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The role of the extensive margin in export of Turkey: A comparative analysis



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ABSTRACT

We examine the role of extensive margin, in other words, new export products and destinations, on Turkish export performance between 1995 and 2013, in comparison with some other countries. We use two complementary methods together with several extensions taking into account critiques in the literature. Our results suggest that, Turkey was quite successful in extending its extensive margin compared to other developing countries. The growth of extensive margin mostly comes from entering into new markets. Nevertheless, the level of the extensive margin is still low as of 2013 compared to the other countries. Turkey still has important opportunities to increase its exports via extensive margin especially in products.

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1. Introduction

In recent decades the international flow of trade has grown to unprecedented levels. Since 1950, world trade has increased over 20-fold (by value), far exceeding the growth rate of population or of GDP.¹ Parallel to this, the world economy has witnessed the expansion of trade both in the number of exchanged varieties and the destinations, the so-called *extensive margins*.²

In this paper, we aim to analyze the extensive margin of Turkish exports in product and market aspects, between 1995 and 2013, in comparison with some other countries. The experience of Turkey in the last decades is interesting for studying extensive margin. First, Turkey joined the Customs Union with the European Union at the end of 1995, which led the country to enter, freely, into one of the

biggest markets in the world. Second, Turkey witnessed two major financial crises in 1994 and 2001, which caused export orientation in order to compensate the decline in the domestic demand. Furthermore, Turkey implemented a successful structural transformation program after the crisis of 2001 in order to boost productivity and competitiveness.³

We employ two complementary methods to analyze the extensive margin of Turkey. First, we decompose Turkish export growth between 1995 and 2013 into extensive and intensive margin growth by employing Bingzhan (2011)'s methodology together with several extensions. Then, we analyze the development of extensive margin over time by using Hummels and Klenow (2005)'s method. Our findings suggest that extensive margin growth has a significant impact on Turkish export growth especially when we consider product-country space. The growth of extensive margin is comparable to outperforming emerging markets, such as China and India. On the other hand, Turkey has still room to increase its exports via extensive margin both in product and country aspects, when the level of the extensive margin in 2013 compared to the other countries is taken into account. Hence, efforts to enter into new export markets should continue and be extended to include efforts to extend the product variety in exports.

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¹ For example, between 2005 and 2011, world merchandise trade has grown by 3.7% annually, while GDP has risen by 2.3%. See http://www.wto.org/english/res_e/statistics_e/its2012_e/its2012_e.pdf.

² For example, Hamano (2014) shows that from 1980 to 2000, the average number of items exported into and imported from the U.S. increased by 38.1% and 13.4%, respectively. Hamano (2014) studies the average growth of 4-digit Standard International Trade Classification (SITC) of exported and imported goods in U.S. bilateral trade with 15 OECD countries.

³ Following the 2001 recession, The Turkish economy grew at an average annual rate of 6.9% between 2002 and 2007. There were contractions in 2008 and 2009 due to the global crisis. After contracting by 4.8% in 2009, the Turkish economy rebounded quite rapidly and recorded a real growth of 9.2% in 2010 and 8.8% in 2011.

The paper proceeds as follows. In the next section, we define the concepts and summarize the literature. Section 3 introduces the methodology, and Section 4 introduces data with descriptive statistics. Section 5 presents the results of the analysis and Section 6 concludes.

2. Conceptual framework and brief literature

Export growth can come from two sources. Exports can increase due to, new goods exported or new countries destined as export markets or a combination of these, which is extensive margin. On the other hand, export growth can come from increasing exports of existing firms, goods and markets, which is referred as the intensive margin. Policymakers prefer export growth coming from the extensive margin in order to avoid possible risks on growth path from export prices or change in the composition of world import demand.

There is not a consensus on the sources of higher exports in trade literature.⁴ The Armington model assumes that all countries produce and export a single variety (Armington, 1969). Hence, exports can grow only by exporting more of the single export good, i.e. the intensive margin. On the other hand, the Krugman model assumes endogenous number of export varieties which is proportional to per capita GDP of the countries (Krugman, 1981). In addition, all countries export the same quantity per variety. As a result, all export growth comes from the extensive margin. The Melitz model with heterogeneous firms and fixed cost of exporting finds that only productive firms will export (Melitz, 2003). As firms become more productive, more firms will enter the export market. Hence, Melitz model has a room for extensive margin in export growth.

In recent years, there is a considerable literature on measuring the contributions of these margins and relating them to some economic variables. Building on Melitz's model with heterogeneous firms, Helpman et al. (2008) and Chaney (2008), among others, developed trade models that explicitly consider the decision to export and therefore explicitly model the extensive margin of trade. Felbermayr and Kohler (2006) find that GATT- or WTO-membership increases world trade via extensive margin. Markusen (2013) extends the gains from trade literature by including the gains via extensive margin explicitly. Brenton and Newfarmer (2007) examine the export performance of a list of developing countries and find that growth at the extensive margin has relatively little weight in export growth, while extensive margins in markets is higher than the one in products. Hummels and Klenow (2005) analyze a cross section of countries in 1995 and conclude that differences in exports between larger and smaller economies mainly come from the extensive margin. In this framework, export growth comes from the extensive margin if the share of country's basket of export goods in world's exports is increasing. Kehoe and Ruhl (2013) analyze several countries and argue that extensive margin is the leading factor in export growth of developing countries while there is no such observation for developed countries. Furthermore, they find that structural reforms and trade agreements have significant effects on the extensive margins whereas business cycles do not have such an effect. In country basis works, Amiti and Freund (2010) and Bingzhan (2011) decompose Chinese export growth and Berthelon (2011) decompose Chilean export growth into margins. Studies based on firm level data also use similar decomposition, such as Eaton et al. (2007) for Colombian firms.

In fact, we observe that the literature has expanded and has been developed together with methodological discussions. The analysis has been conducted in different methods for measuring margins and used alternative dimensions, which possibly explain the changing/conflicted findings. One method is directly

decomposing export growth due to existing, new and disappearing goods, where the contribution of existing goods are defined as intensive margin and the contribution of others are defined as extensive margin. Amiti and Freund (2010) and Berthelon (2011) use this method. Brenton and Newfarmer (2007) use a similar methodology for a list of developing countries but they extend the analysis to product-country space. Eaton et al. (2007) also apply a similar decomposition in their studies based on firm level data.

Another methodology to measure extensive margin is based on the literature on the variety of goods in trade, starting with Feenstra (1994). Hummels and Klenow (2005) adjust Feenstra (1994)'s product variety definition in order to get extensive and intensive margin definitions. They define extensive margin as the ratio of total worldwide exports of a country's export basket to the total worldwide exports and intensive margin as the share of a country's exports to the worldwide exports in the country's export basket.

Kehoe and Ruhl (2013) criticize the definition of new good as the goods that were not exported at all in the beginning of the analysis period. Instead, they argue that goods that are exported with very small amounts should not be considered as export goods. They introduce the evolution of the exports of initially least traded goods as an indicator of extensive margin. They argue that such an indicator might capture the effect of structural changes or trade agreements on the evolution of the extensive margin.

Besedes and Prusa (2011) criticize the decomposition methodologies that use a static framework and compare two points in time. Static approaches define the goods that are exported at the end of the sample period but not exported at the beginning, as new goods. This way of defining ignores the dynamics between these two points. Indeed, some of the new goods would be considered as traditional export goods or some traditional export goods would be considered as new goods if sample period changes slightly. They propose an alternative way of decomposing export growth which takes the survival rate of export relationship into account. In addition, Besedes and Prusa (2011), like Evenett and Venables (2002), use the broadest definition of extensive margin by using product-country export lines as unit of analysis. In this definition, exports of traditional products to new markets or new products to traditional export markets are considered to be extensive margin.⁵

There are very few studies on Turkey in extensive and intensive margin framework. Üngör (2011) follows Kehoe and Ruhl (2013) and analyzes the evolution of the share of the least traded goods in Turkish exports and imports to/from the World and China between 1985 and 2003. Aldan and Çulha (2012) apply the same methodology and extend it to product-country space and for Turkish exports to EU and MENA regions, as well as to the world, and find significant effect of the extensive margin on export growth for 1993–2011 period. This study is extended by Aldan and Çulha (2013) by employing Hummels and Klenow (2005)'s methodology and find that the extensive margin of Turkey increased faster compared to other developing countries. Ekmen-Özçelik and Erat (2013) evaluate the margins role in Turkey's export to EU-15 for the 1996–2006 period by using several methods including Hummels and Klenow (2005). Türkcan and Pişkin (2014) examine the sources of export growth in Turkey over the period 1998–2011 in margins framework by applying the Bingzhan (2011)'s method derived from Hummels and Klenow (2005). These last two studies find limited contribution of extensive margin to Turkey's export growth.

⁴ See Hummels and Klenow (2005) and the references therein for a comprehensive discussion on the sources of export growth in different trade models.

⁵ See, also, Hillberry and McDaniel (2002), Eaton et al. (2004), Dennis and Shepherd (2007), Berthou and Fontagné (2008), Helpman et al. (2008), Hillberry and Hummels (2008), and the references therein for alternative definitions of the extensive margin based on different levels of aggregations.

3. Methodology

We analyze the role of extensive margin in export growth of Turkey in two stages. First, we decompose the export growth rates of Turkey and the comparison countries into the contributions of margins i.e. extensive and intensive margins, following Bingzhan (2011)'s methodology. We extend the method into product-country space and show that extensive margin is indeed important in Turkish export growth once new markets are taken into account. At the second stage we calculate the extensive margins of same countries over time, following Hummels and Klenow (2005)'s decomposition methodology.

Hummels and Klenow (2005) decompose the share of a country's exports in the world exports into the extensive and intensive margins.⁶ The extensive margin is the share of country's basket of export goods in world's export basket, whereas the intensive margin is the share of country's exports in world's exports in country's basket of export goods. Formally, extensive (EM) and intensive (IM) margins of a country can be formulated as;

$$EM = \frac{\sum_{i \in I^c} x_i^w}{\sum_{i \in I^w} x_i^w}, \quad (1)$$

$$IM = \frac{\sum_{i \in I^c} x_i^c}{\sum_{i \in I^c} x_i^w}, \quad (2)$$

where the value of country c 's and world's exports are denoted by x_i^c and x_i^w , respectively. I^c is the set of goods exported by country c while the set I^w contains all goods that are exported in the world. Therefore, I^c is a subset of I^w and both EM and IM figures lie between 0 and 1. High extensive margin means exporting more varieties of products. In this framework, the share of a country's exports in world's total export is the product of extensive and intensive margins. Eqs. (1) and (2) can be used to compare countries' extensive and intensive margins for a given year. In addition, time path of extensive margin is quite informative: fast growing extensive margin means success of exporting new products. Such a time series indicator might be informative on the response of extensive margin to structural reforms, global conditions or trade agreements comparable to the least exported goods indicator of Kehoe and Ruhl (2013).

Our second methodology is in line with the method of Bingzhan (2011). He uses Hummels and Klenow's methodology, but he decomposes the trade growth rates instead of export shares. To do this, he defines an export ratio between two periods (exports in period $t + s$ divided by exports in period t) as a product of extensive and intensive margin using the formula.⁷

$$R = \frac{\sum_{i \in I_{t+1}^c} x_{it+1}^c}{\sum_{i \in I_t^c} x_{it}^c} = \left(\frac{\sum_{i \in I_{t+1}^c} x_{it+1}^c / \sum_{i \in I_t^c} x_{it}^c}{\sum_{i \in I_t^c} x_{it}^c} \right) \times \frac{\sum_{i \in I_{t+1}^c} x_{it+1}^c}{\sum_{i \in I_t^c} x_{it}^c} \quad (3)$$

Extensive margin Intensive margin

where I^c is the basket of goods exported in both periods. Part in the parenthesis gives the contribution of extensive margin to the export growth. Taking the logarithm of Eq. (3) we can express

growth rate of exports as a sum of growth rate of extensive and intensive margin. That is

$$g_R = g_{EM} + g_{IM} \quad (4)$$

The measures of extensive and intensive margins and their contributions to export growth might be sensitive to several definitions. First, one should make a choice on the set of I^c , the export basket of country c . In Hummels and Klenow (2005), I^c is the set of goods that has a positive export record. However, they admit that a country exporting tiny amounts of many goods might misleadingly have a high extensive margin. As a solution, Evenett and Venables (2002) classify a good with export value below 50,000 dollars as non-traded. However, Kehoe and Ruhl (2013) argue that such fixed thresholds might be misleading due to different sizes of economies. They suggest excluding the least traded goods from I^c . They sort goods according to export values in the beginning and form 10 sets of goods which account for 10 percent of total exports. The value of the export of the good with highest exports in the first quintile (i.e., in the least exported goods) gives the threshold value in choosing the set I^c . The advantage of this method is that it allows threshold values vary across countries. In this framework, in both stages we calculate the margins by taking into account the threshold of least traded goods as well.

Second, the measures of extensive and intensive margin are heavily dependent on the unit of analysis. In the analysis based on products as unit of measurement, only new export products are taken into account as the extensive margin. In this narrow definition, the effect of exporting a traditional product to a new market is considered as intensive margin. On the other hand, if the analysis is extended to product-country space as in Besedes and Prusa (2011), such an entry will be counted as extensive margin. We conduct our analysis both on product and product-country spaces. This approach enables us to compare the sources of extensive margin, i.e., whether it comes from new products or new markets for traditional products.

4. Data and descriptive statistics

We use annual export data from BACI at six-digit level, covering the period of 1995–2013 and compare the results for Turkey with those for several countries.⁸ First, we compare the results for Turkey with the U.S. (the largest economy in the world) and China (the biggest exporter in the world). The U.S. is the largest economy in the world with around US\$16.8 trillion as of 2013; and China is the second largest economy in the world with around US\$9.2 trillion as of 2013.⁹ Moreover, China is the biggest exporter in the world (2.2 billion \$) followed by the US (1.6 billion \$).¹⁰ Hence, US and China can be considered to be frontier in the variety of export products and/or markets. In addition, we compare Turkey with successful countries in terms of GDP and export growth such as Czech Republic, India, Korea and Mexico in order to have a geographically dispersed comparison group.

Table 1 presents information for GDP, per capita GDP and manufacturing exports of Turkey to the world in comparison with some countries. Except for the U.S., export growth in manufacturing in all countries between 1995 and 2013 was higher than the world average, most significantly in China, India, Czech Republic and Turkey. Except for Mexico and US, all countries performed better than the world average in terms of per capita GDP growth.

⁶ In fact, they also decompose intensive margin into price and quantity margins which is now out of focus of this study.

⁷ See Bingzhan (2011) and Türkcan and Pişkin (2014) for a detailed discussion of the methodology.

⁸ BACI provides bilateral values and quantities of exports at the HS 6-digit product disaggregation, for more than 200 countries since 1995. For more detailed information about database see Gaulier and Zignago (2010).

⁹ The World Bank, World Development Indicators Database (online access).

¹⁰ The World Trade Organization, International Trade Statistics 2012.

Table 1
Selected indicators.

	GDP (billion USD, current prices)			GDP per capita (USD, in 2000 prices)			Manufacturing exports (billion USD)		
	1995	2013	Change (%)	1995	2013	Change (%)	1995	2013	Change (%)
United States	7664.1	16768.1	118.8	35116.6	45710.3	30.2	584.7	1579.6	170.1
Turkey	169.5	822.1	385.1	5417.0	8722.9	61.0	21.6	151.8	601.5
China	728.0	9240.3	1169.3	777.3	3583.4	361.0	148.8	2209.0	1384.7
Czech Republic	59.5	208.8	250.7	9944.0	14647.5	47.3	21.3	161.5	657.0
India	366.6	1875.1	411.5	469.5	1189.8	153.4	30.6	313.2	922.6
Korea, Rep.	559.3	1304.6	133.2	12270.8	23892.5	94.7	125.1	559.6	347.5
Mexico	343.8	1260.9	266.8	6531.9	8519.0	30.4	79.5	380.2	378.0
World	30592.5	75621.9	147.2	6044.2	7933.8	31.3	5205.6	18946.9	264.0

Source: World bank, World Trade Organization.

Table 2 displays the number of export products and product-country export lines in 1995 and 2013. All countries export most of the products traded in the world both in 1995 and 2013. Turkey has the lowest number of products in 1995 but it caught up with other countries in 2013. In the case of product-country pairs, the differences between countries are more significant. In 1995, Turkey exported in 54,147 export lines (ranked 6th among 7 countries), quite small compared to the U.S. with 257,368 lines. In 2013, all countries increased the number of export lines and Turkey is one of the most successful countries after China and India. In sum, the number of products and product-country pairs exported provides evidence for Turkey's relative success in the extensive margin of export growth.

5. Results

5.1. Decomposition of Turkish exports

In this section we decompose Turkish export growth between 1995 and 2013 into extensive and intensive margin growth following Bingzhan (2011). We first decompose Turkish export growth in product level and present the results in Table 3. In the upper panel, every product that has a positive export is considered to be an export good; i.e. there is no threshold. In the lower panel, least exported products which constitute 10% of exports in the first three years of analysis (1995–1997) are not considered to be export goods; i.e. there is a 10% threshold as in Kehoe and Ruhl (2013). Without threshold only 0.1 percentage point of 10.9 annual growth rate of exports is due to extensive margin growth and almost all export growth comes from intensive margin, which is in line with Türkcan and Pişkin (2014)'s results. We obtain similar results for other countries as well. On the other hand, results with threshold reveal that extensive margin growth has relatively considerable effect on export growth of Turkey; almost one fifth of export growth (2.1 percentage points of 11.4 percent) comes from extensive margin. The growth rate of extensive margin is highest in Turkey amongst comparison countries, followed by India and China.

Table 2
Number of products and product-country pairs exported.

	Products		Product-country pairs	
	1995	2013	1995	2013
China	4810	4748	146,460	409,067
Korea	4517	4454	94,109	149,285
Turkey	4112	4420	54,147	180,597
India	4538	4569	84,025	211,719
Czech Rep.	4558	4434	59,663	112,141
USA	4897	4739	257,368	332,930
Mexico	4490	4279	46,033	83,838
World	4902	4864	609,250	696,644

Source: UN COMTRADE, Authors' calculations.

Next we repeat the decomposition exercise in product-country level and present the results in Table 4. As expected, extensive margin growth is larger compared to product level analysis since export of traditional export products to new markets are considered as extensive margin. Turkey's extensive margin growth is higher than comparison countries except for India in the analysis without threshold. In the analysis with 10% threshold, Turkey's extensive margin is highest, followed by India and China and almost 40 percent of Turkey's export growth (4.4 percentage points of 11.1 percent) comes from the extensive margin.

In sum, extensive margin has considerable contribution to export growth while main source of export growth seems intensive margin, when only exported products are considered and small amounts of exports are excluded. However, effect of extensive margin growth is noticeably higher when entry into new markets is also taken into account. Anyway, Turkey's extensive margin growth is larger than the comparison group of countries. As a result, this finding deviates fairly from the results of the previous studies on Turkey highlighting the role of intensive margin more.

5.2. Development of extensive margin

In this section we analyze the development of extensive margin in Hummels and Klenow (2005) framework. Comparison of extensive margin developments over time among the countries is presented in Figs. 1 and 2, both in product and product-country space. Upper graphs show country's export variety relative to the world's export variety as defined in Hummels and Klenow (2005) including all product/product-country pairs with positive export values (without threshold), while lower ones exclude initially least exported products/product-country in the definition of exported goods (with 10% threshold).

Upper panel of Fig. 1 reveals that Turkey and all countries in the comparison group have extensive margin values close to 1 in all years (Fig. 1a). That is, all these countries seem to export almost all varieties traded in the world at least in tiny amounts. Hence, there is a very limited room to increase the product variety and this explains almost zero contribution of extensive margin in export growth in the decomposition exercise in Section 5.1 and in Türkcan and Pişkin (2014), Ekmen-Özçelik and Erilat (2013). When applied a %10 threshold, there is an increase in extensive margin in all countries. Turkey is one of the most successful countries in expanding its export product variety with China while her extensive margin was lowest in 1995 with the value of 0.38. Extensive margin of Turkey increased very fast between 1997 and 1999, which might be a result of Customs Union agreement.¹¹ After the

¹¹ In a similar fashion, jump in China's extensive margin after 2002 might be a result of its membership in World Trade Organization. See Utar (2013) for a detailed analysis of China's trade opening process.

Table 3

Decomposition of export growth in product space, 1995–2013.

	Turkey	China	Korea	USA	India	Czech Rep.	Mexico
<i>No threshold</i>							
Annual growth rate	10.9	13.5	8.5	5.6	12.5	11.0	8.7
Extensive margin growth rate	0.1	0.0	0.0	0.1	0.3	−0.1	0.0
Intensive margin growth rate	10.8	13.4	8.6	5.6	12.2	11.1	8.8
<i>%10 Threshold</i>							
Annual growth rate	11.4	14.1	9.0	6.1	13.1	11.6	9.3
Extensive margin growth rate	2.1	1.5	0.5	0.4	1.7	0.7	0.9
Intensive margin growth rate	9.3	12.5	8.6	5.7	11.3	10.9	8.3

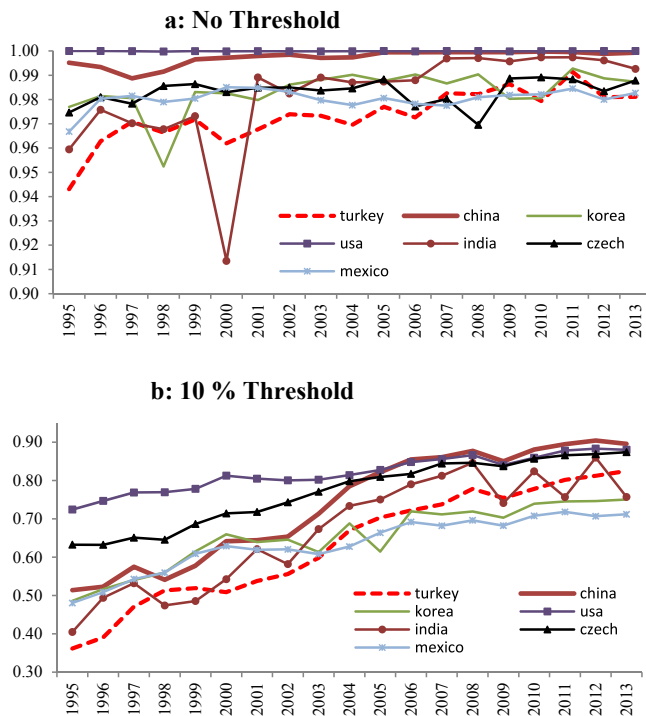
Notes: Annual growth rate, extensive margin and intensive margin growth rate are calculated using Eq. (4).

Table 4

Decomposition of export growth in product-country space, 1995–2013.

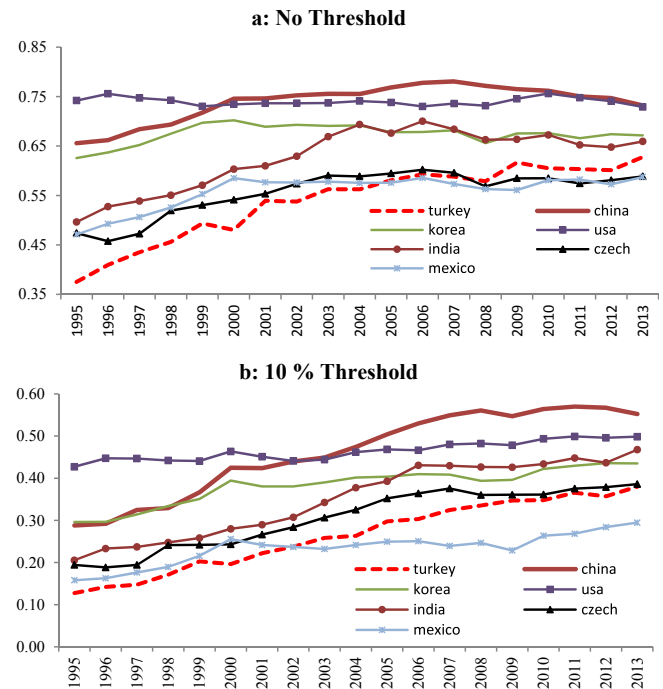
	Turkey	China	Korea	USA	India	Czech Rep.	Mexico
<i>No threshold</i>							
Annual growth rate	10.9	13.5	8.5	5.6	12.5	11.0	8.7
Extensive margin growth rate	2.2	0.8	0.4	0.6	2.2	0.4	−0.1
Intensive margin growth rate	8.7	12.7	8.2	5.1	10.3	10.7	8.8
<i>%10 Threshold</i>							
Annual growth rate	11.1	13.9	8.9	6.0	12.9	11.4	9.1
Extensive margin growth rate	4.4	3.1	0.8	0.9	3.7	2.2	0.9
Intensive margin growth rate	6.8	10.7	8.1	5.1	9.2	9.3	8.2

Notes: Annual growth rate, extensive margin and intensive margin growth rate are calculated using Eq. (4).

**Fig. 1.** Extensive margin in product line.

slowdown in 1999 and 2000, extensive margin increased steadily except for 2009, which follows the global financial turmoil. As a result, Turkey's extensive margin increased to 0.82 in 2013 and is higher than the extensive margin of Mexico, India and Korea.

In product-country space without threshold, presented in Fig. 2, Turkey's extensive margin seems increased very fast between 1995 and 2002 except for 2000 and then increased at a slower pace (Fig. 2a). However, Turkey has been generally successful in increasing extensive margin and caught up with Mexico and Czech

**Fig. 2.** Extensive margins in product-country line.

Republic. In case of 10% threshold, Turkey is one of the most successful countries in extensive margin growth together with India and China (Fig. 2b).

In sum, looking at development of extensive margins over time, we find that Turkey is quite successful in expanding its export products/markets compared to other countries with successful export growth. The only exception is the extensive margin at product level with no threshold since Turkey always exports almost all product varieties traded in the world in the whole period even in tiny amounts and hence there is no room to increase the product variety in exports.

6. Concluding remarks

Export diversification is perceived to be crucial in maintaining export growth and reducing external demand risks in many developing countries and Turkey is no exception. In this paper, we analyzed one aspect of export diversification, namely extensive margin. We applied Bingzhan (2011) and Hummels and Klenow (2005) methods to Turkey with some adjustments and extensions. In addition, we compared Turkey with similar countries whose export performance is better than the world average.

Our results suggest that extensive margin has been playing an important role in understanding the export growth in Turkey. This role, mainly, comes from (i) products that were initially exported at tiny amounts and (ii) the entrance to new markets. The level of extensive margin reveals that Turkey exports almost all kinds of products/goods that are traded worldwide. In what follows, we argue that there is no room to increase exports via exporting totally new products. Having said that, extensive margin can help Turkish export growth in accelerating the exports of the goods that have (almost) negligible export values (in total exports). In addition, entering new markets and expanding the set of countries as export destinations would be the gains of extensive margin in Turkey's trade structure.

We argue that the results of this paper provide a productive research area for future studies. For example, one can study the relation between policies and the increase in the extensive margin in Turkish exports. In addition, further research may focus on survival in export markets following Besedes and Prusa (2011) which will complement the research on extensive and intensive margins.

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