.65	-0.92	-1.76
Jewish households (quintile 3)	66,779.64	-0.93	-1.78
Jewish households (quintile 4)	90,395.58	-0.99	-1.90
Jewish households (quintile 5)	149,089.92	-1.17	-2.25

Note: lowest income =quintile 1 and highest income =quintile 5.

Table 8: Changes in household welfare (NIS million and % of income)

	PW050		PW100	
	NIS million	% income	NIS million	% income
Non-Jewish households (quintile 1)	-139.97	-0.97	-264.66	-1.83
Non-Jewish households (quintile 2)	-32.23	-0.24	-53.87	-0.40
Non-Jewish households (quintile 3)	-15.16	-0.14	-23.44	-0.22
Non-Jewish households (quintile 4)	-9.18	-0.13	-14.26	-0.20
Non-Jewish households (quintile 5)	-18.69	-0.36	-34.69	-0.66
Jewish households (quintile 1)	-446.71	-1.61	-865.26	-3.12
Jewish households (quintile 2)	-420.80	-0.96	-814.20	-1.86
Jewish households (quintile 3)	-436.96	-0.65	-841.01	-1.26
Jewish households (quintile 4)	-459.92	-0.51	-879.82	-0.97
Jewish households (quintile 5)	-608.97	-0.41	-1150.87	-0.77

Note: lowest income = quintile 1 and highest income = quintile 5.

In order to assess the combined effect of declines in income and increasing consumer prices on household welfare, Table 8 summarizes the welfare implications. It exemplifies the welfare impact by the equivalent variation (EV) in NIS million and shows the percentage of the welfare change relative to the base household income. The EV results show that low income households are hit more by the shocks compared to higher income households. This is due to the fact that low income households have a substantially higher expenditure share for food items, which increase heavily in price (Table 4). Thus, the regressive effects on the expenditure side overcompensate the progressive effects on the income side and in conclusion the simulated price shocks result in a more unequal income distribution in Israel. The aggregated welfare loss at the country level is NIS billion 2.9 and NIS billion 4.9 under the two scenarios, which is equivalent to 0.47% and 0.89% of the national GDP in the model base

4 Conclusions

This paper assesses the implications of periods of high international agricultural commodity prices for the highly import dependent Israeli economy with a focus on distributional effects. The study is motivated by the current increase in domestic food prices in Israel and strong international food price volatility. The international food price hikes of 2006–2008 have been transmitted completely to domestic prices of wheat in Israel, which is empirically assessed in this paper by the estimation of a cointegration model for quantifying the connectedness of domestic Israeli wheat prices with world prices.

To be able to depict the economy-wide implications of this connectivity between the world market and the Israeli market, a CGE is calibrated to the empirically determined degree of pass-through of prices from the world market to Israel. The price transmission found for wheat is perfect and in the calibration of the CGE the assumption is made, that this is similar for other agricultural raw products and their first stage processed products. Six agricultural commodity groups were shocked with a 50% and a 100% increase in the world price of im- and exports. Results show the Israeli GDP to slightly retract driven by declines in production and total use. As a result, total household income from the different sources including factors, enterprises, rest of the world, and other households shrinks and hence consumption and welfare decline. Income effects are progressive: high income households face higher income declines in absolute as well as relative terms due to their low share of transfer income from the government. But the regressive effects on the expenditure side which result from high expenditure shares for food in low income households overcompensate the progressive effects on the income side. In conclusion, low income households are harder hit by the shocks compared to high income groups for both, Jewish and non-Jewish households, and the simulated price shocks result in a more unequal income distribution in Israel.

References

CUDJOE, G., BREISINGER, C.and X. DIAO (2010): Local Impacts of a Global Crisis Food Price Transmission and Poverty Impacts in Ghana. Food Policy 35: 294-302.

DE JANVRY, A. and E. SADOULET (2010): The Global Food Crisis and Guatemala: What Crisis and for whom? World Development 38(9): 1328-1339.

DICKEY, D. A.and W. A. FULLER (1981): Likelihood ratio statistics for autoregressive timeseries with a unit root. Econometrica 49(4): 1057-1072.

GLOBAL INFORMATION and EARLY WARNING SYSTEM (GIEWS) (2011): Internet data source. Available at: http://www.fao.org/giews/english/cpfs/index.htm. Accessed in June 2011.

GOODWIN, B. K. and N. PIGGOTT (2001): Spatial Market Integration in the Presence of Threshold Effects. American Journal of Agricultural Economics 83: 302-317.

GÖTZ, L., GLAUBEN, T.and B. BRÜMMER (2010). Impacts of Export Controls on Wheat Markets During the Food Crisis 2007/2008 in Russia and Ukraine, Selected paper, Agricultural & Applied Economics Association 2010 AAEA, CAES, & WAEA Joint Annual Meeting, July 25-27, 2010, Denver, Colorado, USA.

HGCA (2011): Internet database. Available at: www.hgca.com. Accessed in September 2011.

ICBS (2011): Israeli Central Bureau of Statistics. Foreign trade data, various years.

IVANIC, M. and W. MARTIN (2008): Implications of higher global food prices for poverty in low-income countries. Agricultural Economics 39: 405-416.

JOHANSEN, S. (1995): Likelihood-based Inference in Cointegrated Vector Autoregressive Models. Oxford University Press, Oxford.

KWIATOWSKI, D., PHILLIPS, P. C. P., SCHMIDT, P.andY. SHIN (1992): Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root. Journal of Econometrics 54: 159-178.

MCDONALD, S. (2009): STAGE Version 1: July 2007. Course Documentation.

MEYER, J.and S. von CRAMON-TAUBADEL. (2004): Asymmetric price transmission: A survey. Journal of Agricultural Economics 55: 581-611.

NICITA, A. (2006): Multilateral Trade Liberalization and Mexican Households: The Effect of the Doha Development Agenda. In: Hertel, T. and L.A. Winters (ed.): Poverty and the WTO: Impacts of the Doha Development Agenda. The World Bank: 107-128.

SIDDIG, K. and H. GRETHE (2012): International Price Transmission in CGE Models: How to Reconcile Econometric Evidence and Endogenous Model Response? Contributed paper at the International Association of Agricultural Economists Conference. Foz do Iguaçu/Brazil. 18 – 24 August 2012.

SIDDIG, K., FLAIG, D., LUCKMANN, J.and H. GRETHE (2011): A 2004 Social Accounting Matrix for Israel. Agricultural Economics Working Paper Series (Hohenheimer Agrarökonomische Arbeitsberichte) No. 20.Institute of Agricultural Policy and Markets, Hohenheim.

TAKAYAMA, T. and G. JUDGE (1971): Spatial and Temporal Price Allocation Models. Amsterdam: North-Holland.