ASECU South-Eastern Europe Journal of Economics 1 (2011) 1-11 SEEJE

GROWTH AND EU TRADE RELATIONS: A CASE STUDY

ARISTEA GKAGKA[1*]
GRIGORIS ZAROTIADIS[2*]

[1]University of Ioannina, Greece
[2]Aristotle University of Thessaloniki, Greece

Abstract
Our analysis differs in two ways from the existing trade / growth literature. First, we testify the validity of the four thinkable relevant hypotheses for the same dataset simultaneously: export-led growth, import-led growth, growth-led imports and growth-led exports. Second, we check for the different effects that might result from trading within a regional trade agreement regime. We see that trading partners do matter: EU-15 growth seems to be favored by intra-EU exports and imports from the rest of the world, with the exception of China. Yet, the reversed hypotheses are not confirmable. Therefore, even if trading with specific countries creates positive growth effects, they are not likely to be long-lasting.

Keywords: Trade & Growth Relations
JEL Classification: F43

* *Corresponding author:* Aristea Gkagka, Department of Economics, University of Ioannina, 45110, Ioannina, Greece. E-mail: argkagka@cc.uoi.gr

1. Introduction

Confirming a positive interrelation of growth, international competition and openness, is of substantial theoretical importance, especially in times of systemic crises: international expansion is perhaps the major, orthodox, neoclassical proposal for growing out of the depression. Unluckily, the relevant empirical literature has revealed many different and partly controversial conclusions. Findings are highly sensitive to differences in the underlying assumptions, the variables used, the sample and the statistical data, as well as the econometric techniques applied. The dominant position seems to be that trade contributes to the strengthening of growth, but there are plenty of studies, which either show no relation, or, even worse, relate trade and growth in a significantly negative way.

Specifically, standard theory favors the so-called export- and import-led growth hypothesis (ELG and ILG respectively)[1]. Export performance works as an engine of growth in many ways. First, an increase in foreign demand for domestic exportables can be a catalyst for growth directly as a component of aggregate output (Balassa, 1978; Michaely, 1977; Vamvoukas, 2007; Awokuse, 2008). Second, exports contribute to diffusion of technical knowledge and innovations and stimulate technological improvement. New theoretical results suggest that trade may increase not only productivity (Dar and AmirKhalkhali, 2003; Coulombe, 2003) but also the growth rate through its effects on technology (Grossman, 1991; Rivera-Batiz and Romer, 1991; Young, 1991). Moreover, higher exports facilitate our access to advanced technologies and stimulate labor- and managerial-skills through learning-by-doing and internationalized entrepreneurial activity. Third, exports cause positive economies of scale and efficient resource allocation, strengthening the degree of international competitiveness (Helpman and Krugman, 1985; Awokuse, 2008; Nath and Mamun, 2007; Panas and Vamvoukas, 2002; Vamvoukas, 2007; Abhayaratne, 1996). Finally, expanded exports provide foreign exchange that may finance imports of intermediate

1. The vast majority of the empirical literature focuses on ELG. See for example the empirical works of Chuang (2002), Frankel and Romer (1999), Van den Berg (1996), Lewer and Van den Berg (2003), Vamvoukas (2007); Wooster et al (2008), Coulombe (2003), Awokuse (2007), Wacziarg and Welch (2003). ELG studies can be further categorized as follow: studies of a specific country suggesting appropriate policies (Serletis, 1992), and those which examine a group of countries and draw international comparisons and conclusions (Michaely, 1977; Balassa, 1978; Tyler, 1981; Feder, 1982; Jung and Marshall, 1985; Chow, 1987; as well as Bahmani-Oskooee et al, 1991). Yet, it has been argued that the studies for specific countries are not suitable for deriving more general conclusions or, even worse, might be misleading. On the other hand, the studies for a group of countries may not satisfactorily consider the cross-country dynamic socio-economic specificities. Therefore, covering different countries with similar characteristics and controlling for cross-country fixed effects, as we do in the present study, might be the best option.

goods, raising in turn capital formation and thus stimulating output growth (Balassa, 1978; Esfahani, 1991; Khalafalla and Webb, 2001; Ramos, 2001).

The last argument provides the basis for ILG hypothesis. Recent references criticize the ignoring of imports (Thangavelu and Rajaguru, 2004). Importing intermediate inputs complements the competitiveness of exporting sectors: they serve as a channel for letting foreign technology and know-how be incorporated in domestic productions. Moreover, in many small open developing economies, imports provide necessary production factors for the exporting sectors (Awokuse, 2008). Endogenous growth models emphasize those arguments (Grossman and Helpman, 1991; Coe and Helpman, 1995). Foreign cutting-edge technologies are usually bundled with imported intermediate goods such as computers, precision machines and equipment (Lawrence and Weinstein, 1999; Mazumdar, 2001). Finally, we should recall that import penetration exposes domestic firms to foreign competition, pushing them to respond to technological competitive pressure (Lawrence and Weinstein, 1999). In that sense, export promotion, as a strategy for economic growth, would only be partially effective if import restrictions are maintained. Notice that ILG arguments refer mainly to the developing countries.

In addition, quite a few empirical investigations ascertained reversed causality: economic growth might also lead to a strengthening of trade flows (growth-led exports and imports hypotheses – GLE[2] and GLI[3]). Exports can be stimulated by increases in domestic productivity. Specifically, Jung and Marshall (1985) consider a paradigm, where technical progress and accumulation of business skills advance more rapidly in some industries. Because of this sector-specific growth, the flourishing industries would probably turn to foreign markets (higher exports) since domestic demand for their products is insufficient. Moreover, in presence of economies of scale, growth can generate and/or strengthen comparative advantages of certain sectors, leading to further specialization and expansion of exports.[4]

Nevertheless, according to various empirical papers that provide evidence for non-positive and even negative growth-effects, there are also enough arguments that favor a non-positive relationship between growth and trade (infant industry, intersectoral rigidities etc.). For example, Jung and Marshall (1985), Abhayaratne (1996), and also Kónya (2006), or Yakovlev (2007), Bahmani Oskooee *et al* (1991) and Michaely (1977) for a significant negative effect.

---

2. See in Awokuse, 2007; Panas and Vamvoukas, 2002; Vamvoukas, 2007 and Gagnon, 2004. There are also a number of studies that speak for a bi-directional causality (Ramos, 2001; Ghali, 1999; Tsen, 2006; Nath and Mamun, 2007; McNab and Moore, 1998 and Liu et al, 2002).
3. For a GLI study, see in Thangavelu and Rajaguru, 2004 and Awokuse, 2007 and 2008.
4. The "product life cycle" argument developed by Vernon (1966) also favors this conclusion.

The present study explores the validity of ELG, ILG, GLE, GLI hypotheses for member states of the European Union (EU-15) in the period 1995-2007. In the next section we present the methodology we follow and the data we use. Empirical estimations will be discussed in the third part. Finally, we conclude with the policy implications derived from the estimated coefficients and discuss proposals for further research.

2. Methodology and Data

There are two main innovative points that characterize the approach we follow. **First**, we consider the different growth-effects of trading within a regional trade regime or with different trading partners. We distinguish three categories of exports and imports: intra-EU(15), trade flows with China, and the rest. **Second**, we testify the validity of the four thinkable relevant hypotheses for the same dataset simultaneously: export-led and import-led growth, growth-led exports and imports (ELG, ILG, GLE and GLI respectively). The first equation concentrates on ELG and ILG hypotheses, the second, third and fourth on GLE and the last three on GLI hypotheses: [5]

$$(1)\quad Y_{i,t} = a + b_{1\ EU}X_{i,t-1} + b_{2\ EU}X_{i,t-2} + c_{1\ Ch}X_{i,t-1} + c_{2\ Ch}X_{i,t-2} + d_{1\ RoW}X_{i,t-1} + d_{2\ RoW}X_{i,t-2} + b_{3\ EU}M_{i,t-1} + b_{4\ EU}M_{i,t-2} + c_{3\ Ch}M_{i,t-1} + c_{4\ Ch}M_{i,t-2} + d_{3\ RoW}M_{i,t-1} + d_{4\ RoW}M_{i,t-2} + h\,K_{i,t} + u$$

$$(2)\quad {}_{EU}X_{i,t} = a + b_1\,Y_{i,t-1} + b_2\,Y_{i,t-2} + c\,K_{i,t} + u$$

$$(3)\quad {}_{Ch}X_{i,t} = a + b_1\,Y_{i,t-1} + b_2\,Y_{i,t-2} + c\,K_{i,t} + d\,e_{i,t} + h\,t_{i,t} + u$$

$$(4)\quad {}_{RoW}X_{i,t} = a + b_1\,Y_{i,t-1} + b_2\,Y_{i,t-2} + c\,K_{i,t} + d\,e_{i,t} + h\,t_{i,t} + u$$

$$(5)\quad {}_{EU}M_{i,t} = a + b_1\,Y_{i,t-1} + b_2\,Y_{i,t-2} + c\,K_{i,t} + u$$

$$(6)\quad {}_{Ch}M_{i,t} = a + b_1\,Y_{i,t-1} + b_2\,Y_{i,t-2} + c\,K_{i,t} + d\,e_{i,t} + h\,t_{i,t} + u$$

$$(7)\quad {}_{RoW}M_{i,t} = a + b_1\,Y_{i,t-1} + b_2\,Y_{i,t-2} + c\,K_{i,t} + d\,e_{i,t} + h\,t_{i,t} + u$$

5. When we use exports and imports to China and to the rest of the world as dependent variables (namely in the 3rd, 4th, 6th and 7th estimation), we include also time in the regressors. The reason is that €/$ exchange rates (used as an additional explanatory variable) is non-stationary (empirical tests for stationarity are available by request). Therefore, we include time in order to capture any deterministic trend (Van den Berg, 1996).

There are certain clarifications that need to be made about the estimated equations. First, we apply the *(augmented) sources of growth methodology*, meaning that we express all variables in (annual) growth rates, with the exception of €/$ exchange rates and time. Second, all the variables are in real, per capita terms (apparently, again with the exception of €/$ exchange rates and time). In fact, the above equations arise out of the simple neoclassical model: per capita (p.c.) GDP growth is determined by p.c. capital endowments and average labor productivity, as well as the growth-effects from the economy's international relations (captured by trade flows). All the remaining socioeconomic specificities that could affect growth are left for the residuals. Finally, note that we use two time lags (t-1, t-2) in order to assure one-way causality.[6] We explain the choice of specific lags by mentioning four arguments. First, we use two lags because of three relevant statistic criteria: Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQIC), which give the maximum and optimum lag length of two. In similar empirical studies, which estimate the hypotheses on the basis of time series, after checking the relevant statistic criteria (AIC, SIC etc), authors end up using short lags, mostly of two or three years (Ghali, 1998; Abhayaratne, 2006; Chow, 1987; Panas and Vamvoukas, 2002, Vamvoukas, 2007; Ramos, 2001). Besides, the theoretical background of the four hypotheses supposes that the effects of trade flows on GDP growth and vice-versa occur within a relatively short period (recall the previous theoretical literature review). As a final point, data constraints inhibit the use of longer lags for technical reasons.

The estimations we discuss in the following arise from two different methodologies. First, we regress each one of the seven equations separately using cross-section fixed effects, or alternatively, depending on the outcome of the Hausman-test, cross-section random effects (Panel EGLS). Second, we estimate all the equations as a system using the "*Full Information Maximum Likelihood*" methodology (Wooldridge, 2000, Zellner, 1962).[7]

For the needs of the present study, we used data from UN ComTrade Database (trade flows)[8] and from AMECO Database (macroeconomic variables). We considered the relevant variables for each of the EU-15 member states in the period 1992-

6. Stationarity has been checked – relevant empirical tests are available by request. We should not forget to mention that we applied also Dynamic Panel Regression with 1 and 2 lags of the dependent variable. Results did not change significantly.

7. Due to the use of lags and also the fact that GDP and trade flows change rates are stationary, the system of the seven equations has a reduced form, a feature which spares us from checking the identification problem based on the relevant order and rank conditions.

8. Imports are generally reported on the basis of Cost, Insurance and Freight (CIF) while exports are reported on a Free on Board (FOB) basis. Exports and imports are expressed in SITC, Rev.3.

2007.[9] Trade flows refer purely to goods and services, as we removed the values of energy related imports and exports.[10] Beside data availability, using the specific time period is interesting because of the special characteristics of the European and the world economy as a whole (we will return to this feature in the discussion of the results).

3. Empirical Analysis

Table 1 provides the estimations of the coefficients in equation (1). We regress the annual growth rate of real GDP p.c. against the growth rates of p.c. exports and imports (in real values), decomposed for three different categories of trade partners: intra-EU trade (exports and imports from other member states), trade with China and trade with the rest of the world.

There are significant but also quite different growth-effects derived from trade flows. Intra-EU exporting activity enhances the growth perspectives. The opposite is true for exports to China (although with a much smaller marginal effect). Similarly, the estimated effect of imports from China is also significantly negative. Trading with China – an emerging economy with low-wage production and socioeconomic conditions that generate strong economies of scale – seems to affect adversely the growth rate of the EU-15! On the contrary, the ILG hypothesis can be clearly confirmed for imports from the rest of the world.

Next, we discuss the reversed GLI and GLE hypotheses. The reader should remember that there are plenty of arguments why economic growth could stimulate trading activity, both, in terms of exports and imports. In table 2, we present the estimations of six different regressions, trying to explain the growth rate of p.c. exports (imports) to the rest of the EU-15, to China and to the rest of the world. We use growth rate of p.c. GDP – lagged by one and two years – growth rate of p.c. capital[11] and €/$ exchange rates (in case of extra-EU regressions) as explanatory variables.

In general, the explainability of the "reversed", GLI and GLE regressions is quite low. Only in case of intra-EU imports, adjusted R-squared reaches a satisfactory level of 25%. Also noticeable is the generalized significance of p.c. capital, which has a clear positive trade effect. This seems to be in line with the theory of comparative

9. Note that, as we regress growth rates of the respective variables and we use 1 and 2 period lags, the dependent variables cover the period 1995-2007.

10. In particular, we subtracted the category "Mineral fuels, lubricants and related materials" (SITC, Rev.3), which contains coal, coke and briquettes, petroleum, petroleum products and related materials, gas, natural and manufactured, and electric current.

11. Although we find that p.c. capital affects both p.c. GDP and p.c. trade flows, this should not hinder us from using p.c. capital as an explanatory variable in both settings. Multicollinearity is not a problem, as, in both settings, the rest of the explanatory variables are lagged.

advantages that result from factors' relative abundance: as capital becomes relatively plentiful, the EU-15 gets more specialized in the appropriate branches and both exports and imports increase.[12]

On the contrary, consequences of economic growth are very unclear: except the case of exports to the rest of the world, where the estimated coefficient of p.c. GDP is significantly positive, the rest of the regressions do not provide evidence for a clear effect. The picture changes, as we can see in table 3, when we proceed with the system estimate of the seven equations simultaneously (Full Information Maximum Likelihood methodology). We still favor ELG hypothesis in case of intra-EU exports and ILG in case of imports from the rest of the world, but regarding the reversed effects, there is clear evidence for negative effects of growth on imports. Contrary to the GLI-related argumentation, it seems that the faster an economy grows the more the growth of imports is weakened. This finding reminds us of the cumulative process described by Pred (1966): as an economy grows, the part of domestic demand covered by domestic production increases too.

4. Conclusion

The effect of international trade on economic growth has been the subject of a vigorous debate. Beside its theoretical importance, confirming a positive interrelation of growth, international competition and openness are of substantial political significance, especially in times of systemic crises, like the recent period: if ELG/ILG and GLE/GLI hypotheses prove to be valid simultaneously, a policy that favors the economy's degree of openness could uncoil a constructive cycle, which may bring us out of the depression.

Unluckily, the estimations we present repeat the controversial findings of the related literature: neither export- nor import-led growth hypothesis seems to have a generalized validity. Moreover, as we distinguish trade flows by groups of countries, we see that trading partners do matter. For instance, EU-15 growth seems to be favored by intra-EU exports and imports from the rest of the world. Yet, this cannot be confirmed for trade flows with China. In future versions of the study, we could proceed with an additional distinction of the category "rest of the world": namely we could split it into "OECD non-EU15" partners and the rest.

Finally, GLE and GLI hypotheses are not confirmable. On the contrary, we have significant evidence for a cumulative process, where, as an economy grows, the part of domestic demand covered by domestic production increases too! This means that,

12. It is surprising that the €/$ exchange rate has no significant effect on imports. It probably signifies that the imposed negative price effect on domestic demand for imports is being counterbalanced by the positive value effect.

even if there are positive growth-effects from trading with specific countries, they are not likely to be long-lasting, as there is no sign of a bi-directional, self-reinforcing causality.

References

Abhayaratne, A.S.P. (1996) *Foreign trade and economic growth evidence from Sri Lanka, 1960-1992*, Applied Economics Letters, 3 (9), pp. 567-570.

Awokuse, T.O. (2007) *Causality between exports, imports, and economic growth: Evidence from transition economies*, Economics Letters, 94, pp. 389-395.

Awokuse, T.O. (2008) *Trade openness and economic growth: is growth export-led or import-led?*, Applied Economics, 40 (2), pp. 161-173.

Bahmani-Oskooee, M., Mohtadi, H. and Shabsigh, G. (1991) *Exports, growth and causality in LDCs. A re-examination*, Journal of Development Economics, 36, pp. 405-415.

Balassa, B. (1978) *Exports and economic growth. Further evidence*, Journal of Development Economics, 5, pp. 181-189.

Chow, P.C.Y. (1987) *Causality between export growth and industrial development. Empirical evidence from the NICs*, Journal of Development Economics, 26, pp. 55-63.

Chuang, Y. (2002) *The trade-induced learning effect on growth: cross-country evidence*, Journal of Development Studies, 39 (2), pp. 137-154.

Coe, T. and Helpman, E. (1995) *International R&D spillovers*, European Economic Review, 39, pp. 859-887.

Coulombe, S. (2003) *Intranational and international trade, the "L Curve," trade barriers, and growth*, Paper presented at the 37th Annual Meeting of the Canadian Economics Association (CEA), Ottawa, Ontario.

Dar, A. and AmirKhalkhali, S. (2003) *On the impact of trade openness on growth: further evidence from OECD countries*, Applied Economics, 35 (16), pp. 1761-1766.

Feder, G. (1982) *On exports and economic growth*, Journal of Development Economics, 12, pp. 59-73.

Frankel, J.A. and Romer, D. (1999) *Does trade cause growth?*, The American Economic Review, 89(3), pp. 379-399.

Gagnon, J.E. (2004) *Growth-led exports: is variety the spice of trade?*, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, Number 822.

Ghali, K.H. (1998) *Government size and economic growth: evidence from a multivariate cointegration analysis*, Applied Economics, 31 (8), pp. 975-987.

Grossman, G.M. (1991) *Trade, innovation and growth*, American Economic Review, 80, pp. 86-91.

Grossman, G.M. and Helpman, E. (1991) *Innovation and Growth in the Global Economy*, MIT Press, Cambridge, MA.

Helpman, E. and Krugman, P. (1985) *Market Structure and Foreign Trade*, MIT Press, Cambridge, MA.

Jung, W.S. and Marshall, P.J. (1985) *Exports, growth and causality in developing countries*, Journal of Development Economics, 18, pp. 1-12.

Khalafalla, K.Y. and Webb, A.J. (2001) *Export-led growth and structural change: evidence from Malaysia*, Applied Economics, 33 (13), pp. 1703-1715.

Kónya, L. (2006) *Exports and growth: Granger causality analysis on OECD countries with a panel data approach*, Economic Modelling, 23, pp. 978-992.

Lawrence, R.Z. and Weinstein, D.E. (1999) *Trade and growth: import-led or export-led? Evidence from Japan and Korea*, NBER Working Paper, No. 7264.

Lewer, J.J. and Van den Berg, H. (2003) *Does trade composition influence economic growth? Time series evidence for 28 OECD and developing countries*, The Journal of International Trade & Economic Development, 12 (1), pp. 39-96.

Liu, X., Burridge, P. and Sinclair, P.J.N. (2002) *Relationships between economic growth, foreign direct investment and trade: evidence from China*, Applied Economics, 34 (11), pp. 1433-1440.

Mazumdar, J. (2002) *Imported machinery and growth in LDCs*, Journal of Development Economics, 65, pp. 209-224.

McNab, R.M. and Moore, R.E. (1998) *Trade policy, export expansion, human capital and growth*, The Journal of International Trade & Economic Development, 7 (2), pp. 237256.

Michaely, M. (1977) *Exports and growth. An empirical investigation*, Journal of Development Economics, 4, pp. 49-53.

Nath, H.K. and Mamun, K.A. (2007) *Trade, growth and wage inequality in Bangladesh*, The Journal of International Trade & Economic Development, 16 (4), pp. 505-528.

Panas, E. and Vamvoukas, G. (2002) *Further evidence on the Export-Led Growth Hypothesis*, Applied Economics Letters, 9 (11), pp. 731-735.

Pred, A. (1966) *The spatial dynamics of US urban-industrial growth, 1800-1914*, MIT Press, Cambridge, MA.

Ramos, F.F.R. (2001) *Exports, imports, and economic growth in Portugal: evidence from causality and cointegration analysis*, Economic Modelling, 18, pp. 613-623.

Rivera-Batiz, L.A. and Romer, P.M. (1991) *Economic integration and endogenous growth*, The Quarterly Journal of Economics, 106, pp.531-556.

Serletis, A. (1992) *Export growth and Canadian economic development*, Journal of Development Economics, 38, pp. 133-145.

Thangavelu, S.M. and Rajaguru, G. (2004) *Is there an export or import-led productivity growth in rapidly developing Asian countries? A multivariate VAR analysis*, Applied Economics, 36 (10), pp. 1083-1093.

Tsen, W.H. (2006) *Granger causality tests among openness to international trade, human capital accumulation and economic growth in China: 1952-1999*, International Economic Journal, 20 (3), pp. 285-302.

Tyler, W.G. (1981) *Growth and export expansion in developing countries. Some empirical evidence*, Journal of Development Economics, 9, pp. 121-130.

Vamvoukas, G.A. (2007) *Trade Liberalization and Economic Expansion: A Sensitivity Analysis*, South-Eastern Europe Journal of Economics, 1, pp. 7188.

Van den Berg, H. (1996) *Does simultaneity exaggerate empirical tests of the trade-growth relationship?*, Applied Economics Letters, 3 (4), pp. 225-231.

Vernon, R. (1966) *International Investment and International Trade in the Product Cycle*, The Quarterly Journal of Economics, 80 (2), pp. 190-207.

Wacziarg, R. and Welch, K.H. (2003) *Trade liberalization and growth: new evidence*, NBER Working Paper Series, Working Paper No.W10152.

Wooldridge, J.M. (2000) *Introductory Econometrics. A Modern Approach,* South-Western College Publishing, a division of Thomson Learning.

Wooster, R.B., Banda, T.M. and Dube, S. (2008) *The contribution of intra-regional and extra-regional trade to growth: Evidence from the European Union*, Journal of Economic Integration, 23 (1), pp. 161-182.

Yakovlev, P, (2007) *Arms trade, military spending, and economic growth*, Defence and Peace Economics, 18 (4), pp. 317-338

Young, A. (1991) *Learning by doing and the dynamic effects of international trade*, The Quarterly Journal of Economics, 106, pp. 369-405.

Zellner, A., (1962) *An efficient method of estimating seemingly unrelated regression equations and tests for aggregation bias*, Journal of the American Statistical Association 57, pp. 348–368.

Table 1: Testing of Import- and Export-Led Growth Hypotheses (dependent variable: real GDP p.c. growth rate)

Cross section fixed effects / Cross-sections included: 15
Total panel (unbalanced) observations: 188
White period standard errors and covariance (d.f. corrected)

Explanatory Variables	Coefficient	t-stat	Statistics	
Constant	**0.016**	**7.88**	R-squared	0.77
Growth rate of p.c. Exports to EU-15 (t=-1)[1]	0.000	0.00	Adjusted R-squared	0.73
Growth rate of p.c. Exports to EU-15 (t=-2)	**0.037**	**2.08**	Durbin-Watson stat	1.89
Growth rate of p.c. Exports to China (t=-1)	-0.002	-1.06	Akaike info criterion	-6.45
Growth rate of p.c. Exports to China (t=-2)	**-0.003**	**-1.65**	Schwarz criterion	-5.96
Growth rate of p.c. Exports to RoW (t=-1)	-0.011	-0.95	F-statistic	19.38
Growth rate of p.c. Exports to RoW (t=-2)	0.000	0.05	Mean of dependent	0.025
Growth rate of p.c. Imports from EU-15 (t=-1)	0.026	1.23	S.D. of dependent	0.17
Growth rate of p.c. Imports from EU-15 (t=-2)	-0.019	-1.51		
Growth rate of p.c. Imports from China (t=-1)	-0.001	-0.49		
Growth rate of p.c. Imports from China (t=-2)	**-0.005**	**-1.90**		
Growth rate of p.c. Imports from RoW (t=-1)	**0.023**	**2.13**		
Growth rate of p.c. Imports from RoW (t=-2)	**0.024**	**2.22**		
Growth rate of p.c. Capital	**0.162**	**9.13**		

Table 2: Testing of Growth-Led Exports and Imports Hypotheses

Cross-sections included: 15
Total panel (unbalanced) observations: 190
White period standard errors and covariance (d.f. corrected)

	Growth-led Exports Hypothesis						Growth-led Imports Hypothesis					
Dependent:	**Growth rate of p.c. X to EU-15** (f.e.)[2]		**Growth rate of p.c. X to China** (r.e.)		**Growth rate of p.c. X to RoW** (r.e.)		**Growth rate of p.c. M from EU-15** (r.e.)		**Growth rate of p.c. M from China** (r.e.)		**Growth rate of p.c. M from RoW** (r.e.)	
Explanatory Variables	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
Constant	0.020	1.34	-0.316	-1.75	0.035	0.93	**0.045**	**10.46**	-0.084	-0.73	0.029	0.65
Growth rate of GDP p.c. (t=-1)	0.470	1.40	2.309	1.11	**0.800**	**1.82**	**0.507**	**3.05**	-1.177	-1.10	-0.616	-1.45
Growth rate of GDP p.c. (t=-2)	0.225	0.57	-0.196	-0.10	-0.385	-0.86	**-0.537**	**-2.99**	1.091	1.03	-0.417	-0.80
Growth rate of p.c. Capital	**0.61**	**10.02**	0.073	0.18	**0.280**	**2.50**	**0.531**	**5.89**	**0.755**	**4.18**	**0.886**	**10.25**
Exchange rate (€ per US$)	-		**0.428**	**2.91**	0.051	1.34	-		0.201	1.53	0.053	1.07
Statistics												
R-squared	0.19		0.05		0.07		0.26		0.07		0.21	
Adjusted R-squared	0.11		0.03		0.04		0.25		0.04		0.19	
Durbin-Watson stat	2.47		2.41		2.28		2.00		2.12		1.84	
Akaike info criterion	-2.12		-		-		-		-		-	
Schwarz criterion	-1.81		-		-		-		-		-	
F-statistic	2.35		2.02		2.70		21.96		2.74		9.79	
Mean of dependent	0.06		0.19		0.08		0.06		0.20		0.07	
S.D. of dependent	0.08		0.30		0.10		0.07		0.19		0.10	

Table 3: Estimations of the system of seven equations

Estimation Method: Full Information Maximum Likelihood
Included observations: 188
Total system (balanced) observations: 1316
Convergence achieved after 1 iteration

Dependent:	Growth rate of GDP p.c.		Growth rate of p.c. X to EU-15		Growth rate of p.c. X to China		Growth rate of p.c. X to RoW		Growth rate of p.c. M from EU-15		Growth rate of p.c. M from China		Growth rate of p.c. M from RoW	
Variable	Coef	z-stat	Coef	z-stat	Coef	z-stat	Coef	z-stat	Coef	z-stat	Coef	z-stat	Coef	z-stat
Growth rate of p.c. Exports to EU-15 (t=-1)	0.008	0.39	-		-		-		-		-		-	
Growth rate of p.c. Exports to EU-15 (t=-2)	**0.026**	**1.12**	-		-		-		-		-		-	
Growth rate of p.c. Exports to China (t=-1)	**0.006**	**1.59**	-		-		-		-		-		-	
Growth rate of p.c. Exports to China (t=-2)	0.003	0.85	-		-		-		-		-		-	
Growth rate of p.c. Exports to RoW (t=-1)	-0.004	-0.22	-		-		-		-		-		-	
Growth rate of p.c. Exports to RoW (t=-2)	0.006	0.41	-		-		-		-		-		-	
Growth rate of p.c. Imports from EU-15 (t=-1)	0.021	0.87	-		-		-		-		-		-	
Growth rate of p.c. Imports from EU-15 (t=-2)	-0.009	-0.34	-		-		-		-		-		-	
Growth rate of p.c. Imports from China (t=-1)	0.001	0.23	-		-		-		-		-		-	
Growth rate of p.c. Imports from China (t=-2)	0.002	0.29	-		-		-		-		-		-	
Growth rate of p.c. Imports from RoW (t=-1)	0.006	0.33	-		-		-		-		-		-	
Growth rate of p.c. Imports from RoW (t=-2)	**0.021**	**1.71**	-		-		-		-		-		-	
Growth rate of GDP p.c. (t=-1)	-		-0.166	-0.13	0.867	0.28	0.043	0.04	0.095	0.14	**-2.146**	**-1.17**	**-1.180**	**-1.41**
Growth rate of GDP p.c. (t=-2)	-		-0.572	-0.42	-1.036	-0.38	**-1.025**	**-1.31**	**-0.767**	**-1.43**	0.247	0.13	**-1.137**	**-1.60**
Growth rate of p.c. Capital	**0.207**	**10.28**	**0.526**	**1.65**	0.336	0.44	**0.413**	**2.00**	**0.579**	**4.22**	**0.957**	**1.50**	**1.021**	**4.11**
Exchange rate (€ per US$)	-		-		**0.494**	**1.31**	0.097	0.93	-		0.275	0.96	**0.113**	**1.13**
Statistics														
R-squared	0.57		0.10		0.04		0.026		0.24		0.05		0.17	
Adjusted R-squared	0.53		0.08		0.01		-0.001		0.23		0.03		0.14	
Durbin-Watson stat	1.24		2.19		2.37		2.17		1.95		2.09		1.78	
Mean of dependent	0.03		0.06		0.19		0.08		0.06		0.20		0.07	
S.D. of dependent	0.02		0.09		0.30		0.10		0.07		0.19		0.10	

1. Thereby, we note the use of time lags: t=1 (t=2) means that the variable is lagged by one (two) period(s).
2. Thereby we note the methodology we used for each different regression, based on the results of the Hausman test: f.e. indicates “cross-section fixed effects”, while r.e. indicates “cross-section random effects” (panel EGLS).