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Preferential vs. Full Trade Liberalisation: A Dynamic CGE Model with Heterogeneous Households for Jordan[1*]

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Abstract:

This paper deals with the economic effects and the policy implications of trade liberalisation on the Jordanian economy, with emphasis on welfare, income distribution and real wages of heterogeneous households, by using a neoclassical dynamic computable general equilibrium (CGE) model. Specifically the paper assesses the impacts of preferential trade liberalisation with the European Union (EU) and compare them with those brought about by broad and non-discriminatory trade liberalisation.

Keywords: Dynamic CGE Models, Heterogeneous households, Trade liberalisation, Jordan

1. Introduction

The process of preferential trade liberalisation undertaken by Jordan in the framework of the Association Agreement (AA) with the European Union (EU) is expected to provide benefits for Jordan in terms of lower import prices of investment and consumption goods that bring about higher consumer welfare. Investment demand plays a key role in the process of trade liberalisation, and determines the dynamic behaviour of investment and output, which are expected to increase in the long-run (Francois et al., 1997 and Baldwin, 1993). On the other hand, trade liberalisation has an unpleasant effect for the government. There is a loss in government revenue, due to foregone import tariff duties. Such an impact is likely to be particularly strong for Jordan, where government revenue

1 * I would like to thank Timo Trimborn, Beatriz Gaitan Soto, Bernd Lucke and Stefan Kolev.

relies heavily on custom duties.[2] The policy implications for Jordan suggest, therefore, that in order to counteract the adverse effects on government revenue due to the reduction in custom duties the government should accompany the trade liberalisation process with appropriate measures of public finance. However, such measures could make welfare impacts ambiguous, particularly for those households who rely heavily on transfer from the government. Furthermore, low-income households will probably fail to exploit the benefits of increased incentives for investment and will therefore fail to make use of the full potential of trade liberalisation. As pointed out by Winters (1996), trade reforms might affect households asymmetrically and might even create some losers.

A trade policy issue playing a role in Jordan's trade liberalisation is the debate about global versus regional integration (Winters, 1996). Whereas there is wide empirical evidence that economic growth rates and trade liberalisation are positively related (Sachs and Warner, 1995), there is further evidence supporting the view that non-discriminatory trade openness leads to higher growth than preferential trade liberalisation does (Vamvakidis, 1998). Moreover, preferential trade liberalisation is likely to cause trade diversion, that is a diversion of Jordanian imports from more efficient non-EU countries to more costly EU producers. The policy implications for Jordan therefore suggest that broad and non-discriminatory openness would be more beneficial than regional integration (Hoekman and Djankov, 1997, Ghesquiere, 1998). A multilateral and non-discriminatory trade liberalisation process would also avoid the costs of trade diversion, although it would clearly reduce further government revenues, and hence require additional compensatory measures of public finance.

Previous studies by Hosoe (2001) and Lucke (2001) on Jordan's trade liberalisation implemented static CGE models with one single representative household and focused on aggregate welfare and fiscal effects. However, these models do not account for dynamic effects due to capital accumulation and can not analyse income distribution effects.[3]

Theoretical studies by Chatterjee (1994) and Caselli and Ventura (2000) analyse the effects of introducing heterogeneous consumers into a neoclassical framework. However, the first approach that analyses income distribution in an applied dynamic neoclassical general equilibrium framework in which heterogeneous households are assumed to have different discount rates has been developed by Feraboli and Trimborn (2006), who augmented the dynamic CGE model developed by Feraboli et al. (2003) by introducing heterogeneous households.

This paper addresses the question of how both preferential and non-discriminatory trade liberalisation combined with a parallel process of complementary economic reforms affect welfare of heterogeneous households by implementing the dynamic computable general equilibrium (CGE) of Feraboli and Trimborn (2006).

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2 Import duties from EU trade in Jordan in the period 1994-96 averaged 12% of total tax revenue and 2% of GDP, total import duties averaged more than one-third of total tax revenue and about 6% of GDP (Abed, 1998).

3 To my knowledge, there is no other study on Jordan's trade liberalisation based on a dynamic CGE model with heterogeneous households.

2. The EU-Jordan Association agreement

The 1977 Cooperation Agreement granted Jordan duty-free access to the EU markets for most industrial products and preferential access for agricultural commodities. The Cooperation Agreement has been replaced by EU-Jordan Association Agreement (AA), which was signed in November 1997 and entered into force in May 2002. The AA provides the gradual reduction of import duties on imports of EU industrial and agricultural products into Jordan over a period of twelve years and aims at creating a free trade area between the EU and Jordan for most of the industrial sectors. Table 1 shows the pre-AA import duty rates and the tariff reduction schedule of the Association Agreement for eight good sectors.[4]

Period	Agric.	Mining	Food	Text.	Paper	Chem.	Miner.	Others
Pre-Agreement rates	17.0%	9.4%	29.2%	14.1%	13.2%	2.8%	12.2%	12.2%
Entry into force of the AA	17.0%	5.6%	29.2%	8.5%	7.9%	1.7%	7.3%	7.3%
One year after	17.0%	5.0%	29.2%	7.5%	7.0%	1.5%	6.5%	6.5%
Two years after	17.0%	4.4%	29.2%	6.6%	6.2%	1.3%	5.7%	5.7%
Three years after	17.0%	3.8%	29.2%	5.7%	5.3%	1.1%	4.9%	4.9%
Four years after	15.3%	2.8%	26.3%	4.2%	4.0%	0.8%	3.7%	3.7%
Five years after	13.6%	2.5%	23.4%	3.8%	3.5%	0.8%	3.3%	3.3%
Six years after	11.9%	2.2%	20.4%	3.3%	3.1%	0.7%	2.9%	2.9%
Seven years after	10.2%	1.9%	17.5%	2.8%	2.6%	0.6%	2.4%	2.4%
Eight years after	8.5%	1.6%	14.6%	2.4%	2.2%	0.5%	2.0%	2.0%
Nine years after	8.5%	1.3%	14.6%	1.9%	1.8%	0.4%	1.6%	1.6%
Ten years after	8.5%	0.9%	14.6%	1.4%	1.3%	0.3%	1.2%	1.2%
11 years after	8.5%	0.6%	14.6%	0.9%	0.9%	0.2%	0.8%	0.8%
12 years after	8.5%	0.0%	14.6%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 1

Tariff reduction schedule of the AA with the EU.

3. The Model

The Jordanian economy is modelled as a dynamic small open economy, by using the model developed by Feraboli and Trimborn (2006), which builds upon previous work done by Feraboli et al. (2003). The domestic economy has nine production sectors, eight of which produce goods and one produces services. Aggregate private consumption, government consumption, and aggregate investment are Cobb-Douglas composites of nine different sectoral outputs, which, in turn, are composites of domestically produced and imported goods (Armington,1969). Firms produce nine different commodities using a

4 The production sectors are Agriculture, Mining, Food, Textiles, Papers, Chemicals, Minerals, and Others.

Leontief production technology that employs sectoral goods and a value-added production, which is in turn a constant elasticity of substitution (CES) composite of capital and six different kinds of labour. Total output can be sold domestically or exported according to a constant elasticity of transformation (CET) specification. The Government raises taxes, collects import tariffs and runs a balanced budget. Government revenues are spent for a fixed amount of government consumption as well as for transfers to households. The domestic economy is a price-taker in international markets. Perfect competition and full employment are assumed in all sectors. Production factors are perfectly mobile across sectors.

For each of the six different household groups, the representative consumer chooses consumption and new capital so as to maximise discounted utility, subject to the budget constraint, the motion equation of capital, the equality between savings and investment, and the given initial level of capital stock.

The problem of each representative infinitely-lived household *i* is therefore to maximize discounted intertemporal utility

$$\int_0^\infty \log\left(C_i\right)\cdot e^{-\rho_i t}dt,\ i=1,...,6$$

subject to

$$\dot{K}_i = SAV_i - \delta K_i = \frac{YD_i - P_C C_i}{P_I} - \delta K_i$$

$$K_i\left(0\right) = K_{i,0}$$

where C_i, YD_i, K_i and SAV_i are consumption, disposable income, capital and saving of household *i*, respectively. Each representative household discounts future utility with discount rate ρ_i, which is specific to each household category. P_C and P_I are the composite prices of private consumption and investment goods and δ is the depreciation rate of capital.

Disposable income of each household group is given by

$$YD_i = \left(1-\tau_i\right)\left(w_i L_i + rK_i + GT_i + FT_i\right)$$

where w_i, L_i, K_i, GT_i and FT_i denote the individual wage rate, labour endowment, capital endowment, government transfer and foreign transfers to household *i*, respectively. The interest rate *r* is identical for each household since capital is a homogenous good. Each household pays a different income tax τ_i depending on its household group.

The solution to the above dynamic maximisation problem yields the Euler equation

$$\frac{\dot{C}_i}{C_i} = \frac{\left(1-\tau_i\right)r}{P_I} - \rho_i - \delta,\ i=1,...,6$$

Consumption of each household group is in turn a Cobb-Douglas composite of sectoral consumption

$$C_i = \Omega_i \prod_{j=1}^{9} c_{i,j}^{\theta_{i,j}},\ \Omega_i > 0,\ 0 < \theta_{i,j} < 1,\ i = 1,...,6;\ j = 1,...,9$$

where $c_{i,j}$ is household i's consumption of good j, $\theta_{i,j}$ is the share parameter of good j in consumption of household i, and Ω_i is the shift parameter in the Cobb-Douglas consumption function of household i.

4. Data and Calibration

The calibration procedure is based on the Social Accounting Matrix (SAM) for Jordan constructed for the year 2002.[5] On the assumption that the dataset represents an equilibrium of the economy, functional parameters in the model, such as share and shift parameters, are calibrated, i.e. they are estimated, such that the SAM represents a solution of the model. Household survey data allows disaggregation into six different groups of households. Each group differs with respect to labour income, capital income, transfers from government and from abroad, income-tax payments, and savings, as well as total consumption and the composition of total consumption. Households are taxed with a progressive, general income tax, resulting in different net interest rates[6]. Therefore, each household faces different incentives for saving. Time preference rates are then calibrated from survey data by assuming that consumption levels of all households are stationary in the long-run. Table 2 presents size and income composition of the household groups. For convenience household group one (HH1) is denoted as the poorest and household group six (HH6) as the richest household group.

The model is programmed in Gauss and solved with the relaxation procedure as proposed by Trimborn et al. (2008).

Class	Individuals	Labour	Capital	Gov. Transfer	Foreign remit.
HH1	81184	48%	27%	14%	11%
HH2	583420	58%	24%	10%	8%
HH3	970240	58%	27%	8%	7%
HH4	1251301	52%	32%	9%	7%
HH5	1224470	45%	39%	8%	8%
HH6	939704	30%	57%	6%	7%

Table 2

Size and income composition of the household groups

5 The SAM was constructed by Feraboli and Kolev.

6 This reflects the tax system in Jordan.

5. Simulations

Since the dataset available for the calibration procedure represents the Jordanian economy in the year 2002, this is the benchmark year. All variables at their benchmark levels have been normalised to one. Exogenous shocks are then implemented in the model, in order to compute the counterfactual equilibrium determined by the change in the policy regime. The effects of the policy change are assessed by comparison between counterfactual and benchmark equilibria.

The two simulations run in this work have two components: (i) the gradual reduction of import duties given by the EU-Jordan Association Agreement (AA), i.e. the schedule shown in Table 1, and (ii) the domestic counteracting policy response, i.e. the endogenisation of aggregate government transfer to households.[7]

The first simulation applies the gradual reduction of import duties only to the EU imports, i.e. it implements the AA with the EU. The immediate effect of reducing import rates on EU imports is a change in the relative prices in the domestic economy. The price of EU imports falls relatively to the price of imports from the rest of world. The composite import price will also decrease relative to the price of domestically-produced goods. The fall in the import prices boosts domestic demand and increases incentives for investment, which in turn leads to faster capital accumulation. In the long-run equilibrium this leads to a higher value of aggregate capital stock. Output is also expected to increase in the long-run. The loss in government revenue due to reduction in import duties is partially offset by the expansion in the tax base in the long-run. In the short-run government transfer to households is expected to fall to compensate for the immediate drop in government revenue. Consumption is likely to increase in the long-run on aggregate and also for each household class, but in the short-run consumption of specific household groups or even aggregate consumption might fall

The impact on welfare on each household class is therefore ambiguous. On the one hand, consumption is likely to increase in the long-run and this has therefore a positive impact on welfare. On the other hand, the fall in the government revenue brought about by trade liberalisation forces the government to reduce transfers to households, at least in the short-run. This affects negatively disposable income of households, who are forced, ceteris paribus, to reduce consumption. Clearly this will affect welfare negatively. Moreover, whereas aggregate consumption might increase in the short-run, the benefits might be distributed unevenly across different households, and some specific household category can be worse off after the trade liberalisation takes place.

In the second simulation the trade liberalisation is non-discriminatory, that is the gradual reduction of import tariff rates applies to all imports. This brings about a bigger negative effect on composite import prices, which is likely to have a larger positive impact on welfare than under the case of discriminatory trade liberalisation. However, full liberalisation has also a larger negative impact on government revenue. This might result in a larger decrease in government transfer to households and therefore in a larger negative impact

7 More precisely, aggregate transfer from the government to households is endogenous, whereas the share of each household's transfer in aggregate transfer is fixed.

on welfare. Hence the impact on welfare of individual households might be in principle ambiguous under both scenarios.

The simulation results lead to welfare changes in Jordan between –0.08% and 0.42%, as shown in Table 3, providing therefore evidence that trade liberalisation has different effects across heterogeneous households and can even create some losers. Low-income households gain slightly more from trade liberalisation in terms of welfare, since they can overcome losses in government transfer by an increase in the wage income due to aggregate capital accumulation. However, income inequality increases, since high income households can exploit the benefits of increased incentives for investment. This results in higher capital income and leads therefore to an increase in the income gap. Moreover, whereas preferential trade liberalisation makes one household worse off, non-discriminatory trade liberalisation leads to positive effects on welfare for all household groups. Finally, the behaviour of aggregate variables is qualitatively consistent with previous work done by Feraboli et al. (2003).

Scenario	HH1	HH2	HH3	HH4	HH5	HH6
AA with the EU	0.12	0.42	0.18	0.11	-0.08	0.14
Full liberalisation	0.12	0.31	0.21	0.16	0.06	0.11

Table 3

Welfare effects (percent change)

Figures 1 and 2 in the Appendix show the dynamic path of private consumption. Under both scenarios the consumption levels of the three richest households (HH4, HH5 and HH6) falls below the initial benchmark level (equal to one) and increases afterwards, implying that these household groups must give up consumption in the short-run in order to achieve higher future consumption. The common feature of the consumption path of all household groups is the increase in the short-run and the approach to the long-run equilibrium from below.

Since welfare gains are higher for poor households, one might expect income inequality to decrease. However, the opposite is the case. The Gini coefficient (Gini, 1912) is used as a measure of income inequality. From the initial value of 0.2763, the Gini coefficient increases slowly to 0.2786 in the scenario of the AA with the EU and to 0.2837 in the scenario of broad and non-discriminatory trade liberalisation. Hence, the process of trade liberalisation leads in both cases to larger income gap among household groups.

The reason for this can be seen in Figures 3 and 4. Whereas the capital stocks owned by the richest household increase over time, the two poorest household groups (HH1 and HH2) use their capital assets to smooth consumption and therefore deaccumulate capital. This leads to a widening income gap between rich and poor.

The real wage is at all periods above the benchmark level and the poorest household groups experience a slightly larger increase than rich households.

6. Conclusions

In this paper the question of how preferential and non-discriminatory trade liberalisation affect different households has been investigated. The model implemented here is a dynamic, neoclassical computable general equilibrium (CGE) model, augmented by introducing heterogeneous households. Each of the six household groups differs with respect to income, initial endowments of assets, transfers from the government and from abroad, wage rate, income tax rate and individual preferences. Whereas several studies implemented CGE models to address trade liberalisation and income distribution issues in a dynamic framework, this work uses the approach developed by Feraboli and Trimborn (2006), who introduced the fundamental assumption that different household groups are characterised by different discount rates, which are calibrated from the available data.

Trade liberalisation lowers prices for investment and consumption goods in the domestic economy and therefore boosts internal demand and output, which in turn leads to faster capital accumulation. Government transfer to household decreases due to foregone government revenue brought about by the reduction in import duties. The results of the simulations support the fact that welfare effects are different across households groups, and under the scenario of preferential trade liberalisation one household group is even worse off. Therefore trade liberalisation alone is not always Pareto improving for Jordan. Moreover, welfare gains are slightly higher for poor households, who can compensate for the reduction in transfer from the government by an increase in labour income. However, the income gap between rich and poor increases slightly. Whereas rich households' capital income increases sharply in the long-run due to exploitation of investment incentives, low-income households deaccumulate capital over time in order to smooth consumption.

Hence, the introduction of heterogeneous households into a standard dynamic CGE model provides useful results and interesting implications for welfare and income distribution analysis.

Figures

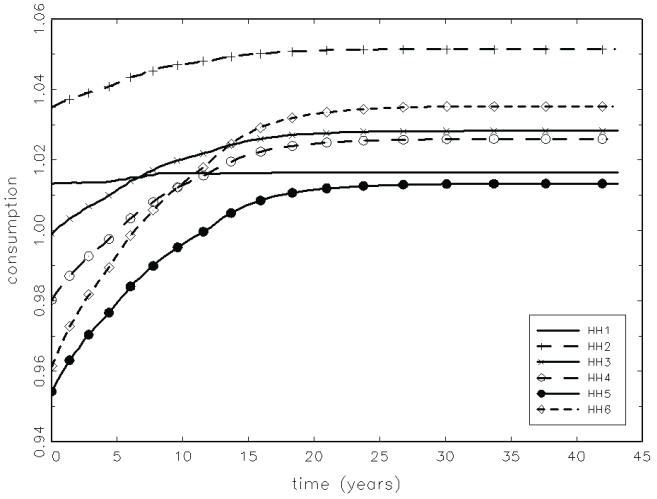

Figure 1

Effects of the AA with the EU on consumption

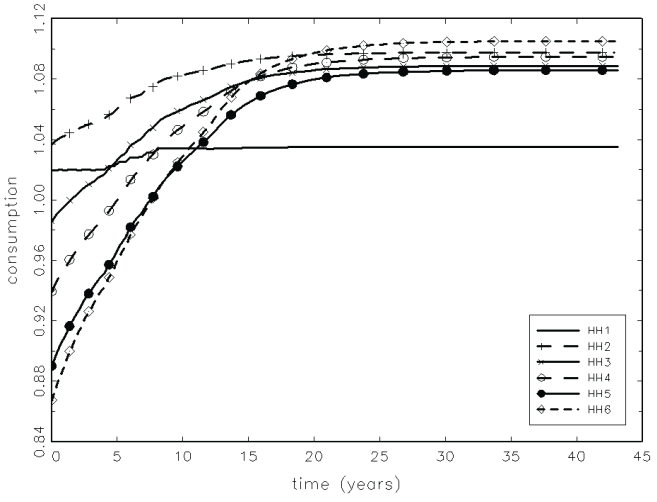

Figure 2

Effects of full liberalisation on consumption

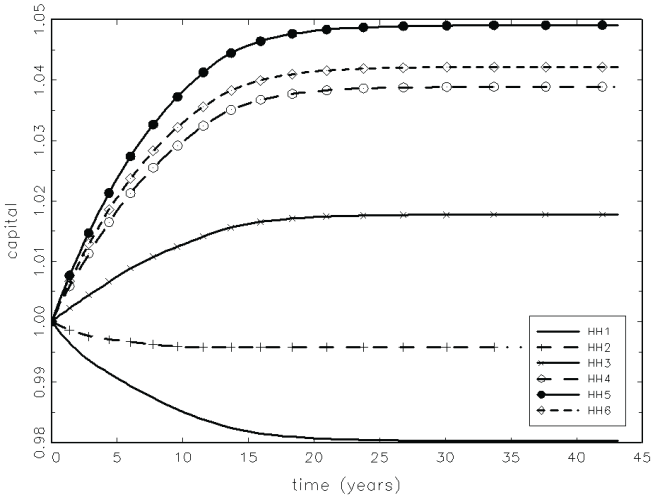

Figure 3

Effects of the AA with the EU on capital

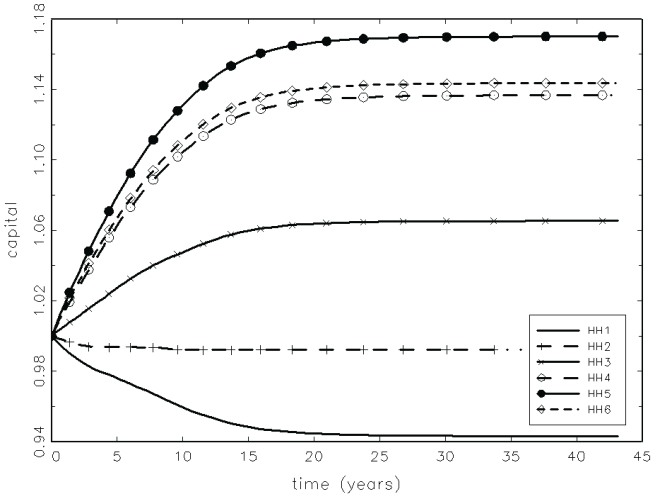

Figure 4

Effects of full liberalisation on capital

References

[1] Abed, G.T., 1998, Trade Liberalization and Tax Reform in the Southern Mediterranean Countries, *IMF Working Paper*, 49

[2] Armington, P.S., 1969, A Theory of Demand for Products Distinguished by Place of Production, *IMF Staff Papers*, 16, 159-176

[3] Baldwin, R., 1993, On the Measurement of Dynamic Effects of Integration, *Empirica*, 20, 129-145

[4] Caselli, F. and Ventura, J., 2000, A Representative Consumer Theory of Distribution, *American Economic Review*, 90, 909-926

[5] Chatterjee, S., 1994, Transitional Dynamics and the Distribution of Wealth in a Neoclassical Growth Model, *Journal of Public Economics*, 54, 97-119

[6] Feraboli, O., Lucke, B. and Gaitan Soto, B., 2003, Trade Liberalisation and the Euro-Med Partnership: A Dynamic Model for Jordan, *Discussion Paper, University of Hamburg*

[7] Feraboli, O. and Trimborn, T., 2006, Trade Liberalization and Income Distribution, *Discussion Paper, University of Hamburg*

[8] Francois, J.F., McDonald, B.J. and Nordström, H., 1997, Capital Accumulation in Applied Trade Models, in Francois, J.F. and Reinert, K.A. (eds.), *Applied Methods for Trade Policy Analysis*, Cambridge University Press

[9] Ghesquiere, H., 1998, Impact of European Union Association Agreements on Mediterranean Countries, *IMF Working Paper*, 116

[10] Gini, C., 1912, *Variabilità e mutabilità*. Reprinted in Memorie di metodologia statistica, Ed. Pizzetti E. and Salvemini, T., Libreria Eredi Virgilio Veschi, 1955

[11] Hoekman, B. and Djankov, S., 1997, Effective Protection and Investment Incentives in Egypt and Jordan During the Transition to Free Trade With Europe, *World Development*, 25(2), 281-291

[12] Lucke D., 2001, Fiscal Impact of Trade liberalisation: The Case of Jordan. *FEMISE Research Programme Final Report*

[13] Sachs, Jeffrey and Werner, Andrew, 1995, Economic Reform and the Process of Global Integration, *Brookings Papers on Economic Activity*, 1

[14] Trimborn, T., Koch, K. and Steger, T.M., 2008, Multi-Dimensional Transitional Dynamics: A Simple Numerical Procedure, *Macroeconomic Dynamics*, 12(03), 301-319

[15] Vamvakidis, A., 1998, Regional Trade Agreements Versus Broad Liberalisation: Which Path Leads to Faster Growth? Time-Series Evidence, *IMF Working Paper*, 40

[16] Winters, L. A., 1996, Regionalism versus Multilateralism, *World Bank Policy Research Working Paper*, 1687