Structure of Iran's Foreign Trade *ex-ante* and *ex-post* Economic Sanctions: Role of Intensive and Extensive Margins

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Abstract

This study decomposes the structure of Iran's trade, ex-ante and ex-post economic sanctions. It employs two distinct methods of trade growth decomposition, intensive and extensive margins, as proposed in the literature. The major findings on Iran's foreign exports spanning the period 2000-2012 are as follows. First, the intensive margin of trade played a dominant role for export growth in both the pre- and post- sanction intervals. Second, for the entire period, Iran has constantly attempted to deepen its existing trade relationships. However, the sanctions, on average, magnified failed relationships. Third, efforts to deepen current trade relationships resulted in the substitution of quantity for quality exports, ex-post sanctions. Fourth, since 2007, Iran successfully created new trading relationships to divert its export markets. Nevertheless, aggregate losses from the failed relationships exceeded the gains from new trade linkages. Fifth, Iran's foreign trade policies towards different geographical regions varied both pre- and post- economic sanctions.

Key Words: intensive margin; extensive margin; economic sanctions; Iran

JEL Classification: F10, F14

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1- Introduction

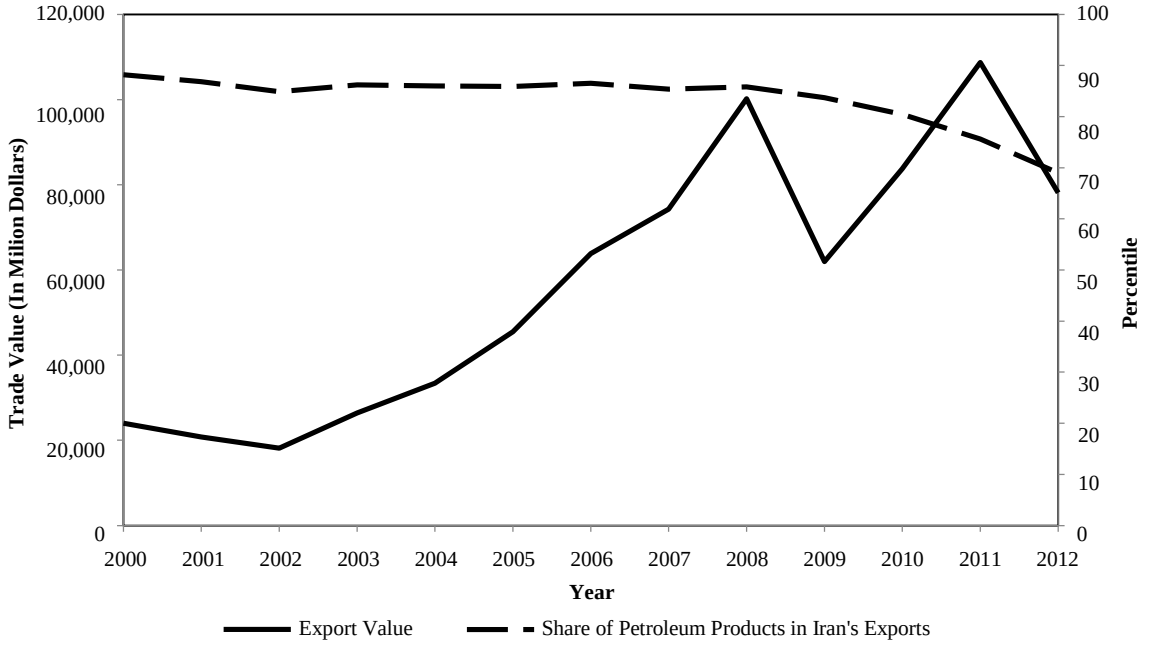
Following the revolution in 1979, Iran has encountered numerous sanctions. Since the emergence of the Islamic Republic regime, the United States (US) imposed unilateral embargoes against Iran[1]. Thereafter, those sanctions have always been extended by the subsequent US presidents. Since 2006, following the failure of international negotiations on Iran's controversial nuclear enrichment programme and the controversial announcements by President Ahmadinejad, the sanctions against Iran tightened. For the period of 2006-2012, the United Nation's Security Council passed eight resolutions. Both US sanctions and embargoes from the European Union (EU) plagued the economy over the same period. These sanctions took a serious toll on Iran's economy. One recent consequence of the sanctions is that Iran's currency (Rial) depreciated by 80 per cent over the second half of 2011 until early 2012. Further John Kerry, the US Secretary of State, declared that economic sanctions have already crippled Iran's oil export income, reducing it from US$120 billion to less than US$45 billion dollars per annum[2].

Despite all these obstacles, prior to 2012, Iran's foreign trade statistics showed little response to the restrictions. Iran witnessed steady growth in exports for the period 2000-2011. Except for the 2001 terrorist attacks and the 2009 global financial crisis, Iran's export growth has always been positive throughout the period 2000-2012 (See Figure 1). After 2006, the Iranian economy counteracted the sanctions by lowering the state's dependency on oil exports, which has been the main target of the sanctions. However, the low export value of Iran in 2012 signals possible failure of such policies to address embargoes.

[1] Those sanctions came into force upon the seizing of the US embassy in Iran by a group of Iranian students, who were protesting against the US decision to host the exiled Shah of Iran for some medical treatment. The protestors took all the US employees there as hostages.

[2] Source: http://www.bbc.co.uk/news/world-middle-east-24946990

Figure 1: Global* Exports of Iran and Share of Petroleum Exports, 2000-2012



Note: *Refers to Iran's exports to 126 countries (Appendix 1).
Source: Compiled from the UNCOMTRADE database.

This paper aims to decompose the structure of Iran's trade, *ex-ante* and *ex-post* economic sanctions, to investigate the implications for trade following sanctions. For this, we decomposed Iran's trade to "intensive" and "extensive" margins for the period 2000-2012. The decomposition methods of Bingzhan (2011) and Besedeš and Prusa (2011) are employed for this study. Our findings reveal that the intensive margin (depth or intensity of trade relations) had been the major source of Iran's export growth throughout the period of review. Among the components of intensive margin, the survival issue was the least concern of the Iranian government. Iran deepened her trade relationships post sanctions, wherein quantity was replaced by quality of products, which then translated into a price boost. Since 2007, Iran made attempts to divert its trade flows through establishing new relationships. However, the value of trade losses rooted in failed relationships exceeded gains from new associations. Finally, the role of each margin varied across different regions.

The remainder of this study is organized as follows. Section 2 summarizes the literature on global sanctions, and reviews the progression of trade decomposition methods

and findings. Section 3 discusses the two methods of trade decomposition adopted for the study. Section 4 reports and discusses the results of our investigation. Section 5 concludes.

2- Literature Review

Evidence from the Megarian Decrees in 435 B.C. presents early applications of economic coercions as a mean to impose a political decision, when war is costly (Eyler, 2007). Over the 20th and 21st century, the US established several economic sanctions to penalize offensive governments. Those that came into force during the period 1933-1991 were mainly concerned with the nation's security against empowerment of hostiles in the second world war, especially Japan, Germany, and the Soviet Union. Since then, other motives drove the US to establish new economic embargoes (Dobson, 2004).

Effectiveness of sanctions, however, is always been a controversial issue.[1] Generally, an effective sanction must possess three characteristics: i) Economic effectiveness: Damage macroeconomic properties of the target market (for example create exchange rate fluctuations); ii) Humanitarian effectiveness: Although populace impacts of sanctions are inevitable, an effective sanction must aim at the ruling sector; and iii) Political effectiveness: Eventually, a sanction must result in initial political purposes or at least marginal changes in behaviors of an aggressor. Moreover, to prevent a sanctioned economy to divert its supplying resources to alternative states, forming an embargo based upon a joint global policy is mandatory. Still, as a non-tariff barrier (NTB), a sanction is associated with negative consequences even for the sender (Eyler, 2007).

Evaluating economic impacts of certain sanctions, solely based on trade growth assessment, seems ingenuous. Instead, analysis of trade growth structure could bring more

[1] See Haidar (2015)

fruitful results (for example what drivers lead to trade expansion or how trading relationships are altered *ex-post* a particular set of economic sanctions). Hence, we turn to a novel concept

that is introduced in the contemporary economic literature: "intensive" and "extensive" margins of trade.

Conventional trade theories, for a long period, merely considered the "intensive margin" of trade as the only source for trade expansion. This limited international trade studies to "existing" bilateral relationships and a set of predetermined commodities (see Armington, 1969). These constraints led to serious underestimations in welfare costs of trade restrictions, biased results in analysis of trade growth and undermined terms of trade predictions (Brown, 1987; Hummels and Klenow, 2002; Romer, 1994). Thus, the contemporary literature proposed a new phenomenon in international trade vocabulary, the "extensive margin" of trade. This new term, particularly focuses on export initiation by new firms (Melitz, 2003), fresh establishments of trade relationships between countries that reported zero-trade, previously (Helpman, Melitz, and Rubinstein, 2008), and fresh exporting commodities, which were not traded before (Bernard, Redding, and Schott, 2006).

Trade costs are one of the predominant factors that made economists to differentiate the intensive from extensive margins of trade. Introduction of a new commodity to the export market is always associated with invention and innovation fixed costs (Romer, 1994). Moreover, to reach an access to a foreign market, a company ought to allocate a sunk cost, initially after building up an export relationship (Bernard *et al.*, 2006). This mentioned sunk cost is enforced as a means to overcome the imperfect information of the new exporting firm, *vis-à-vis* domestic suppliers and/or other exporting firms, which already compete in the target market (Volpe Martincus and Carballo, 2008). More recently, Besedeš and Prusa (2011) introduced a maintenance cost that must continuously be paid by an exporting firm in order to prolong its access to a foreign market. The first two types are special for the extensive margin, whereas, the latter is unique for trade growth in the intensive margin. Accordingly,

assumptions on homogeneity of export competing firms, and therefore, evaluation of total trade growth may not provide fruitful results.

Decomposition of trade growth into the intensive and extensive margins has had various implications. One of the most significant avails was attempts to justify the puzzle introduced by Rose (2004). In his study, Rose (2004) evaluated the efficiency of the World Trade Organization (WTO) membership through the assessment of liberalized trade policies. His findings showed that *vis-à-vis* pre-membership policies, post-membership policies have only had negligible modifications towards liberalization. Following Rose (2004), numerous studies explored empirically the implications of WTO accession. Buono and Lalanne (2012) and Debaere and Mostashari (2010) evaluated the impacts of tariff reductions, as a major implication of the accession to the WTO by France and the US. Their findings, both, approved that tariff reduction policies were mainly in favour of companies, which were already engaged in the export market (intensive margin). In contrast, Dutt, Mihov, and Van Zandt (2013) found the extensive margin as the main source of trade expansion after the WTO establishment. Their evaluation on 150 countries over 1962-1999, revealed that unlike the reducing trend of the intensive margin, the extensive margin of trade has grown by 25 per cent. Besides, they found strong evidence on reduction of trade fixed costs by joining the WTO.

Several studies continued to explore the importance of each margin on global trade growth; however, their results have been at best contradictory. Some studies introduced the extensive margin as the main driver for growth in global trade (Evenett and Venables, 2009; Hummels and Klenow, 2002), whereas, others reported opposite findings (Felbermayr and Kohler, 2006; Helpman *et al.*, 2008). Although no clear justification is offered throughout the literature, Besedeš and Prusa (2011) believed this is rooted in the differences in definitions of the margins. Generally, three different approaches are employed in defining the extensive

margin of trade: i) Country-level: New bilateral partnerships are the only sources for the extensive margin; ii) Product-level: Export initiations for commodities that were not already exported are origins for the extensive margin; and iii) Country-product-level: A combination of the two former definitions constitute the extensive margin. Existence of sunk cost often relate to the latter. Except for a few studies (Buono and Lalanne, 2012), due to data availability restrictions, the firm-level extensive margin[3] as proposed by Bernard *et al.* (2006), was almost overlooked.

A majority of studies simply presumed the number of trade relationships as the extensive margin, and the average value of exports through each trading relationship as the intensive margin. This approach applied by using the gravity model. However, some economists came up with more complex methods to decompose trade growth. Hummels and Klenow (2002) argued that the intensive margin of trade growth is rooted either in an increase in price of exported merchandise (quality boost), or an expansion in the number of traded commodities (higher exploitation of domestic production factors). Hence, they proposed a new decomposition method based upon this novel approach. Their findings on 110 exporters to 59 importers revealed that richer economies tended to export more of both quantity and quality goods. Corroborating the economic implications of this finding, Bingzhan (2011) provided a minor alteration to the formalization as suggested by Hummels and Klenow. His results on the decomposition of China's trade growth indicated that approximately 70 per cent of the annual expansion in exports was driven by quantity increases. Thereby, he predicted the growth as not sustainable, as it was a result of over-exploitation of domestic production factors.

Another vein of complex decomposition methods was proposed by Besedeš and Prusa (2011). They introduced the components of the intensive margin to include an effort to

[3] They suggested that firms with multiple products may not export all varieties of their output. Therefore, as these firms initiate exports of a new type of product, it should be considered as extensive margin.

survive in a target market or deepen the current trading relationship. Their approach was considered superior as it provided several features: i) It accounted for asymmetric information of the exporting companies on the costs associated with access maintenance in a foreign market; ii) It considered a dynamic circumstance for each trading relationship based upon the age of service in the estimations. Besedeš and Prusa finally applied their model to a group of successful developing countries. Their findings suggested that the intensive margin plays a crucial role for export growth, and to reach higher trade advances, both branches within the margin must be treated more precisely.

Other empirical studies also contributed to the literature on the intensive and extensive margins of trade. The remainder of this paragraph summarizes some significant findings in this regard. Coughlin and Wall (2011) evaluated the role of ethnic networks on each of the mentioned margins. Their conclusion on export flows of the US to 29 countries over 1990 and 2000 supported that the ethnic networks contribute to trade expansion on the intensive margin. Auray, Eyquem, and Poutineau (2012) assessed the impacts of monetary unification on the volatility of the extensive margin within the EU. Their findings suggested that except for Germany, the adoption of a common currency has resulted in an increase in the volatility of the extensive margin throughout the EU. Finally, Eaton, Eslava, Kugler, and Tybout (2008), showed that although new firms account for almost a half of Columbian companies that engage in the export market annually, the state's trade growth is mainly driven by the intensive margin.

3- Methodology

In this study, we evaluated the structure of Iran's trade growth for the period 2000-2012. We compiled a data set at the 6-digit harmonized system (HS) classification of Iran's exports to

126 countries[4], which reported non-zero imports for at least two years of the study period. Since data for export flows of Iran was unavailable for some years, we used the import flows of other parties. One might question the validity of import flows as they are normally reported on cost insurance and freight (CIF) basis. However, since decomposed trade growth is the focus of the study, our estimations apply price growth, not price *per se.* Our final data set comprised 192,000 observations, drawn from the United Nations Commodity Trade Statistics (UNCOMTRADE). The period 2001-2006 is assumed the pre-sanction interval, while 2007-2012 is treated as the post-sanction era. To control for different types of trade costs, we adopted the country-product-level of decomposition.

Since recent economic sanctions were mainly imposed and emphasized by Western states, we also considered the regional implications of the economic embargoes on Iran's trade structure. Hence, to obtain precise results, this study took into account nine geographical regions: Africa, Central Asia, East Asia, the EU-15, Europe (Excluding EU-15), Latin America, Middle East, Oceanic, and the North America.

To decompose the structure of Iran's trade, pre and post recent economic sanctions, we followed two distinct methods proposed in the literature. In the first estimation approach, we employed the augmented procedure of Hummels and Klenow (2002), as introduced by Bingzhan (2011). This method enables us to investigate the following issues: i) quantity or quality based aspects of intensive growth of trade; ii) diversion to new trading relationships post sanctions; and iii) alteration of structure of trade post sanctions.

Model I:

$$R = \frac{\sum_{i\in\Omega_{t+1}} V_{it+1}}{\sum_{i\in\Omega_t} V_{it}} = \left(\frac{\sum_{i\in\Omega_{t+1}} V_{it+1}}{\sum_{i\in\Omega_c} V_{it+1}} \Big/ \frac{\sum_{i\in\Omega_t} V_{it}}{\sum_{i\in\Omega_c} V_{it}} \right) \times \prod_i \left(\frac{p_{it+1}}{p_{it}} \right)^{w_{it}} \times \prod_i \left(\frac{q_{it+1}}{q_{it}} \right)^{w_{it}}$$

where R represents the magnitude of export growth, V indicates the value of trade, p stands for the price of a traded commodity, and q exhibits the export quantity of the same product. i

[4] Appendix 1 presents the list of countries chosen for this study.

and *t* are respectively representatives for commodity types and the times when trade occurred. Ω_t shows the portfolio of traded commodities over time *t*, and Ω_c presents a range of common commodities that were exported at times *t* and *t+1*. Finally, w_{it} is the weighting ratio, quantified as:

$$w_{it} = \frac{\frac{s_{it+1} - s_{it}}{\ln s_{it+1} - \ln s_{it}}}{\sum_i \frac{s_{it+1} - s_{it}}{\ln s_{it+1} - \ln s_{it}}}$$

where s_{it} is the value share:

$$s_{it} = \frac{p_{it} q_{it}}{\sum_i p_{it} q_{it}}$$

The first term in the right-hand-side of the "Model I," exhibits the extensive margin of trade growth. The subsequent terms present the contributions of price and quantity increase on the intensive margin of trade growth, respectively.

A log-linear transformation of the "Model I," enables us to convert the multiplicative form to a summative one:

$$G_R = G_{EX} + G_P + G_Q$$

Unlike Bingzhan (2011), we did not divide the both sides of the latter equation with the term G_R. The main purpose of this division was to extract the contribution of each of the tracks on total growth (e.g. $r_{EX}+r_P+r_Q=1$). However, if the annual growth turns to negative, then this step will result in adverse findings upon the margins. Since our dataset contained years, when the total value of Iran's exports experienced reduction, we ignored this step.

In the second investigation, our study decomposed the growth of Iran's trade based on the method proposed by Besedeš and Prusa (2011). In addition to the second and third afore-mentioned advantages, using the "Model II", we were able to trace how the trend of Iranian trade relationships has changed towards her partners within each region.

Model II:

$$V_{t+1} - V_t = \sum_{z \in Z} \left\{ \sum_{i=1}^{I} \left\lceil (1 - h^i_{z,t+1}) n^i_{z,t} \right\rceil \left\lceil v^i_{z,t+1} - v^i_{z,t} \right\rceil - \sum_{i=1}^{I} \left\lceil \left(h^i_{z,t+1} - n^i_{z,t} \right) v^i_{z,t} \right\rceil + \varepsilon_{z,t+1} v^0_{z,t+1} \right\}$$

where *t* presents time, *z* is an exported commodity, *Z* indicates a set of products that were exported to a region, *i* exhibits the age of service, and *l* is the maximum potential year of service. V_t is the total value of exports at time *t*. presents the hazard rate of commodity *z*'s trade partnership closure at the i^{th} year of service, at time *t*. The ratio is computed based on a portion of the commodity *z*'s trade relationships at time *t-1*, which did not survive at time *t*. represents the number of commodity *z*'s trade partnerships at i^{th} year of service, at time *t*. is the average value of commodity *z*'s export worthiness towards each of its the i^{th} aged relationships at time *t*. Finally, $\mathcal{E}_{z,t}$ demonstrates the number of commodity *z*'s new trade partnerships at time *t*.

Thereby, the term, ( ) determines the number of trade relations that survived from time *t* to *t+1* (Survival index of the intensive margin). The second term, ( ) explores the extent to which those survived relationships have deepened (deepening index of the intensive margin). $\sum$ presents losses that resulted in the failed relationships at time *t*. The last term, , estimates the worthiness of new trade relationships at time *t+1*.

The above equation enabled us to extract desperate magnitudes for the intensive and extensive margins of trade. However, due to the summative nature of the introduced intensive margin, we were unable to decompose the margin further to surviving and deepening components. For this study, we developed an augmentation method as follows. First, we assumed the intensive margin of trade growth as a ratio of export values for relationships with more than zero years of service at time *t+1* to total value of exports at time *t*. Then as per Besedeš and Prusa (2011) we presumed the margin as either an effort to survive in a foreign market or deepen the trading relationship:

$$Intensive\ growth_{t+1}=SUR_{t+1}\times DEEP_{t+1}$$

where surviving and deepening indices are defined as subsequent formulae:

$$SUR_{t+1} = \frac{\sum_{z \in Z} \sum_{i=1}^{l} n_{z,t+1}^{i}}{l} \Big/ \sum_{z \in Z} \sum_{i=0} n_{z,t}^{i}$$

$$DEEP_{t+1} = \frac{V_{t+1} - \sum_{z \in Z} \varepsilon_{z,t+1} v_{z,t+1}^{0}}{\sum_{z \in Z} \sum_{i=1}^{l} n_{z,t+1}^{i}} \Big/ \frac{V_t}{\sum_{z \in Z} \sum_{i=0}^{l} n_{z,t}^{i}}$$

In this stage, the log-linear transformation method enabled us to extract the surviving and deepening impacts to our introduced intensive margin. Finally, we adjusted the value of our intensive margin to that as developed by Besedeš and Prusa (2011).

4- Findings and Discussion

Initial assessments of the Iranian average trade growth reveal that *vis-à-vis* the pre-recent sanctions era (2001-2006), the post-recent sanctions period (2007-2012) has been accompanied by fewer commodity export expansions. Indeed, massive export contractions in 2009 and 2012 have undermined the average trade increments for the period 2007-2012 (see Figure 1).

Table 1 presents the average topographical growth of Iran's merchandise exports to different geographical territories pre- and post-sanctions. The average growth rates provide support that Iran's trade expansion towards all regions has reduced with the implementation of economic embargoes. The magnitude of this reduction has been much lesser for East Asia and non-EU-15 European states relative to other regions.

As per Table 1, Iran's foreign trade has been highly concentrated on East Asia, pre- and post-sanctions. Although the EU-15 constituted almost 27 per cent of Iran's exports pre-sanctions, the share declined to only 18 per cent in the post-sanctions era. The opposite holds

in the case of Central Asia. For the other remaining regions, variations in the share of exports have been less than one per cent.

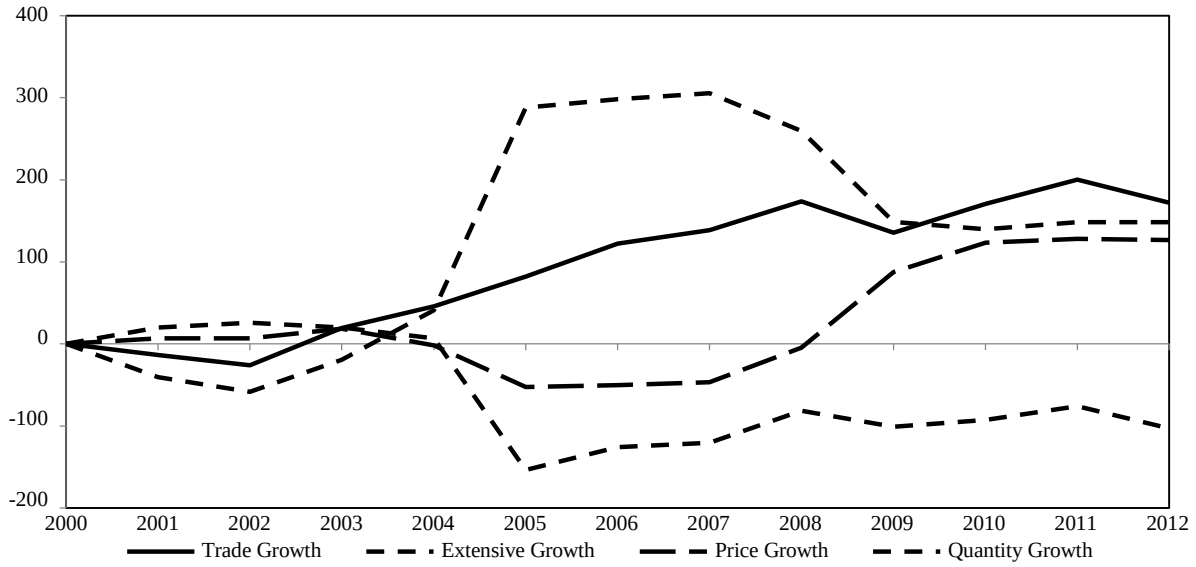
Table 1: Average Growth and Trade Shares of Iran's Regional Exports (in percent)

Region	Pre-Sanctions (2000-2006)		Post-Sanctions (2007-2012)	
	Trade Growth	Share of Exports	Trade Growth	Share of Exports
Overall	20.37	-	8.32	-
Africa	18.45	6.54	-7.61	4.05
Central Asia	88.79	4.74	16.92	15.16
East Asia	18.56	51.58	11.65	50.97
EU-15	16.08	26.87	-3.85	17.96
Europe (Non-EU-15)	38.55	7.16	27.26	10.14
Latin America	153.60	0.21	22.51	0.25
Middle East	26.62	2.11	2.54	1.20
Oceanic	64.13	0.15	43.01	0.13
North America	-2.88	0.64	-11.72	0.13

Source: Compiled from the UNCOMTRADE database.

Our results on the first decomposition of the Iranian trade growth (Model I) revealed interesting findings. Figure 2 portrays the cumulative trend of each of the factors contributing towards the expansion of Iranian exports as per Model I. Based on our findings, Iran's trade growth was mainly characterized by establishments of new trading relationships (the extensive margin) for 2000-2003. For 2003-2005, expansions at the extensive margin become less important. In 2006, as President Ahmadinejad's ruling party came to power and with the tightening of the sanctions, Iran tried to increase exports through the building up of new partnerships. Except for 2009, when the financial crisis took place, and 2012, when foreign imposed restrictions asserted their maximum impact, the growth of Iran's foreign exports on the extensive margin had always been positive.

Figure 2: Cumulative Growth of Exports (Model I)



Source: Results on trade growth decomposition based on Model I.

From the perspective of existing relationships (the intensive margin), in the pre-sanction period, the Iranian export policies were mainly characterized by increasing the number of exported commodities and lowering the prices. In other words, as a country endowed with natural resources, Iran's export growth emphasized the exploitation of the mining sector throughout the period. However, since 2007, the policies shifted emphasis towards quality rather than quantity (price) increases. Interestingly though, considerable devaluation of the Iranian Rial in 2012 did not lead to price reductions in the exported commodities.

The findings on decomposed trade growth by regions indicate heterogeneous policies towards each of the geographical territories. Table 2 reports the average expansion of each of the growth factors/ components, pre- and post- recent economic sanctions[5]. Overall, the results support the significance of quantity growth prior to 2007, while prices (quality increase) emerged the major driver for export growth for the period of 2007-2012. Besides, our findings reflect Iran's efforts to create new trading relationships post 2007. For example,

[5] Appendix 2 presents the cumulative trends of each of the "Model I" growth factors for the nine different geographical regions.

in the Middle East, there is a clear diversion in Iran's policies from quality boost to the establishment of new trading relationships. Conversely, for Latin America and the Oceanic regions, the prime importance of the extensive margin prior to 2007 was substituted with quantity increases in the post-sanction era.

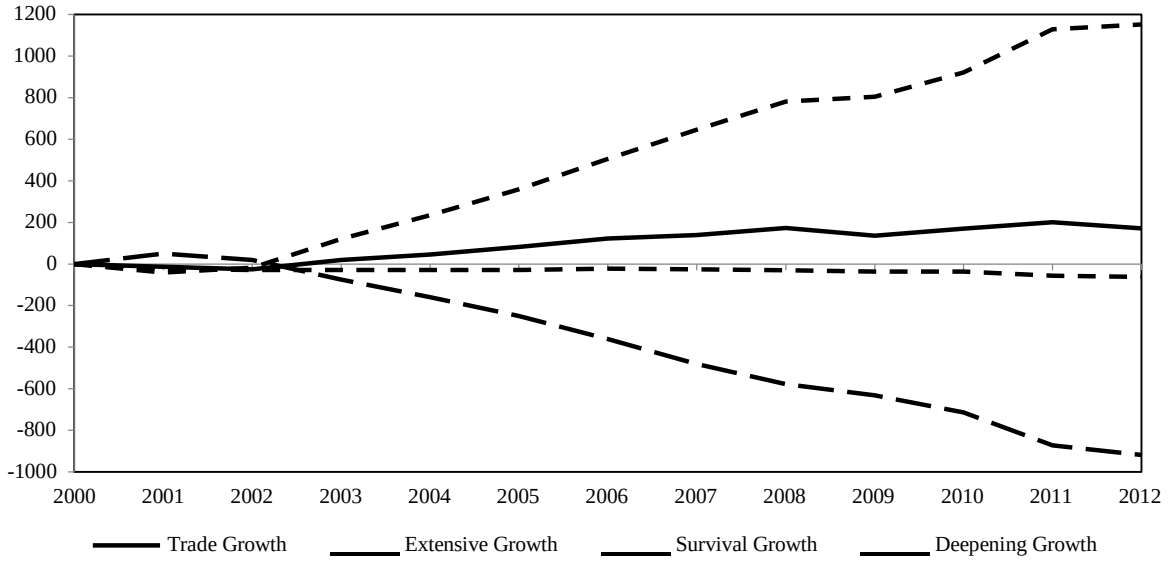
Table 2: Average Expansion of Export Growth (Model I) (in percent)

Region	Pre-Sanctions (2000-2006)				Post-Sanctions (2007-2012)			
	Total	Extensive	Price	Quantity	Total	Extensive	Price	Quantity
Overall	20.37	-20.95	-8.39	49.71	8.32	3.82	29.49	-24.98
Africa	18.45	-30.33	-28.44	77.23	-7.61	-18.36	15.67	-4.92
Central Asia	88.79	35.89	20.69	32.21	16.92	17.43	86.28	-86.78
East Asia	18.56	-54.89	-1.68	75.13	11.65	5.09	7.66	-1.10
EU-15	16.08	-17.91	16.76	17.24	-3.85	2.71	13.53	-20.08
Europe (Non EU-15) Latin	38.55	7.22	-18.67	50.00	27.26	-12.86	33.16	6.96
America	153.60	455.16	-197.11	-104.45	22.51	-1.77	5.35	18.94
Middle East	26.62	-18.85	66.77	-21.30	2.54	69.54	56.91	-123.90
Oceanic	64.13	51.68	21.55	-9.10	43.01	-79.49	-131.94	254.44
North America	-2.89	-3.98	0.01	1.08	-11.72	-0.22	16.31	-27.81

Source: Results on trade growth decomposition based on Model I.

Unlike the findings of Model I, our results from Model II reveal consistent policies but strong divergences in the structure of Iran's trade. Figure 3 presents the cumulative growth of Iran's trade and its margins. Noting the definition of the extensive margin in Model II, based on Figure 3, losses from Iran's failed trading relationships appear to have constantly exceeded the value of its new relationships for the entire period. For the intensive margin, the survival and deepening components diverged significantly with time. The declining trend in the survival component indicates that Iran's existing trading relationships were affected by the sanctions. Still, the deepening margin reveals that amongst the remaining partnerships, Iran successfully strengthened its ties by increasing the exports.

Figure 3: Cumulative Growth of Exports (Model II)



Source: Results on trade growth decomposition based on Model II.

Regional patterns of Iran's foreign trade structure in Model II, exhibit more consistent results in terms of the overall observed pattern. Table 3 reports the average contribution of each of the margins to total trade growth, pre- and post- recent economic sanctions[6]. Our findings show that for Africa, East Asia, the EU-15, non-EU-15 European nations, and North America, the growth patterns have been similar to that of overall trends. For Central Asia, a rapid growth of new partnerships in 2006 reflected the role of the extensive margin during the pre-sanctions period. Since 2007, however, the deepening factor has been the major driver of export expansions in this region.

Iranian export policies toward Latin American countries vary *ex-post* sanctions. Prior to 2006, deepening established relationships has been the ruling driver of Iran's export expansion in the region. The average expansions at the extensive growth in the case of trade with Latin America signifies considerable efforts to build up new associations. After 2007, however, the main focus of Iran's trade towards Latin American nations was to establish new trading relationships.

[6] Appendix 3 presents the cumulative trends for each of the "Model II" growth factors for the nine different geographical regions.

Table 3: Average Expansion of Export Growth (Model II) (in percent)

Region	Pre-Recent Sanctions (2000-2006)				Post-Recent Sanctions (2007-2012)			
	Total	**Extensive**	**Survival**	**Deepening**	**Total**	**Extensive**	**Survival**	**Deepening**
Overall	20.37	-3.70	-60.25	84.32	8.32	-6.62	-92.76	107.70
Africa	18.45	-4.48	-113.16	136.09	-7.61	-7.66	-242.70	242.75
Central Asia	88.79	76.58	-13.13	25.34	16.92	-0.46	-27.76	45.14
East Asia	18.56	-4.44	-54.87	77.87	11.65	-4.60	-84.00	100.25
EU-15	16.08	-0.25	-67.58	83.91	-3.85	-7.36	-87.98	91.49
Europe (Non EU-15) Latin	38.55	-4.99	-51.68	95.22	27.26	-8.74	-85.15	121.15
America	153.60	140.07	-1078.85	1092.38	22.51	33.73	-13.65	2.43
Middle East	26.62	11.20	-233.00	248.42	2.54	-2.53	-12.12	17.19
Oceanic	64.13	54.52	6.80	2.81	43.01	11.66	-35.14	66.49
North America	-2.89	-4.45	-12.12	13.68	-11.72	-3.20	-26.97	18.45

Source: Results on trade growth decomposition based on Model II.

Export growth of Iran to the Middle East is characterized best by deepening current relationships in both time intervals. Prior to the recent sanctions, expanding the portfolio of trading relationships has also been a source for trade enhancement in the region. Since 2007, political conflicts between Iran and its counterparts led to major failures in deepening existing partnerships and beyond.

For 2001-2006, Oceanic has been the only geographical region, where Iran successfully enhanced all its export margins, on average. The extensive margin of trade has been the major source for trade growth. Since 2007, although Iran failed to maintain her relations with this region, the average export magnitude of newly established relationships exceeded the failures. Similar to a majority of other geographical realms, deepening existing trade relationships has been the main driver of export growth after 2007.

Generally, although Iran's foreign trade policies on expanding the quantity or quality of exported commodities vary significantly *ex-post* sanctions, they have consistently emphasized on deepening rather than surviving existing trade relationships.

5- Conclusion

This study decomposes the structure of Iran's trade *ex-ante* and *ex-post* economic sanctions. For this, we employed two distinct approaches on the intensive and extensive margins of trade as proposed by the literature, with some modifications. In the first approach, following Hummels and Klenow (2002) and Bingzhan (2011), we presumed the intensive margin of trade growth to be rooted either in an expansion in quantity of exported commodities or boost in prices. In the second approach, we followed the decomposition method as introduced by Besedeš and Prusa (2011). In this approach, efforts to survive in certain markets or deepen trading bonds are considered as the potential sources to expand on the intensive margin. A large data set was specially constructed for the analysis, comprising import flows of 126 countries from Iran, spanning the period of 2000-2012. Commodities were differentiated at the detailed 6-digit HS classification. The average growth rates for each of the margins were compared across the pre-sanctions (2000-2006) and post-sanctions (2007-2012) periods.

Our findings indicate that for both time internals, Iran consistently pursued policies to deepen its current relationships, while little efforts were made to increase the number of surviving trading relationships. With the implementation of new embargoes, the average magnitude of failed relations increased and more endeavours were made to deepen the existing relationships. However, Iran established new trade relationships to divert its export markets. Notwithstanding that, the amount of its trade losses rooted in relationship failures exceeded the gains from new export initiations.

To deepen the existing relationships (main means for export expansion), prior to 2007, Iranian policies were mainly concerned with increasing the number of exported commodities. This led the economy to increasingly exploit its natural resources. Since 2007, however, these policies were substituted with quality orientation that translated into a price

boost. This overall pattern was consistent with regional export trends to Africa, East Asia, the EU-15, non-EU-15 European countries, and North America.

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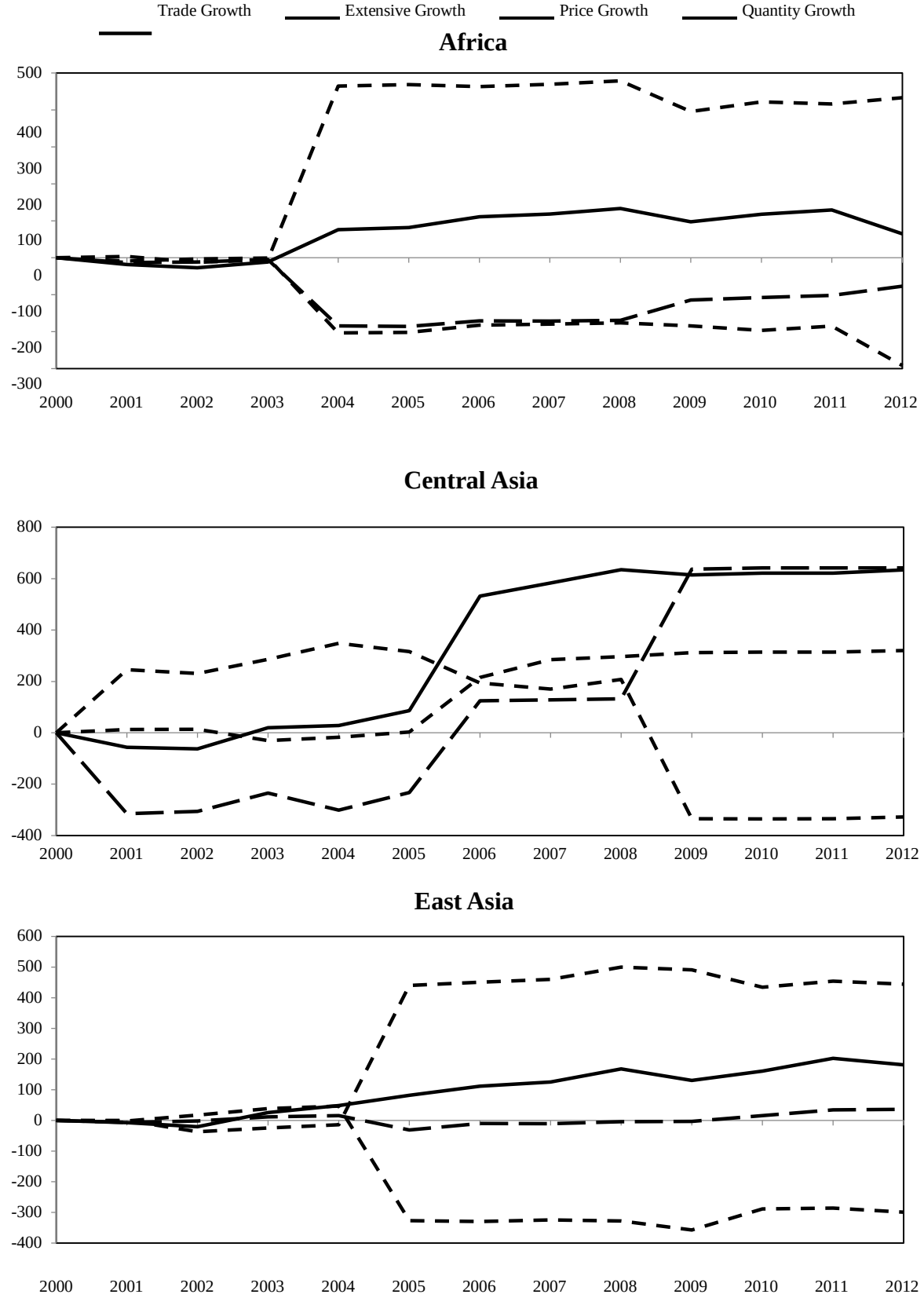
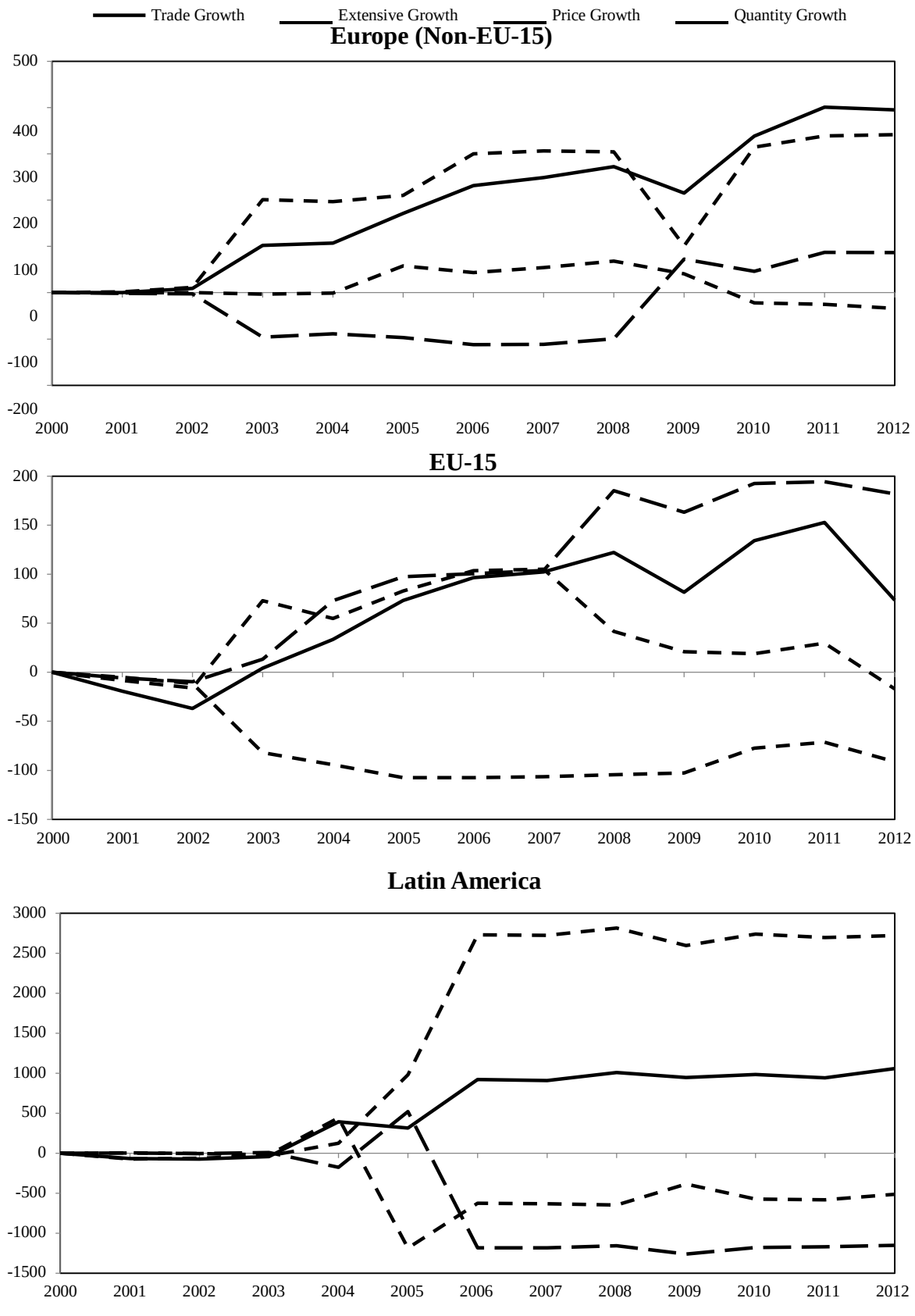
Appendix 1: List of Countries

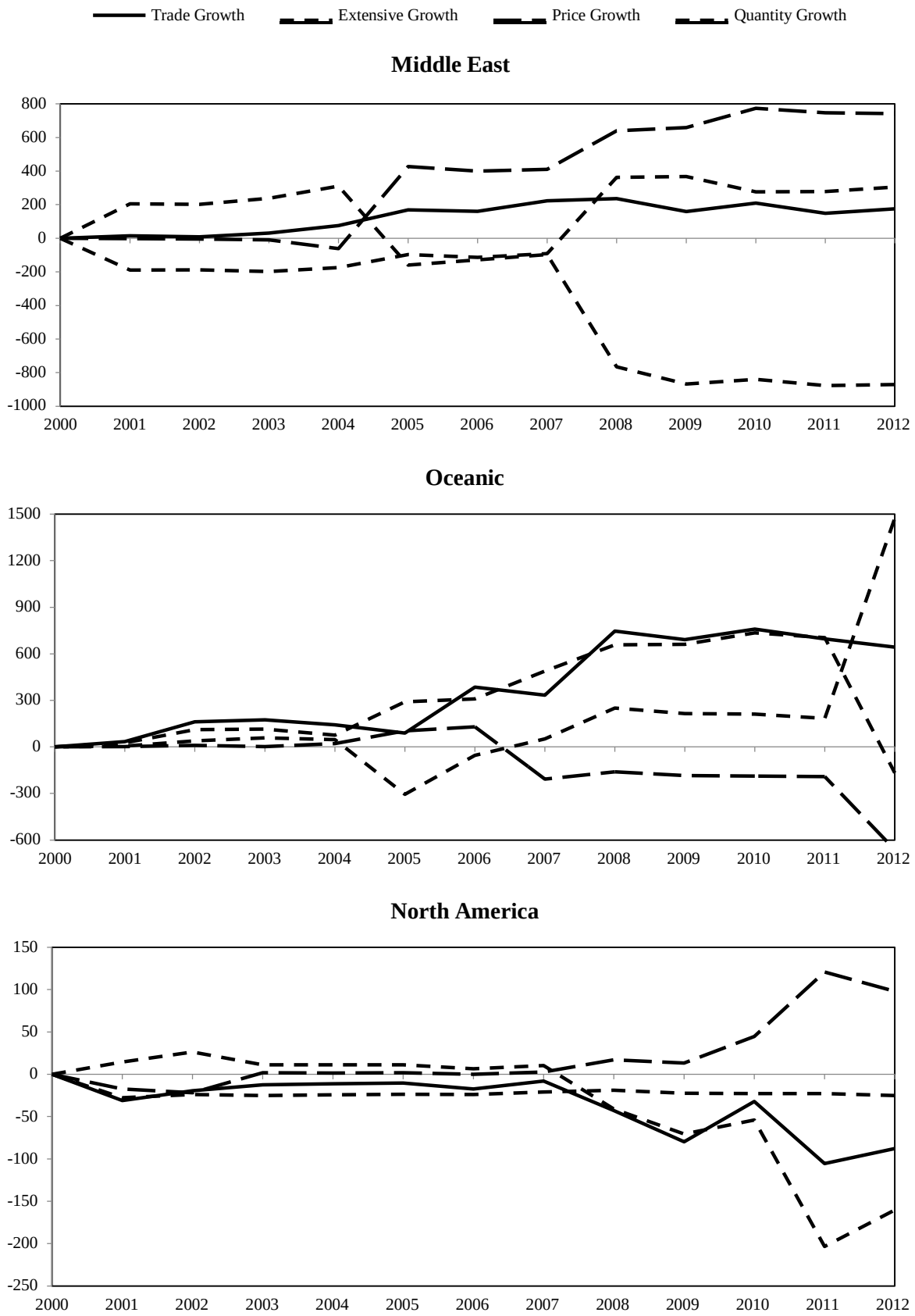
Country	Region	Country	Region
Algeria	Africa	India	East Asia
Benin	Africa	Indonesia	East Asia
Botswana	Africa	Japan	East Asia
Burkina Faso	Africa	Korea Republic	East Asia
Burundi	Africa	Macao	East Asia
Cameroon	Africa	Malaysia	East Asia
Cape Verde	Africa	Mongolia	East Asia
Central African Republic	Africa	Myanmar	East Asia
Comoros	Africa	Philippines	East Asia
Cote d'Ivoire	Africa	Singapore	East Asia
Djibouti	Africa	Thailand	East Asia
Egypt	Africa	Vietnam	East Asia
Eritrea	Africa	Austria	EU-15
Ethiopia	Africa	Belgium	EU-15
Gabon	Africa	Denmark	EU-15
Gambia	Africa	Finland	EU-15
Ghana	Africa	France	EU-15
Guinea	Africa	Germany	EU-15
Kenya	Africa	Greece	EU-15
Lesotho	Africa	Ireland	EU-15
Libya	Africa	Italy	EU-15
Madagascar	Africa	Luxembourg	EU-15
Malawi	Africa	Netherlands	EU-15
Mali	Africa	Portugal	EU-15
Mauritania	Africa	Spain	EU-15
Mauritius	Africa	Sweden	EU-15
Mayotte	Africa	UK	EU-15
Morocco	Africa	Czech Republic	Europe
Mozambique	Africa	Estonia	Europe
Namibia	Africa	Hungary	Europe
Niger	Africa	Iceland	Europe
Nigeria	Africa	Norway	Europe
Rwanda	Africa	Poland	Europe
Sao Tome and Principe	Africa	Slovak Republic	Europe
Senegal	Africa	Slovenia	Europe
Seychelles	Africa	Switzerland	Europe
Sierra Leone	Africa	Turkey	Europe
South Africa	Africa	Argentina	Latin America
Sudan	Africa	Bolivia	Latin America
Swaziland	Africa	Brazil	Latin America
Togo	Africa	Chile	Latin America
Tunisia	Africa	Colombia	Latin America
Uganda	Africa	Costa Rica	Latin America
Western Sahara	Africa	Cuba	Latin America
Zambia	Africa	Dominican Republic	Latin America
Zimbabwe	Africa	Ecuador	Latin America
Afghanistan	Central Asia	El Salvador	Latin America
Armenia	Central Asia	Guatemala	Latin America
Azerbaijan	Central Asia	Honduras	Latin America
Kazakhstan	Central Asia	Mexico	Latin America
Kyrgyzstan	Central Asia	Nicaragua	Latin America
Mongolia	Central Asia	Panama	Latin America
Pakistan	Central Asia	Paraguay	Latin America
Brunei Darussalam	East Asia	Peru	Latin America
Cambodia	East Asia	Uruguay	Latin America
China	East Asia	Venezuela	Latin America
Hong Kong	East Asia	Bahrain	Middle East
Jordan	Middle East	Syria	Middle East

Country	Region	Country	Region
Kuwait	Middle East	United Arab Emirates	Middle East
Lebanon	Middle East	Canada	North America
Oman	Middle East	United States	North America
Qatar	Middle East	Australia	Oceanic
Saudi Arabia	Middle East	New Zealand	Oceanic

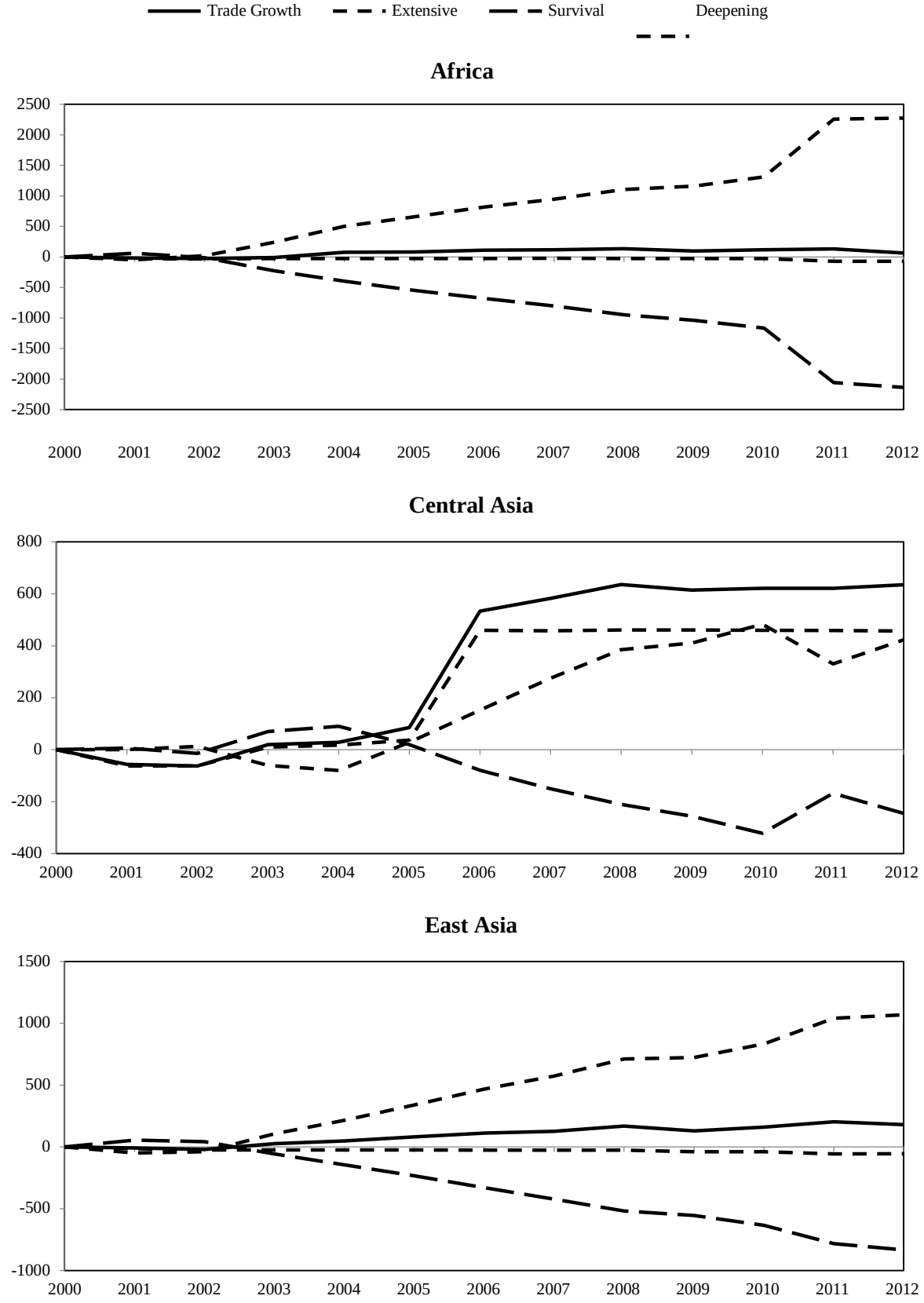
Appendix 2: Cumulative Decomposed Trade Growth (by Region) - Model I

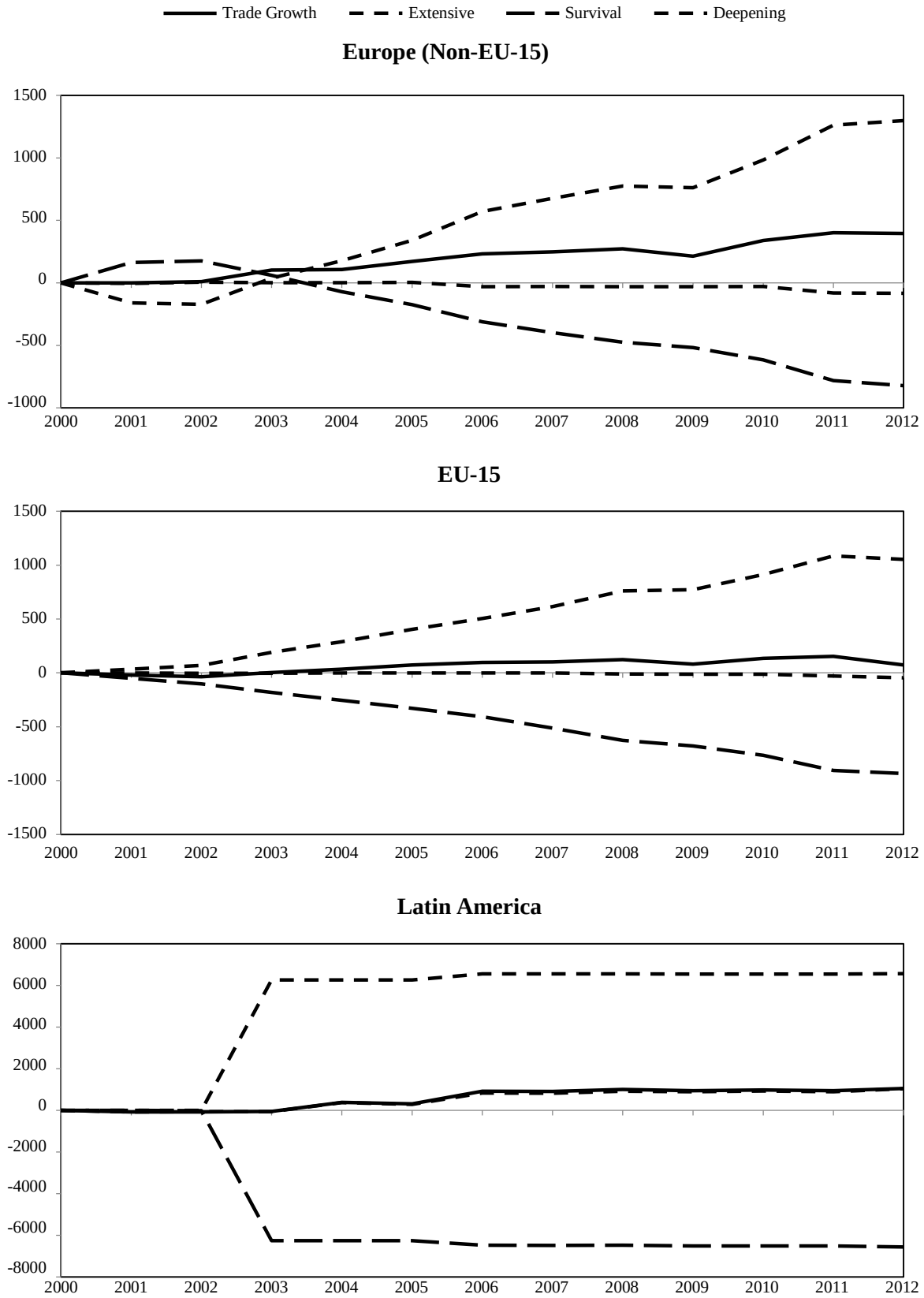


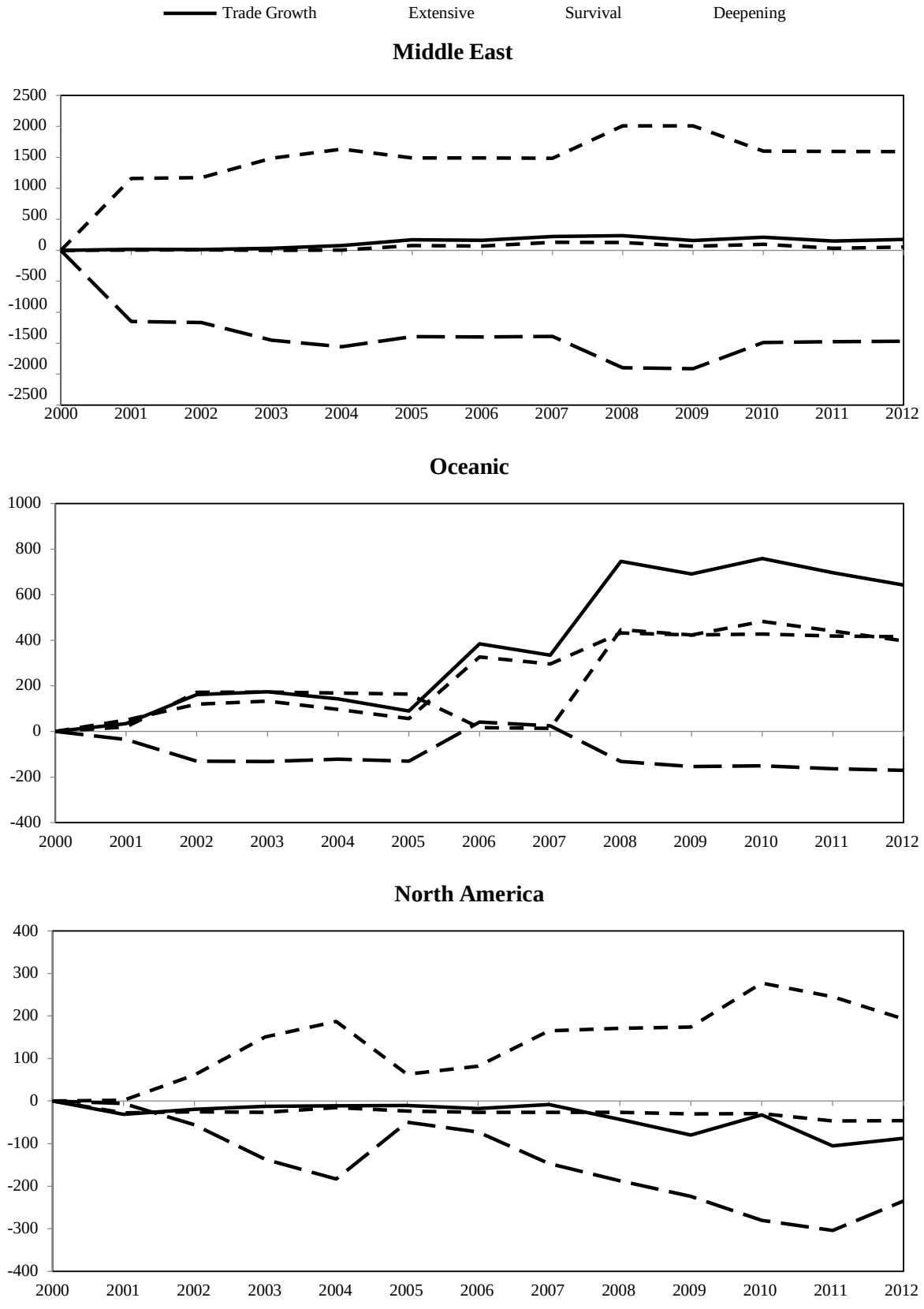

Trade Growth
Extensive Growth
Price Growth
Quantity Growth
Europe (Non-EU-15)
500
400
300
200
100
0
-100
-200
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EU-15
200
150
100
50
0
-50
-100
-150
Latin America
3000
2500
2000
1500
1000
500
0
-500
-1000
-1500


Trade Growth
Extensive Growth
Price Growth
Quantity Growth
Middle East
800
600
400
200
0
-200
-400
-600
-800
-1000
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Oceanic
1500
1200
900
600
300
0
-300
-600
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
North America
150
100
50
0
-50
-100
-150
-200
-250
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

Appendix 3: Cumulative Decomposed Trade Growth (by Region) - Model II




Trade Growth
Extensive
Survival
Deepening
Europe (Non-EU-15)
1500
1000
500
0
-500
-1000
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
EU-15
1500
1000
500
0
-500
-1000
-1500
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Latin America
8000
6000
4000
2000
0
-2000
-4000
-6000
-8000
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


Trade Growth
Extensive
Survival
Deepening
Middle East
2500
2000
1500
1000
500
0
-500
-1000
-1500
-2000
-2500
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Oceanic
1000
800
600
400
200
0
-200
-400
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
North America
400
300
200
100
0
-100
-200
-300
-400
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012