Trade reform in Iran for accession to the World Trade Organization: Analysis of welfare and environmental impacts

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ABSTRACT

We developed a computable general equilibrium (CGE) model to study the potential welfare and environmental impacts of Iran's trade reform for accession to the World Trade Organization (WTO). Our results show that removing trade barriers not only results in higher welfare and GDP as well as lower prices due to efficiency gains, but also reduces emissions of greenhouse gases in terms of CO_2 equivalent. Emissions reductions stem from changes in output composition and lower energy use, despite an offsetting increase in emissions induced by the final consumption of non-energy products due to higher income. Particularly, removing import barriers completely (i.e. full liberalization) would increase Iran's GDP by 8.9%, and reduce greenhouse gas emissions in CO_2 equivalents by 3%. It would generate a welfare gain of 13.2% and 9.3% for urban and rural households, respectively, suggesting that removing the trade barriers would increase the inequality between households in favour of urban and high income groups.

1. Introduction

The Iranian government has formally applied for membership of the World Trade Organization (WTO). It has made various efforts to create the conditions needed for freer trade in order to be admitted to the organization, for example launching the Third Five-Year Economic Development Plan in 2000. Iran is the biggest economy outside the WTO (Reuters, 2015): it accounts for around 1.25% of global PPP GNI and is ranked as the world's 18th largest economy (World Bank, 2014). Reducing import tariffs and nontariff barriers is an important step towards trade reform. Considering the trade and environment linkage, we investigated how this reform would affect economic welfare and emissions.

Tariffs and nontariff barriers are the main import barriers in most sectors in Iran. Tariffs as explicit taxes are in the form of customs duties and commercial benefit tax. However, nontariff barriers, in the form of import licenses, are in general more restrictive (Jensen and Tarr, 2003).[1] In addition to licensing, Iran also imposes mandatory quality standards on imports, protecting domestic producers from foreign competition (World Bank, 2001).[2]

The Iranian government envisaged implementing some reforms, including managed floating exchange rate and nontariff barriers, during the period covered by the Third Five–Year Economic Development Plan (i.e. 2000–05). These policies, however, were flawed and resulted in the Iranian economy experiencing a kind of fixed exchange rate after 2005, and domestic production was protected against competition.[3] Subsidies, especially on energy products, have been increasing. Whereas Jensen and Tarr (2003) pointed out a tariff rate of up to 10% for most sectors, we found the tariff rate for the manufacturing sector in 2008 to be as high as 15%, and it was accompanied by nontariff barriers.

The impact of international trade on the economy and the environment has been studied for decades. There are two main findings in the literature. First, trade is expected to improve economic welfare

[1] See Table 1 for the applied tariff and nontariff equivalent rates, indicating higher nontariff equivalent rates in most cases.
[2] Generally speaking, nontariff barriers are any barriers that result in a gap between foreign and domestic prices. In this context, sanctions could also be considered a nontariff barrier. In this regard, the lifting of sanctions under the interim Joint Plan of Action signed between Iran and the P5+1 (i.e. China, France, Germany, Russia, United Kingdom and United States) will provide a short-term boost to Iran's economy (World Bank, 2016). However, it is expected that the lifting of sanctions will contribute to having more trade with the EU than with the other economies. Before the 2012 sanctions, the EU was one of Iran's biggest trading partners. The Iran–EU trade flow was over €27 million in 2011 while it decreased to €7.7 million in 2015 (European Commission, 2015). China, UAE, India, Turkey and the EU have the most trade flows with Iran, accounting for over half of the total trade (Iranian Customs Administration, 2014). Removing sanctions as a form of nontariff barrier is expected to increase the trade flow with the EU. The Iranian economy after the economic recovery in 2014 is expected to experience a real GDP growth of 4.8% in 2017 (World Bank, 2016).
[3] This issue was considered when developing the CGE model for the Iranian economy.

because of the comparative advantages of the trading countries: every country tends to specialize in producing goods that can be produced at low production costs. This results in factor reallocation and efficiency gains. Many empirical studies support this view. For example, the positive impact of trade liberalization on economic welfare has been identified in both developing countries (Muradian and Martínez-Alier, 2001; Jensen and Tarr, 2003; Jean et al., 2014; Li et al., 2016) and developed countries (Fæhn and Holmøy, 2003; Zhu and van Ierland, 2006; Herzer, 2013). In this context, Kim and Kose (2014) suggested that eliminating tariffs in Korea can generate large welfare gains. Liyanaarachchi et al., (2016) also showed that despite widening urban–rural inequality, all Sri Lankan households benefit from trade liberalization.

Second, international trade can have positive or negative impacts on the environment depending on whether countries specialize in producing clean or dirty products. Some studies support the positive relation and argue that trade promotes economic growth and improves environmental quality in both exporter and importer countries because some of the resources obtained from trade-induced growth can be used for pollution abatement and environment protection (Edwards, 1993; Rutherford and Tarr, 2002). Agricultural trade reforms led to less intensive use of agro-chemicals in highly-protected agriculture in western Europe and northeast Asia (Grossman and Krueger, 1993; Rae and Strutt, 2007), and the free trade agreement between Korea and Japan reduced overall air pollution (Kang and Kim, 2004).

However, other studies support the negative relation and argue that international trade has made a major contribution to environmental degradation since the 1950s (Daly, 1993; Copeland, 1997; Batra et al., 1998; Abler et al., 1999; Copeland and Taylor, 1999). Kasman and Duman (2015) argued that trade openness may in the short term result in higher CO_2 emissions in new EU member and candidate countries. There is also a sizable body of literature demonstrating that free trade increases the risk of environmental degradation, especially in developing countries that are believed to specialize in dirty products (Birdsall and Wheeler, 1993). However, this does not mean that the developed economies can be protected environmentally since international trade may play a significant role in transferring emissions from non-carbon-priced to carbon-priced economies (Sakai and Barrett, 2016), or increasing net emission transfers from developing to developed countries (Peters et al., 2011; Fernández-Amador et al., 2016). Therefore, the overall impact of trade liberalization on the environment may be positive or negative depending on the case examined, given the dynamic and intricate nature of the trade–environment problem (Runge, 1995; Jayadevappa and Chhatre, 2000; Verburg et al., 2009).[4]

Iran accounted for 1.68% of global CO_2 emissions from fuel combustion in 2012, whereas its GDP share of the world economy was 1.19% in 2013 (UNFCCC, 2014). In addition, Iran's per capita CO_2 emissions were amongst the highest in the world, namely 7.8 t in 2011, compared to the global average of 4.9 t (UN data, 2012). Given the growing interest in carbon pricing on traded goods, the carbon-intensive production technology in the Iranian economy may undermine the potential gains from international trade. In the context of joining the WTO, it is thus interesting to investigate the potential impacts of freer trade on both the economy and the environment, deriving implications for the consequent economic and environmental policies in Iran. Therefore, the present research examined the potential welfare and environmental impacts of removing trade barriers in Iran. To this end, a multi-sector general equilibrium model, containing both economic activities and the associated emissions, was developed. The emissions of pollutants from production processes have been calculated in many applied studies (e.g. Fæhn and Holmøy, 2003; Zhu and van Ierland, 2005; Zhu et al., 2006; Aydin and Acar, 2010; O'Ryan

et al., 2011). In Iran, energy use accounts for more than 66% of CO_2 emissions (Farajzadeh, 2012). Iran's energy use per USD GDP is 1.5 times higher than the global average (UN data, 2012). Given the significant role of energy use in emissions, it is interesting to calculate emissions from energy use as well. Therefore, in our study we considered emissions from three sources, that is, production processes, energy consumption and final non-energy consumption. In addition, we included three types of pollutants in our analysis: greenhouse gases (CO_2, CH_4 and N_2O), acidifying substances (SO_2 and NO_x) and health-damaging pollutant (CO), based on data availability. This provided useful information on how future environmental policy could be designed. Furthermore, the model includes ten income groups and distinguishes between rural and urban households, providing information on the welfare distribution and the consequent policy implications.

The novelty of this research is fourfold. First, the total emissions of a wide range of pollutants were decomposed into three sources (production processes, energy consumption and final non-energy consumption). Second, welfare changes by income group for both rural and urban households were distinguished using the linear expenditure system (LES). Third, nontariff barriers were incorporated in both the model and the modified social accounting matrix (SAM). Finally, to make the model more realistic, energy subsidies were also incorporated in the SAM.

The rest of this paper is structured as follows. The model and the data are introduced in the following section. The model results for different trade reform scenarios are presented in Section 3. In Section 4, the results are discussed and the conclusions presented.

2. Methods

For our analysis we developed a CGE model containing detailed production sectors and consumer groups for Iran and an aggregated 'foreign world'. Our model originates from Jensen and Tarr (2003), de Melo and Tarr (1992, Ch. 3), Beghin et al. (2002) and McDonald et al. (2007). However, we extended their models by adding environmental aspects and using updated data for calibration. We incorporated energy subsidies and nontariff barriers in the SAM to make it highly compatible with the Iranian economy. Further, we considered a fixed exchange rate since it reflects the economic environment of Iran since 2005. The main characteristics and the adjustments of the model for analysing welfare and environmental impacts are described briefly below.

The model follows standard assumptions for CGE models on production, that is, goods are produced using primary factors and intermediate inputs. Primary factors include capital and unskilled and skilled labour. As in Gharibnavaz and Waschik (2015) and Farajzadeh and Bakhshoodeh (2015), labour and capital are assumed to be perfectly mobile among sectors.[5] Production technology is represented by the constant elasticity of substitution (CES) function and the fixed-coefficient (Leontief) function.[6] Goods used as intermediate inputs are a composite of domestic and imported goods, based on the CES function following the Armington assumption. The value added makes up the total production function with the intermediate inputs using the fixed-coefficient (Leontief) production function.

Markets are competitive; that is, producers choose the output level such that the marginal cost equals the given market price. Based on

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[4] See Kirkpatrick and Scrieciu (2008) for an overview of the empirical evidence of growth in international trade on environmental quality.

[5] The main reason for this assumption is that the manufacturing and services sectors in Iran are unskilled labour-based, which are therefore easily mobile. Gharibnavaz and Waschik (2015) showed, based on the GTAP 7 dataset, that the unskilled labour share of value added is far higher than that of skilled labour even in non-agriculture sectors. In other words, production processes in Iran are not very technology embodied.

[6] These functional forms are widely used in CGE models to ensure the zero-profit condition at the equilibrium (Ginsburgh and Keyzer, 1997). For example, several studies on Iran used these production functions (see Jensen and Tarr, 2003; Karami et al., 2012; Barkhordar and Saboohi, 2013; Gharibnavaz and Waschik, 2015; Farajzadeh and Bakhshoodeh, 2015).