National Bank of the Republic of North Macedonia

Working Paper No. 2
2020

Income and price elasticities of Macedonian export and import of goods – a panel approach[1]

Dijana Janevska Stefanova[2]
Magdalena Petrovska[3]

Abstract

This paper uses a sectoral version of conventional Imperfect substitutes model to motivate a parsimonious estimation of trade elasticities. The elasticities we compute depend directly on the specialization of trade across sectors, which is believed to add econometric precision to our estimates. On the other hand, estimates of income and price elasticities in the existing literature dealing with the case of North Macedonia are typically obtained from aggregate data, which tend to mitigate the importance of sectoral specialization. The basic assumption of the Imperfect substitutes model is that neither imports nor exports serve as perfect substitutes for domestic goods. Moreover, our import and export functions along with the income and price variables, consider some additional parameters as well, such as foreign direct investments and tariffs on imports. To this end, we were able to obtain theory-implied estimates of import and export income and price elasticities for North Macedonia – i.e. trade elasticities relevant to policy - and ultimately to calibration choices. The income and price elasticity coefficients, both in the import and in the export model, have the expected signs - increases in income positively affect exports and imports while increases in prices lower them. Judging by the size of the coefficients, income effects appear to be much more substantial than price effects.

JEL Classification: F12, F14

Keywords: income and price elasticities, imperfect substitutes model, trade, dynamic panel estimators, two-step Difference GMM, North Macedonia

---

[1] The responsibility for this paper lies solely with the individual authors. The views expressed herein do not necessarily represent those of the National Bank of the Republic of North Macedonia.
A version of this paper has been published in Journal of Contemporary Economics and Business Issues, Vol.6, No.2, 2019.
(First version: July 2018.)

[2] National Bank of the Republic of North Macedonia, E-mail: janevskad@nbrm.mk

[3] National Bank of the Republic of North Macedonia, E-mail: petrovskam@nbrm.mk

Table of Contents

1. Introduction

The aim of this research is to identify the income and price elasticities of Macedonian export and import of goods, based on sectoral data. The estimation of income and price elasticities of trade has been given much attention in the empirical literature due to its significant implications on policy design for economic growth performance, competitiveness in the context of modern international trade, balance of payments equilibrium and development of governments' industrial strategies.

Estimates of the trade elasticities in the literature focused on the case of North Macedonia are typically obtained from aggregate data, which tend to diminish the importance of sectoral specialization. Therefore, the sectoral dimension of our research is believed to add econometric precision to the estimates.

We use a sectoral version of conventional Imperfect substitutes model to derive a parsimonious estimation of trade elasticities. Given that in this paper we analyze total merchandise trade broken down into sectors within which there is still a large number of very heterogeneous goods, the application of the perfect substitutes model would not be appropriate.

The key postulate of the Imperfect substitutes model is that neither imports nor exports serve as perfect substitutes for domestic goods. Furthermore, our import and export functions along with income and price variables, incorporate some additional parameters as well, like foreign direct investments and tariffs on imports. Just for an illustration, tariffs are introduced into the model as a type of exogenous market distortion to the competitive environment. In addition, foreign direct investment influence supply-side determinants of sectoral exports and imports, reflecting the sector's quality of physical capital assets as well as quality of education and skills of the labor force and sector's potential for growth.

The rest of the paper is structured as follows: Section 2 briefly reviews the field literature; Section 3 focuses on the stylized facts covering the recent trends and developments in the total external trade of the domestic economy; Section 4 discusses the econometric method, along with the data we used, in parallel presenting the estimates we obtain for trade elasticities; Section 5 concludes.

2. Literature review

Within the large array of literature on this topic of notable interest in this section is research which has built upon the estimation of trade elasticities for countries in the region, as well as research which has dealt with disaggregated data in parallel providing some novel understanding of a specific cause and effect in this particular context. This section also reviews the existing stream of literature on Macedonian trade elasticities' estimation.

Therefore, Bobic (2010) deals with price and income elasticities' estimation of Croatian trade flows using disaggregated data by industries for the 2000-2007 period. Export and import demand functions are estimated for total merchandise trade as well as for several partner country subsamples, with controls for other potential trade flow determinants, such as the exchange rate, tariffs, FDI inflows and credit supply to particular industries. Given the dynamic nature of the studied flows and potential endogeneity issues, the models were estimated using the Arellano-Bond method (1991). The results indicate that the sensitivity of both exports and imports to prices is relatively low, while income effects are stronger. These results are confirmed in all the country subsamples. The influence of other factors, however, does not appear to be as stable or uniform across country subsamples.

Bozok et al. (2015) employ several panel time-series methods (Dynamic OLS, Mean Group and Common Correlated Effects Mean Group) in order to estimate the long-run price and income elasticities of Turkish exports to country groups categorized by geographical regions and development levels. They use bilateral trade data of Turkey with 67 countries over the period 2005Q1-2013Q4 and find that price and income elasticities vary across country groups. Income elasticity estimates are statistically significant in every country group classification and range between 1.82 and 3.35, while price elasticity ranges between -1.56 and -0.27 and is found statistically significant only in three groups of countries. Empirical results imply that in trade policy design, region-specific measures should be taken into account, and that policies based on real exchange rate depreciation are less efficient in boosting exports than the sustainable growth in trading partners as a factor for achieving viable growth in Turkish exports.

Arbatli and Hong (2016) were investigating Singapore, as one of the world's most open economies in the world (about 350 percent of GDP). With the rise of highly diversified cross-border production networks, Singapore has come to play an integral role in the global supply chain with heavy reliance on foreign contents in its exports and production. It has also successfully moved up the value chain, exporting goods with high sophistication and economic

complexity. Against this backdrop, in this paper, using disaggregate industry/product level trade data, they revisit Singapore's export elasticities and find that growing participation in global production chains and rising export complexity are important determinants.

However, Utkulu and Seymen (2004) support the view that the import and export equations which estimate long-run elasticities in excess of unity may reflect omitted variable bias, and may represent hidden structural breaks. Their paper in fact deals with the possible effects of factors such as structural breaks, integration of markets, product innovation, supply, and omitted variables as regards the significance and the magnitude of the income and price elasticities. The various long-run estimates arising from these authors' research work reveal that the inclusion of a supply variable (i.e. commodity composition index), dummies for structural breaks, and a measure of economic integration with the EU significantly lowers both the long-run price and income elasticities for Turkish exports with the EU. Regarding the import function, this study shows that the inclusion of dummies for structural break and a measure of import capacity (i.e. external debt stock) lowers the price elasticity although the income elasticity remains high and significant.

The stream of existing studies providing conventional estimates of trade elasticities for North Macedonia, obtained from aggregate data [Jovanovic (2007), Jovanovic and Petreski (2008) and Kadievska-Vojnovic and Unevska (2008)] are surveyed in Jovanovic (2013). To this end, the author highlights the presence of substantial dispersion in the estimates of the relative magnitude of the Macedonian trade elasticities. Namely, with respect to the imports, in the underlined studies, the income elasticity is estimated in the range 1.4-3.5, while the price elasticity ranges from 0 to 1.6. On the other hand, income elasticity of exports ranges from 1.5 to 4.7, while exports price elasticity is in between -0.7 and -2.8.

Furthermore, Jovanovic (2013) in his own study, evaluates the aggregation bias in estimating Macedonian trade elasticities by comparing the estimates obtained from data on aggregate trade, with the estimates obtained from data on bilateral trade with 30 countries with highest shares. The author finds that the aggregation bias is indeed present and that the aggregate estimates differ systematically from the bilateral-trade estimates. So finally, using bilateral trade data, Jovanovic (2013) suggests that Macedonian exports have high income elasticity (1.9) and low price elasticity (-0.4). This study also stresses that the short-run income elasticity of exports is higher than the long-run. Similarly, this study shows that Macedonian imports are more elastic to changes in income than to changes in prices (1.9 vs. 0.5), and that the short-run income elasticity is lower than the long-run.

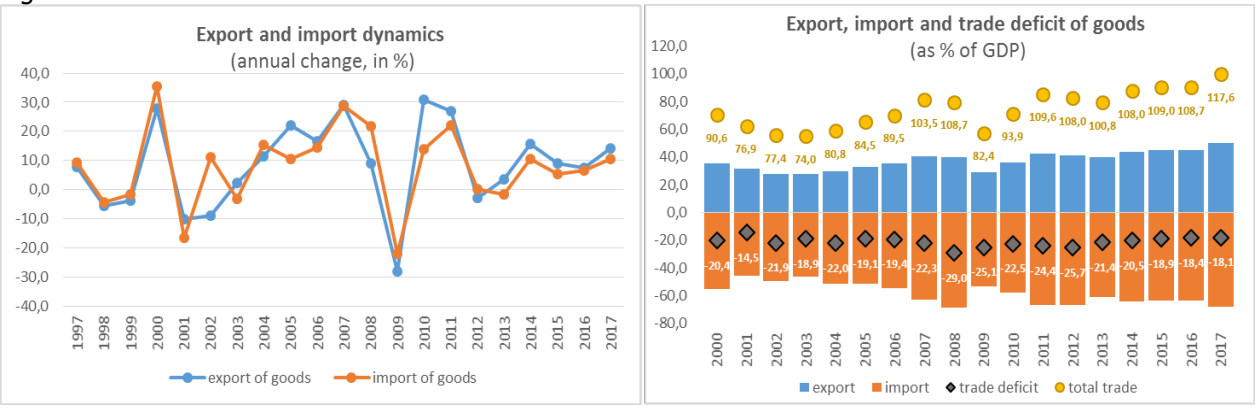
3. Stylized facts

Since its independence in 1991, North Macedonia has become a member of many international organizations. For the purpose of regaining access to international markets, starting from 1996, our country is oriented towards a policy for concluding bilateral free trade agreements[4]. Free trade relations with the European Union were established in 2001, with the signing of the Stabilization and Association Agreement (SSA). Two years later, after lengthy negotiations, in April 2003, North Macedonia became a member of the World Trade Organization (WTO). One of the privileges gained is the right for participation in multilateral free trade agreements, such as the Central European Free Trade Agreement (CEFTA), that enables free trade and other regional cooperation amongst its member countries and represents another stepping stone towards EU accession. North Macedonia became a participant in this agreement in February 2006. These undertaken steps largely contributed to a high degree of trade integration with the region, the EU and the rest of the world as well.

The openness of the Macedonian economy measured as a share of the overall foreign trade in the GDP, for the last 17 years (2000-2017) is on average 95.8%. This trend has been more or less increasing throughout the years and has especially intensified in the last seven years, when foreign trade surpassed the GDP by around 9% on average, thus reaching 117.6% in 2017. These numbers point out to a highly open economy which to a large extent is susceptible to the influence of the events and movements in the global economy. On average, over the past 17 years the export of goods centered around 37.3% of GDP, while import of goods reported 58.5% of GDP. Still, within the analyzed time frame, there are several turning points for the external trade and the economy as a whole such as the 2001 internal conflict, the 2008 global crisis and the 2012 European economy slowdown combined with lower world metal prices and decline in global demand for iron and steel, to name a few. In these years, the annual growth rates of the export of goods (and consequently the import of goods) registered a downturn, unlike the otherwise positive developments in the export performances in the rest of the period in question.

[4] North Macedonia became a regional trade integration leader for having signed bilateral free trade agreements with all the countries from the region before 2004.

Figure 1



Source: SSO of RNM.

From a historical perspective, the export structure in the pre-crisis period (2004-2009) has been highly concentrated, approximately 50.2% of exports consisted of metals[5] and textiles[6]. Besides them being low value added industries, the main drawback is related to their dependence (refers to metals) on the world commodity market developments. Thus, with the emergence of the global crisis and falling global demand, metal prices started to shrink, which had severe impact on the domestic producers, the demand for their products and on the amount of their export revenues. The occurrence of a global crisis implies worsening of the export performances in almost all sectors. Still to a certain extent it illustrated what a severe negative shock to terms of trade, driven mostly by the price of the most important export products, implies for the total exports. However, from 2010 onwards, the entrance of new foreign investors that invested in new and existing export oriented capacities in the economy, led to a change of the export structure based on new and higher value-added products which account for almost 54%[7] of total export in 2017.

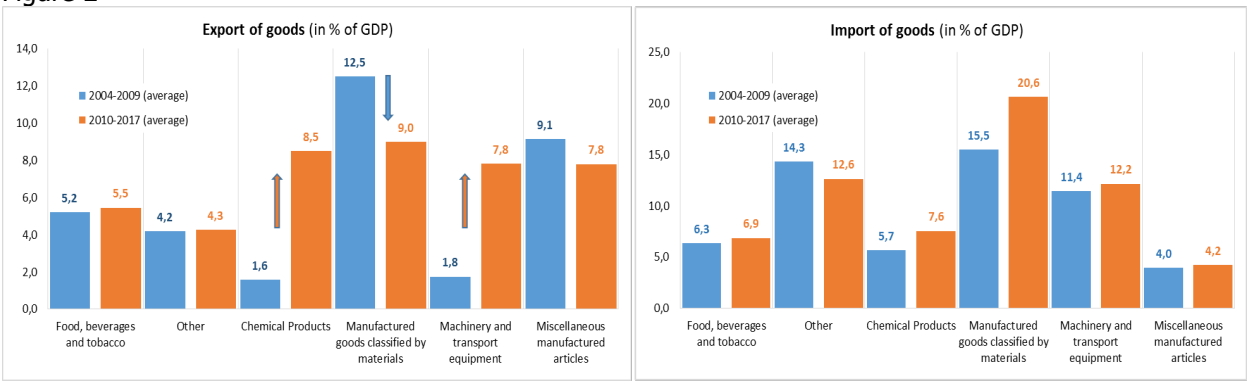
Since the mid-2000s North Macedonia has engaged in major policy moves to improve its business environment and provide incentives to attract FDIs in tradable sectors as a major component of the country's export strategy. Since then, fifthteen Free economic zones offering tax and customs benefits have been established. These zones proved to be significant export platforms. Moreover, with this structural shift in export oriented Greenfield FDIs, investments, and thus the exports, have gradually branched out of traditional sectors such as food and metal processing into technology-intensive industries, in particular automotive

[5] Classified as "Iron and steel" within "Manufactured goods classified by materials".
[6] Classified as "Articles of apparel and clothing accessories" within "Miscellaneous manufactured articles".
[7] Sum of products classified as "Machinery and transport equipment" and "Chemical materials and products".

components for which major global producers have become North Macedonia's main partners. The share of exported products from the the new FDI based companies reached 50% of total Macedonian exports in 2017, from 7.4% in 2010.

Thus, now the structure of the exports of goods includes larger share of the exports of various parts for the automotive industry (chemical products, machinery and equipment) and raw materials, as opposed to the lower share of the exports of "traditional" export goods, i.e. iron and steel, clothing and textiles, beverages and tobacco and oil derivatives. On the other hand, the imports of goods registered an increased structural share of the imports of non-ferrous metals (platinum), chemical products and raw materials, at the expense of the lower share of the imports of iron and steel, machinery and equipment and miscellaneous finished products. A more significant change in the imports is the lower share of the import component for the metal industry, with a simultaneous increase in the import of raw materials for the capacities operating in the free economic zones. The above mentioned shift in the composition of foreign trade, represents a significant structural break in the data and is the reason why our estimates are based on 2010-2015 data.

Figure 2



Source: SSO of RNM.

4. Empirical analysis

4.1 Econometric methodology and modelling issues

The nature of the data adjustment processes being investigated incited estimation of dynamic models. So, at this point, we would like to bring out the bunch of modelling issues that may arise from ignoring the underlying dynamics in the relationships being examined:

1. In studies like this one, the import/export prices are usually assumed to be endogenous. To this end, because causality may run in both directions, i.e. from import/export prices to import/export quantities and vice versa, these regressors may be correlated with the error term.

2. Time-invariant sectoral characteristics (fixed effects), like for instance, the level of the sector's development, may be correlated with the explanatory variables. Namely, the fixed effects are contained in the error term in equation (1), which consists of the unobserved sector-specific effects, η_i, and the observation-specific errors, ε_{it}:

3. Also, the presence of the lagged dependent variable gives rise to autocorrelation.

4. The panel dataset has a short time dimension (T =6) and larger sectoral dimension (N =20), which per se, determines what would be the most suitable estimation method.

According to Mileva (2007), to solve problem 1 (and problem 2) one would usually use fixed-effects instrumental variables estimation (two-stage least squares or 2SLS). However, as Mileva (2007) stresses, with weak instruments the fixed-effects IV estimators are likely to be biased in the way of the OLS estimators. Therefore, in search of a more efficient approach, as suggested by Mileva (2007) as well, we have proceeded with the Arellano – Bond (1991) difference GMM estimator first proposed by Holtz-Eakin, Newey and Rosen (1988). Under this method, instead of using only exogenous instruments, lagged levels of the endogenous regressors can be also added. This makes the endogenous variables pre-determined and, therefore, not correlated with the error term in equation (1).

To cope with problem 2 (fixed effects), the difference GMM uses first-differences to transform equation (1) into equation (2). By transforming the regressors by first differencing, the fixed sector-specific effect is removed, because it does not vary with time.

The first-differenced lagged dependent variable (problem 3) is also instrumented with its past levels. Finally, the Arellano – Bond estimator was designed for small-T (number of time periods) large-N (number of cross-section units) panels (which actually solves modeling issue 4) [adaptation from Mileva (2007)]. Just as a natural extension of this last argument we would like to point out that in very large-T panels a shock to the sector's fixed effect, which shows in the error term, will decline with time. Similarly, the correlation of the lagged dependent

variable with the error term will be insignificant (see Roodman, 2006). In these cases, one does not necessarily have to use the Arellano – Bond estimator. However, a main advantage of all GMM dynamic panel models is that the procedure for handling the endogeneity of the lagged dependent variable may be applied to all potentially endogenous variables in the model: in GMM dynamic panel estimators predetermined or endogenous variables are handled analogous to the dependent variable.

Just for an illustration, under this approach, we modeled the export prices as predetermined (thus instrumented GMM-style in the same way as the lagged dependent variable), while the macroeconomic variables were treated as strictly exogenous (instrumented by themselves as "IV style" instruments; see Roodman 2009). On the other hand, for the import prices a strict exogeneity assumption was applied. The rationale behind these two specification choices is elaborated in the subsequent section.

So, the dynamic model is specified as:

$$y_{it} = \alpha y_{i,t-1} + \beta x_{it} + (\eta_i + \varepsilon_{it}) \qquad Eq.(1)$$

where y_{it} is the value of the dependent variable of sector i in period t ; $y_{i,t-1}$ is the value of the dependent variable for the same sector lagged one period; x_{it} is the vector of explanatory variables for sector i in period t; η_i are the individual effects and ε_{it} is the disturbance term.

The sectoral effects are being treated as stochastic, while a further assumption critical for the consistency of the model is that the disturbances ε_{it} are serially uncorrelated. As we already stated, in order to remove individual sectoral effects, the equation (1) is transformed by first-differencing. The transformed model is then given by:

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \beta x_{it} + \Delta \varepsilon_{it} \qquad Eq.(2)$$

Where $\Delta y_{it} = y_{it} - y_{i,t-1}$

The finally selected export and import functions are test driven, i.e. supported by specification tests. We estimate the models using a two-step Difference GMM approach, employing the standard choices of instruments.

4.2 Specification choices in a nutshell

While the fact that prices determine to different degrees imported and exported quantities is certainly true, it is also possible that the causal relationship works the other way around as well; in other words, quantities of exported or imported goods may influence the price asked for those same goods.

North Macedonia as a small open economy is a price taker in the global markets for the imported goods. In other words, Macedonian economy is small enough that its policies can not alter world prices, which in turn are subject to external changes determined by the world-market forces. Therefore, it may be argued that in Macedonian import function, import prices should be taken as given. On the other hand, imposing strict exogeneity assumption for the export prices in the export function, meaning that prices would have to be treated as entirely independent of past or present exported quantities, is too restrictive. More precisely, assuming exogeneity for export prices is not strictly correct. Just for an illustration, a cut in the scope of the subsidized production aimed at export markets[8] will most likely be translated into higher export prices. Therefore, export prices in the export function are treated symmetrically with the lagged dependent variable, that is, instrumented with their lagged values. The other explanatory variables are assumed to be exogenous and not correlated with the individual sectoral effects.

4.3 Data description

This section provides a brief summary of the variables used in the models as well as the respective data sources. With this regard, our research is analogous to Bobic (2010). So, the following variables are employed in our estimation: real export and import, by sector (in tons); export and import prices, derived as unit values by sector; stock of foreign direct investment in reporting economy, by activity; world and domestic real GDP as well as tariff rates of imports. In the export function, *lx_vol* is the dependent variable and is defined as the log value of the export volume measured in tons. The income variable in the export equation is represented with *lgdp_world* or the log value of world real GDP expressed in euros, whereas

[8] Like for instance, exports of tobacco, bottled wine, table grapes, and both fresh and processed fruits and vegetables.

lx_price denotes the price variable defined as the log value of the unit value indices, calculated from disaggregated data on euro values and quantitates of exports for the period in question. In line with the theory, we include the variable *lfdi_stock* which is intended to capture the effects of foreign investment on competitiveness and productivity - higher levels of investment should indicate that a given sector has some comparative advantages and the potential for growth, because it wouldn't have been able to attract investment otherwise (Benaček, Prokop, Višek, 2003). In the import function, *lm_vol* represents the dependent variable and is defined as the log value of the volume of import measured in tons. In this model, *lgdp_mkd* or the log value of the domestic GDP at constant prices from 2005 as a reference year is a proxy for the income variable. The price variable *lm_price*, analogous to the one in the export equation, is defined as a logarithm of the unit values by sector, calculated from disaggregated data on euro values and quantities of imports for the analyzed period. Two additional variables are included in this model: *lfdi_stock* (identical to the one employed in the export equation) and *ltariffs* or the log value of the unweighted import tariff rates, grouped by sectors.[9] As far as the expected coefficients' signs are concerned, income variables should take positive signs. Hence, we expect that higher domestic and world demand should have positive effects on foreign trade i.e. larger export and import volumes. On the other hand, higher prices are expected to have negative impact on the international trade of goods. A positive coefficient on stock of FDI is also anticipated, while the tariffs coefficient is expected to be negative. The dataset used in this study includes 20 sectors[10] according to the National Classification of Economic Activities (NCEA) and covers the period from 2010 to 2015. Generally, the data are acquired from the SSO of Republic of North Macedonia (export and import volumes and values, domestic real GDP), NBRNM (stock of FDI), World Bank (World real GDP) and Ministry of Finance of the Republic of North Macedonia (tariff rates). The chosen time period is conditional on the availability of detailed sectorial data for both foreign trade and FDI. We are well aware of certain drawbacks of the price variables[11] that need to be taken into account, such as the fact that aggregating data by sectors is likely to result in some loss of information and the influence that the changes in import and export structure have on the value indices. Furthermore, although goods in each particular group of the NCEA sectorization are similar, these sectors are nevertheless not perfectly homogenous and can contain goods which are notably different in type, size, weight, quality and price. We have to bear in mind all the limitations of the data described in this section when interpreting the estimation results. Most

[9] Derived from "Unweighted import tariff rates according to Customs Tariff and the free trade agreements", an annual document from the Ministry of Finance of the Republic of North Macedonia.

[10] See the Appendix

[11] Bobic (2010) provides a notably exhaustive compendium of research on this topic.

of the relevant literature and research dealing with this topic for the same practical reasons uses similar alternatives (Goldstein and Khan, 1985). For some additional information for the estimation, please refer to the Appendix.

4.4 Estimation results

4.4.1 Export function

The results of the export model are summarized in Table 1. Export prices are statistically significant and have the expected sign (coefficient value of -0.23), in line with reviewed literature on this topic[12]. Accordingly, an increase in export prices will be reflected negatively in exported quantities. In addition, this coefficient's sign indicates that due to the relatively lower overall complexity of the Macedonian exports basket, the export competitiveness manifests itself primarily through prices. Furthermore, World GDP has a positive and statistically significant effect on Macedonian exports (estimated elasticity of 0.29). Moreover, the relative magnitude of this coefficient probably to large extent reflects the most recent build-up of significant export capacities that in turn provided some of the lacking components for greater competitiveness of the domestic economy. Namely, the shift of the aggregate demand towards higher exports share is particularly visible starting from 2010 at both the intensive (i.e. the volume exported) and the extensive margins (i.e. new exporters).

Table 1
Export function

	Coefficient	Std.Error	t-Statistic	Probablility
Export volume (-1)	0.4097	0.0231	17.71	0.00
Export price	-0.2269	0.0086	-26.33	0.00
GDP world	0.2919	0.0549	5.31	0.00
FDI stock	0.1174	0.0199	5.91	0.00
Dynamic panel-data estimation, two step difference GMM				
Arellano Bond test for AR (1) in first differences: z= -1.43; Pr >z = 0.152				
Arellano Bond test for AR (2) in first differences: z= -0.63; Pr >z = 0.532				
Sargan test p-value 0.117				
Hansen test p-value 0.582				

Source: Authors' estimates done using the STATA software.

[12] The above-mentioned export prices are implicitly calculated and in general tend to move with the corresponding world prices reflecting the great trade openness of the Macedonian economy.

In line with our stylized facts, the estimation results confirmed that the FDIs have stimulating and statistically significant impact on export volumes (coefficient value of 0.12). Again, this might be seen as an additional indicator that the resources and market access brought with the purely export oriented FDIs located in the free economic zones (FEZ) in this period have evidently complemented North Macedonia's resources and capabilities and provided some stimulus for greater competitiveness.

In addition, all of the reported test statistics do not indicate any dynamic misspecification.

4.4.2 Import function

Table 2 presents the estimation results for the import function. The coefficient on import prices is negative, negligible in magnitude as well as statistically insignificant. The price inelasticity of imports is in fact to be expected having in mind the high import dependence of the Macedonian economy (a structural weakness of the productive system that cannot be easily altered in the short-run).

Table 2
Import function

	Coefficient	Std.Error	t-Statistic	Probablility
Import volume (-1)	0.6219	0.0794	7.83	0.000
Import price	-0.0013	0.0695	-0.02	0.984
GDP mkd	0.8535	0.1988	4.29	0.000
FDI stock	0.0356	0.0456	0.78	0.445
Tariffs	-0.0748	0.0382	-1.96	0.065
Dynamic panel-data estimation, two step difference GMM				
Arellano Bond test for AR (1) in first differences: z= -1.39; Pr >z = 0.165				
Arellano Bond test for AR (2) in first differences: z= -0.99; Pr >z = 0.323				
Sargan test p-value 0.716				
Hansen test p-value 0.669				

Source: Authors' estimates done using the STATA software.

The positive and statistically significant income elasticity coefficient of 0.85 is also within expectations. Its relatively high magnitude can be aligned to the fact that the Macedonian economy did not succeeded to prompt some more visible process of import substitution, which in turn might lead to a structural reorientation of the economy away from import-rich aggregate domestic demand.

The negative, statistically significant but still very small (-0.07) coefficient on import tariffs, indicates that the use of tariffs to dampen import growth has a very limited effect which is expected having in mind country's integration in the multilateral trading system. The key events of such trading policy were WTO membership, conclusion of the Stabilization and Association Agreement with the European Union, and the conclusion of bilateral and multilateral free trade agreements with the countries in the region.

The simple average applied Most-favoured-nation[13] (MFN) tariff for the analyzed sectors declined from 7.3% in 2010 to 6.5% in 2015[14] – levels perceived to be very low by international standards. Moreover, with acceptance of sectoral tariff harmonization agreements, thousands of tariff lines were eventually bound at zero over the analyzed period. In addition, tariff peaks, defined as tariffs of 15% or more, only apply to products of particular concern such as textiles, clothing and some agricultural products.

On the other hand, FDIs, have simulative but still statistically insignificant effect on imported volumes. As is the case with the exports, the reported test statistics do not suggest any dynamic misspecification.

5. Conclusion

The aim of this paper is to estimate income and price elasticities of Macedonian imports and exports, as well as to identify and evaluate the impact of other potential trade determinants. This paper uses a sectoral version of the conventional Imperfect substitutes model to actually bring about a parsimonious estimation of trade elasticities. Given that our approach builds on sectoral data, the trade elasticities we compute depend directly on the specialization of trade across sectors. To this end, conventional estimates that are typically obtained from aggregate data, tend to mitigate the importance of sectoral specialization. Consequently, we believe that the sectoral dimension adds econometric precision to our country specific estimates.

[13] Most-favoured-nation (MFN): treating other people equally. Under the WTO agreements, countries cannot normally discriminate between their trading partners. Grant someone a special favour (such as a lower customs duty rate for one of their products) and you have to do the same for all other WTO members.

[14] Authors' calculations.

Issues with data availability, its consistency and the structural change in the domestic economy with the entrance of new FDI based companies have clearly affected the variables included in the import and export demand models as well as the estimation technique.

In the estimation, two-step Difference GMM method was applied which allowed for dynamic adjustment of the data over time.

To summarize, the findings observed in this study mirror those of the previous published studies that have examined the income and price elasticities of Macedonian export and import of goods [more precisely, Jovanovic and Petreski (2008), Kadievska-Vojnovic and Unevska (2008), and Jovanovic (2013), but only in terms of the expected signs of the coefficients of elasticities. Biger differences are associated with the magnuitudes of the respective coefficients.] In addition, our results corroborate the ideas of Bobic (2010), as a single country within the region case study. To this end, increases in income positively affect exports and imports, while increases in prices lower them. Judging by the size of the coefficients, in the case of North Macedonia, income effects appear to be much more substantial than price effects. So, our results suggest that exported quantities increase by 0.29% when global demand increases by 1%. In parallel, the imports increase by 0.85% when domestic demand increases by 1%. When it comes to price elasticities, our results show that imports and exports decrease by basically 0% and 0.23%, accordingly, when the corresponding price increases by 1%. The observed price inelasticity of imports corroborates the high dependence of the Macedonian economy on imported goods. Also, the sign on the export price coefficient seems to indicate that, in the case of Macedonian exports, competitiveness works primarily through prices, rather than through quality of the goods[15]. But evidently, separating these effects is not usually so straightforward given that both effects may simultaneously be at play. However, it is important to bear in mind the possible bias in these responses. Namely, with N (number of cross-section units) slightly smaller than 25 (as a generally accepted rule of thumb when employing the difference GMM approach), caution must be applied.

[15] A negative coefficient implies that a reduction in export prices results in an increase in exports; the fall in prices could, in turn, either be a result of lower production costs or of lower quality. Evidently, an increase in exports cannot logically be a result of their lower quality, so it can be inferred that in this case the prevailing effect at work is that of price competitiveness. Conversely, if the coefficient is positive and significant, then the opposite is true - an increase in exports is most probably the result of higher quality.

6. References

Arellano, M. and Bond, S. (1991). "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations". The Review of Economic Studies, 58. pp. 277 – 297;

Algieri, B. (2004). "Price and Income Elasticities for Russian Exports", the European Journal of Comparative Economics, 1(2), p. 175 – 193;

Arbatli, E. and Hong, G.H. (2016). "Singapore's Export Elasticities: A Disaggregated Look into the Role of Global Value Chains and Economic Complexity". WP/16/52, IMF;

Bobic, V. (2010). "Income and price elasticities of Croatian trade – A panel data approach". Working Papers W-25, Croatian National Bank;

Bozok, I., Sen Dogan, B., Yunculer, C. (2015). "Estimating Income and Price Elasticity of Turkish Exports with Heterogeneous Panel Time-Series Methods". Working paper No: 15/26, Central Bank of the Republic of Turkey;

Holtz-Eakin, D., Newey, W., and Rosen, H. S. (1988). "Estimating vector autoregressions with panel data". Econometrica 56. pp. 1371 – 1395;

Jovanovic, B. (2007). "The fundamental equilibrium exchange rate of the denar", Unpublished master thesis, Staffordshire University, UK;

Jovanovic, B. (2013). "Aggregation bias in trade elasticities: The case of Macedonia", FIW Working Paper No 106;

Jovanovic, B. and Petreski, M. (2008). "Keynesian macroeconomic model of the Republic of Macedonia: Economic theory and behavioural equations", Ministry of Finance of the Republic of Macedonia, Bulletin;

Kadievska-Vojnovic, M. and Unevska, D. (2007). "Price and income elasticities of export and import and economic growth in the case of the Republic of Macedonia", Working Paper, National Bank of the Republic of Macedonia;

Mileva, E. (2007). "Using Arellano – Bond Dynamic panel GMM estimators in Stata", Tutorial with examples using Stata 9.0, Economics Department, Fordham University;Roodman, D. (2006). "How to do xtabond2: an introduction to "Difference" and "System" GMM in Stata". Center for Global Development Working Paper No 103;

Roodman, D. (2009). "A note on the theme of too many instruments". Oxford Bulletin of Economics and Statistics, Department of Economics, University of Oxford, vol. 71 (1), pages 135-158, 02;

Utkulu, U., and Seymen, D. (2004). "Trade and competitiveness between Turkey and the EU: Time series evidence". Discussion Paper 2004/8, Turkish Economic Association.

Appendix

Table 1

	List of NCEA sectors included in the analysis
1	Agriculture, forestry and fishing
2	Minning and quarrying
3	Food products, beverages and tabaco products
4	Textiles and wearing apparel
5	Wood, paper, printing and reproduction
6	Coke and refined petroleum products
7	Chemicals and chemical products
8	Basic pharmaceutical products and pharmaceutical preparations
9	Rubber and plastic products
10	Basic metals and fabricated metal products
11	Computer, electronic and optical products
12	Computers and peripheral equipment
13	Machinery and equipment n.e.c.
14	Motor vehicles, trailers and semitrailers
15	Other transport equipment
16	Other manufaturing
17	Electricity, gas, steam and air conditioning supply
18	Water supply, sewerage, waste management and remediation activities
19	Services
20	Other

Source: SSO of the Republic of North Macedonia

Table 2
Export function

Dynamic panel-data estimation, two-step difference GMM

Group variable: id		Number of obs	= 55
Time variable : year		Number of groups	= 19
Number of instruments = 22		Obs per group: min	= 0
F(4, 19)	= 3277.86	avg	= 2.89
Prob > F	= 0.000	max	= 3

lx_vol	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lx_vol						
L1.	.4096754	.0231377	17.71	0.000	.3612476	.4581031
lx_price	-.2269509	.008618	-26.33	0.000	-.2449886	-.2089132
lgdp_world	.2918873	.0549306	5.31	0.000	.1769163	.4068583
lfdi_stock	.117371	.0198681	5.91	0.000	.0757866	.1589554

Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
    D.(lgdp_world L.lgdp_world L2.lgdp_world lfdi_stock L.lfdi_stock
    L2.lfdi_stock)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/4).(lx_vol lx_price)

Arellano-Bond test for AR(1) in first differences: z = -1.43 Pr > z = 0.152
Arellano-Bond test for AR(2) in first differences: z = -0.63 Pr > z = 0.532

Sargan test of overid. restrictions: chi2(18) = 25.30 Prob > chi2 = 0.117
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(18) = 16.14 Prob > chi2 = 0.582
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  gmm(lx_vol lx_price, lag(2 4))
    Hansen test excluding group: chi2(2) = 1.47 Prob > chi2 = 0.481
    Difference (null H = exogenous): chi2(16) = 14.68 Prob > chi2 = 0.548
  iv(lgdp_world L.lgdp_world L2.lgdp_world lfdi_stock L.lfdi_stock L2.lfdi_stock)
    Hansen test excluding group: chi2(12) = 12.70 Prob > chi2 = 0.391
    Difference (null H = exogenous): chi2(6) = 3.44 Prob > chi2 = 0.752

Table 3
Import function

Dynamic panel-data estimation, two-step difference GMM

Group variable: id				Number of obs	= 57
Time variable : year				Number of groups	= 19
Number of instruments = 15				Obs per group: min	= 3
F(5, 19)	= 78.27			avg	= 3.00
Prob > F	= 0.000			max	= 3

lm_vol	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lm_vol						
L1.	.6219146	.0794576	7.83	0.000	.455608	.7882213
lm_price	-.0013794	.0695521	-0.02	0.984	-.1469537	.1441948
lgdp_mkd	.8535066	.1988502	4.29	0.000	.4373083	1.269705
lfdi_stock	.0355737	.0456377	0.78	0.445	-.0599471	.1310944
ltariffs	-.0748494	.038192	-1.96	0.065	-.1547861	.0050873

Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
    D.(lgdp_mkd L.lgdp_mkd L2.lgdp_mkd lm_price L.lm_price L2.lm_price
    lfdi_stock L.lfdi_stock L2.lfdi_stock ltariffs L.ltariffs L2.ltariffs)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L2.lm_vol

Arellano-Bond test for AR(1) in first differences: z = -1.39 Pr > z = 0.165
Arellano-Bond test for AR(2) in first differences: z = -0.99 Pr > z = 0.323

Sargan test of overid. restrictions: chi2(10) = 7.10 Prob > chi2 = 0.716
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(10) = 7.28 Prob > chi2 = 0.699
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  gmm(lm_vol, lag(2 2))
    Hansen test excluding group: chi2(7) = 7.26 Prob > chi2 = 0.403
    Difference (null H = exogenous): chi2(3) = 0.03 Prob > chi2 = 0.999

.