The Regional Dimension of Productivity and Exports in Turkey: Evidence from Firm-Level Data

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Abstract

This paper examines the productivity and export performance of new growth centers in Turkey, the so-called Anatolian Tigers, relative to the more traditional industrial centers over the period 2006-2010. We find that while the traditional centers still have higher productivity, there is substantial catch up by the Anatolian Tigers. The productivity differential between the traditional and new growth centers is smaller in manufacturing and larger in non-manufacturing industries. The share of very small firms is higher in the Tigers, and that accounts for some of the gap in productivity, since productivity increases with size in both regions. Measures of R%D expenditures and investments in knowledge-based capital are higher in the West compared to the Tigers. The share of Tigers in total exports has increased over time. Overall, standard measures of export sophistication and quality seem to be higher in the West.

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1. Introduction

Turkey has been one of the faster growing middle income countries in the last decade. An important characteristic of this growth performance is that growth in aggregate labor productivity has been quite high both in comparison to Turkey's performance in earlier decades and in international comparison. Initial assessment with sectoral national income data suggests that a major component of this growth has been due to reallocation of labor from low productivity agriculture to higher productivity industry and services (Atiyas and Bakis, 2013a, 2013b).

There is also quite a bit of anecdotal evidence that suggests another important dimension of growth in the last decade: The emergence of new growth centers in the Anatolian peninsula alongside the more traditional industrial provinces such as Istanbul, Izmir, Kocaeli, and Ankara. These growth centers, also dubbed Anatolian Tigers (AT), have attracted not only domestic but international attention.[2] For example, in explaining Recent economic success of Turkey, Acemoglu and Robinson (2013) state: "One hypothesis — which of course needs to be investigated more systematically — is that the beginning of the AKP[3] government saw an opening of economic opportunities to 'Anatolian tigers,' Anatolian entrepreneurs and would-be entrepreneurs, unparalleled at least since the DP's[4] first term." Turkish Political scientists argue that these provinces represent the newly emerging "Islamic Calvinists" or the "devout bourgeoisie" that forms the main constituency of the Justice and Development Party, which has been the governing party since 2002.[5] It is generally claimed that these new growth centers have not only increased their share in domestic economic activity but also have taken a more active role in exports. In particular, it has been asserted that firms in new growth centers have played a role in diversifying Turkey's exports away from the European Union (EU) towards the Middle East and Africa.[6] Indeed, aggregate trade statistics show that while the trade share of the EU with Turkey has been decreasing, that of the Middle East and North Africa (MENA) has been increasing in recent years.

However hard evidence about the recent economic performance of these new growth centers is hard to come by. In fact, one study that was published in 1999 concluded that the Tiger provinces "did not do as well the rest of the country in improving labor productivity" and that "the provinces grouped under the AT banner are not likely to serve as preferred locations for an export oriented development strategy sustained by low wages." (Filiztekin and Tunali, 1999).

In this paper we examine aspects of the economic performance of new growth centers relative to the traditional centers using enterprise level data over the period 2006-2010. We use province-level aggregate data published by the Statistical Office of Turkey, namely per-capita value added in 2004 and

[2] For example "Anatolian Tigers: regions prove plentiful" Financial Times, November 20, 2006, European Stability Initiative (2005) and The Economist "Turkey and Africa: Ottoman dreaming", March 25, 2010.
[3] AKP: Justice and Development Party.
[4] DP: Democrat Party, which won landslide elections during the 1950s.
[5] For example, Müftüler-Bac and Keyman (2012).
[6] The Economist, *ibid.,* Özkan and Akgün (2010).

employment growth in 2004-2012 -and a bit of judgment- to classify observations into three regions: The first entails the traditional growth centers which we call the West. The second group consists of the Anatolian Tigers (Tiger for short), identified as regions that start with lower (relative to the West) value added in 2004 but exhibit high employment growth between 2004-2012. The third group consists of the remaining regions, called Others. In most cases we will be mainly concerned with a comparison of West vs. Tigers, though data for Others will also be presented for the sake of completeness. We analyze composition of economic activity, productivity, productivity growth and its components, as well as aspects of export performance.

The paper is organized as follows: The next section describes the data. Section 3 provides empirical results. Section 4 concludes.

2. The data

The micro-level data used in this paper come from three data sets: The Annual Industry and Service Statistics (AISS, 2003-2010), Foreign Trade Statistics (FT, 2002-2012) and the Research and Development Activities of Industry and Service Establishments (R&D, 2003-2010). All data sets have some information on classification in terms of economic activity, however only the AISS data set has information on location and age. Hence the analysis of a regional dimension of foreign trade or R&D requires merging the relevant data sets with the AISS. Information on the micro data sets are provided below.

The Annual Industry and Services Statistics

The AISS dataset contains all firms with 20 or more employees (and all firms in industries where the number of firms according to the 4-digit NACE rev.2 definition is less than 100). For firms with 1-19 employees, the data set contains samples with sampling weights. All firms have unique ID codes and the 20+ can be followed over time through these codes. The data set contains information on, among other variables, sales, employment, value added, investment, and payments to workers and the age of firms. Unfortunately there are no data on physical capital stocks. With respect to knowledge-based capital,[7] the AISS data set contains expenditures on software and rights (patents, trademarks, licenses and other intangibles), as well as R&D expenditures.[8] Location information is provided at NUTS2 level. The data set also contains information on the employment and sales of all *plants* owned by the 20+ firms.

One problem with the AISS data set is that the classification of sectors has changed in 2010 from NACE Rev. 1 to NACE Rev. 2. Concordance between the two versions even at the two digit level has proven impossible. This means that any information that requires calculations at the subsector level cannot be consistently gathered before and after 2009.

Almost all sectors are covered. The sectors that are not covered are (under the NACE Rev.2 classification) "agriculture, forestry and fishing", "financial and insurance activities", "public

[7] See Corrado et. al. 2005 and 2009; see Dutz et. al. (2012) for an application to Brazil.
[8] However, TurkStat officials point out that information on R&D expenditures in the AISS data set is less reliable than that provided in the R&D data set discussed below.

administration and defense", "activities of extraterritorial organizations and bodies", "activities of households as employers; services-producing activities of households for own use". Also some divisions in some sectors are not covered, these are: i) a division of J - “Programming and broadcasting activities” in Information and communication activities; ii) two classes of L - “Buying and selling of own real estate” and “Renting and operating of own or leased real estate” in the Real estate activities; and, iii) a division of S - “Activities of membership organizations” in Other service activities.

Table 1 lists the number of observations with at least 20 employees in the AISS dataset. Nt, Nc, Ne and Nx stand for number of total, continuing, entering and exiting firms, respectively. The definitions are as follows:

Nc(t) = firms that are present in the data at date (t-1) and are also present at date t.

Nx(t) = Firms that are present at t and not at (t+1)

Ne(t) = Firms that entered the data set at t (present at date t but not at date t-1).

Note also that Nt(t) = Nc(t) + Ne(t) and Nt(t)= Nc(t+1) + Nx(t).

Obviously entry here means entering the data set. This could happen when a new firm comes into existence and has 20+ employees, or when a firm with less than 20 employees grows to have 20+ employees. It is also possible that a firm with 20+ employees has been in existence before getting captured by the survey for the first time. Table 1 shows that in two occasions, 2005 and 2010, the number of new entrants is extremely large, suggesting that 20+ firms that were already in the market may have been caught for the first time.

For 2010, an additional explanation of large entry turns out to be that a tax pardon encouraged firms that were inactive to become active again. In any case, the larger than usual amount of entry affects calculations of productivity and productivity growth, between 2009 and 2010. Labor productivity growth between 2009-2010 calculated from national income and employment statistics is positive. However, aggregate labor productivity growth between 2009-2010 calculated from the AISS data set is negative. When the same is calculated shutting new entrants out, it becomes positive. This probably reflects that the productivity of many of the new firms included in the survey in 2010 is lower than average productivity of incumbent firms.

There is also a discrepancy between 2004-05 aggregate labor productivity calculated from national income and microdata. In the microdata aggregate productivity growth between 2004-2005 is of the order of minus 15-20 percent, whereas in the national accounts it is positive. While inclusion of a large number of new firms in the survey in 2005 may partly explain this finding, the problem seems deeper in that when the data set is restricted to firms that are already in the data set in 2003, 2004-05 aggregate labor productivity growth is still negative. We could not come up with a good explanation for this and have finally decided to exclude the years 2003-2005 from the analysis.

Depending on the purpose or the topic, results presented in the paper will be based either on observations with at least 20 employees, or on all observations. In the latter case, statistics will be

calculated using sampling weights. For example, entry and exit variables will be calculated on the basis of 20+ observations. We will call this "the 20+ data set." By contrast, statistics related to the size distribution of firms will be based on the whole data set, including the sample of firms with less than 20 employees. We will call this "the full data set." In both cases observations where the absolute deviations of labor productivity from the mean of that year are larger than 2 times the standard deviation of labor productivity in that year are deleted from the data set. For the 20+ data set, trimming results in losing about 200-400 observations per year, adding to about 3000 observations in total, out of about 329 thousand observations. For the full data set, trimming results in losing a total of about 1800 observations, out of a total of about 675 thousand observations.

Foreign Trade Statistics (FT)

The FT data set covers all export and import transactions by all firms in Turkey over the period 2002-2012. The data are collected by the Turkish Customs Authority and processed by TurkStat. The data set has export and import transaction information at the level of firm, product and origin/destination. The product codes are 12 digit- the first 8 of which correspond to the Combined Nomenclature classification, and the last 4 digits are national.

The FT data set does not contain data on firm location, which exists in the AISS data set. Hence to generate information on the regional dimension of exports, the two data sets need to be merged. The match between the two data sets is not perfect, because while the FT data set covers all firms that have export and import transactions, the AISS covers only a sample of firms with less than 20 employees. Table 2 shows that after the match the microdata underestimate the share of the West in total exports: for example, for the year 2006, the share of the West in the microdata is 85 percent, while the share of the West in the aggregate data is 90 percent. The decline in the share of the West and the increase in the share of the Tigers are of similar orders of magnitudes in the two data sets. We also note that total exports in the matched data amounts to 83 percent of total exports in FT (2010). This is a reasonably high number. Still, to the extent that matched vs. unmatched observations are not randomly selected, there may be some bias in the statistics reported below.

Research and Development Activities Survey

The Research and Development Activities Survey (R&DAS) contains information on Research and Development (R&D) expenditures and R&D personnel. The data set also contains information on the sectoral classification (NACE). It covers all government bodies and public and private universities. For the business enterprises sector, the following enterprises are covered according to the survey frame: Enterprises funded by government agencies that provide R&D support, the top 500 enterprises in industry and services sectors by turnover and value added, enterprises in Technology Development Zones and Technoparks, enterprises benefiting from the insurance Premium support (article 3/3) stated in the Law on Supporting Research and Development, no.5746 and enterprises which are known as R&D performers from the AISS survey.[9] This data set can be merged with the AISS data set through firm ID

[9] Metadata information on TurkStat website.

codes.[10] The R&DAS data set contains about 15 thousand observation over the period 2003-2010. The merging operation results in about 9000 matches. For the rest of the observations in AISS, we assume that R&D expenditures are zero.

Classification of regions

In order to classify regions we have followed an approach which is similar in spirit to that in Gönenc et. al. (2012). In the 2000s, TurkStat has not been regularly publishing GDP on a province or regional basis. It has published value added on the basis of the NUTS2 sub-regional classification for the years 2004-2008. Employment at the sub-regional level is also available. We have identified the "West" region basically by including all those sub-regions with the highest per capita value added in 2004. In Figure 1 this includes all the sub-regions with per-capita value added relative to Istanbul in 2004 (measured on the x-axis) 60 percent or higher. We have added two NUTS sub-regions to this set. The first is the sub-region that contains Adana, which has historically been an internationally connected city and which was one of the first cities to witness private sector based industrialization in the 1950s.[11] The second is Zonguldak, which has been home to major coal mines since the 19th century. Following Gönenc et. al., we designated as members of the Anatolian Tigers region (henceforth simply Tigers) those sub-regions with mid-level per capita value added in 2004 and relatively high employment growth between 2004 and 2012 (measured on the y-axis in Figure 1). So the West region consists of the sub-regions of Adana, Ankara, Antalya, Aydin, Balikesir, Bursa, Istanbul, Izmir, Kocaeli, Tekirdag and Zonguldak. The Tigers region consists of Gaziantep, Hatay, Kayseri, Kastamonu, Kirsehir, Konya, Malatya and Van. The rest of the NUTS2 sub-regions are classified as Other, including the sub-regions with the lowest per capita value added in 2004 and/or the lowest employment growth between 2004-2012.

The fact that due to data constraints this classification needs to be done on the basis of NUTS2 sub-regions does impose some limitations. This is illustrated by the cases of the provinces of Aydin and Denizli. Aydin has been a historically rich province and would normally be included among the West region, whereas Denizli is a more recent industrializer and is often among the provinces for which the term Tiger was used for to begin with. However both are classified in the same NUTS 2 sub-region (the *sub-region* Aydin). Based on its sub-regional per-capita value added in 2004 and subsequent employment growth, we have included the Aydin sub-region in the West region.

3. The economic performance of Tigers vs. the West

In this section we compare the economic performance of the Tiger region with that of the West. We examine the composition of economic activity, entry and exit, productivity and productivity growth and

[10] As mentioned above, the AISS also reports R&D expenditures. The R&D information presented in this paper uses information in the R&DAS data set because these are seen as more reliable.

[11] Most NUTS 2 regions are composed of more than one province. However, each region is also named after the first province, as ranked by the State Planning Organization. Hence Region 16 region consists of the Zonguldak, Karabük, and Bartın provinces and is often called the "Zonguldak" region. We follow this tradition.

its decomposition. Then we look at exports, the sophistication and quality of exports as well as the contribution of the West and Tigers towards the re-orientation of exports towards the Middle East and North Africa countries.

Composition of economic activity and productivity

Table 3 displays the distribution of value added and employment across regions in the data set. The Tigers' share in employment is stable at around 22 percent. There seems to be a slight upwards trend in Tigers' share in value added, with a jump of 2.4 percentage points in 2010, reaching about 18 percent. The share of the Others is roughly constant.

Table 4 presents the composition of economic activity in the three regions in 2010. In both the West and the Tigers the bulk of employment is located in manufacturing, retail and wholesale trade, transport, storage and communications and real estate, renting and business activities. The shares of these sectors in employment are not radically different across the two regions, except for real estate which has a higher share in the West relative to the Tiger region. The share of manufacturing in value added is also similar across the west and the Tigers, but the Tigers region has a larger share of value added in utilities and smaller shares in trade, transport, storage and communications, and real estate. The distinguishing characteristic of Others is the comparatively very low share of manufacturing.

Table 5 reports aggregate labor productivity, measured as value added per worker across the three regions, for the years 2006 and 2010. Data is also presented for manufacturing and non-manufacturing industries. The first three columns measure productivity in constant 1998 constant Tl per worker. The last two columns present the ratio of level of labor productivity in the West to that in the Tigers and Others, respectively. Several observations can be made. First, productivity in the West is higher across manufacturing and non-manufacturing, and across years. In 2010, for example, overall labor productivity in the West is 31 percent higher than overall productivity in the Tigers. Second, the difference in productivities of the two regions is larger in non-manufacturing industries than manufacturing industries. For example in 2010 while labor productivity in West manufacturing is about 27 percent higher than productivity in Tiger manufacturing, labor productivity in West non-manufacturing sectors is 38 percent higher than that in Tiger non-manufacturing sectors. The same can be said for a comparison between the West and Others. Third, the gap between the productivity of the West and that of the Tigers has declined over time, for both manufacturing and non-manufacturing industries. So it seems there has been some catching up over time, in both manufacturing and non-manufacturing. The table also suggests that the closing of the gap between the West and the Tigers is faster in non-manufacturing. Fourth, manufacturing has higher labor productivity than non-manufacturing in both regions. However, the gap between manufacturing and non-manufacturing is lower in the West: The ratio of manufacturing to non-manufacturing labor productivity in 2010 is 2.15 in the West compared to 2.34 in the Tigers. Indeed, there seems to be a convergence in productivity within the Tiger region, between manufacturing and non-manufacturing. In Tigers manufacturing labor productivity was 2.5 times labor productivity in the non-manufacturing industries in 2006 and this ratio was reduced to 2.3 in 2010.

Table 5 compares weighted averages of labor productivity across regions and time. One may wonder whether the productivity in the West is higher only in the (weighted) mean or whether this is valid for the entire distribution of productivities. Figure 2 shows the kernel density of log of labor productivity for the three regions, again for the year 2010. The estimated density functions show that labor productivity in the West is uniformly higher than those in the Tiger and the Other regions.

Figure 3Figure 3 provides comparison between labor productivities of the West and the Tigers at the 1 digit NACE breakdown for the year 2010. The gap between productivities is highest in the transport, storage and communications, retail and wholesale trade and education industries. Given the shares in total economic activity, productivity differences in retail and wholesale trade and in transport, storage and communications seem to contribute substantially to the overall productivity gap between the West and the Tigers. Hence an important finding so far is that productivity differences between the West and the Tigers are larger in services than productivity differences in manufacturing.

Structure of manufacturing industry

Table 6 shows sectoral shares of employment and value added in the manufacturing industry across the three regions for the year 2010. The classification is according to 2 digit NACE Rev. 2. Relative to the West, the Tigers have a higher share in food, non-metallic minerals and basic metals. Also, while the West is more concentrated in wearing apparel, the Tigers have higher share in textiles. Compared to the West, the Tiger region has lower employment shares in motor vehicles and chemicals industries, which can be considered as relatively higher technology content industries. Another interesting result is that while the employment share of basic metals is similar in the West and Tigers regions, the value added share of this sector is considerably higher in the Tiger region, pointing to higher productivity. The most noticeable result for the Other region is the high share of food and non metallic minerals. Table 7 provides information on the distribution of employment and value added according to technological content of manufacturing subsectors. The classification of manufacturing subsectors is done according to the Eurostat definition.[13] The data shows that compared to the Tigers the West has a lower share of employment and value added in low technology (LT) industries and higher shares in medium-high technology (MHT) and high technology (HT) industries.

Size distribution

Figure 4 shows the distribution of employment according to size classes in 2010. The share of employment in the smallest category of size, 1-9, is 35 percent in the West, compared to 46 percent in the Tigers and 51 percent in the Others region. The difference in the size distribution of employment between the West and the Tigers is relatively smaller in the middle size categories, though the 20-500 range is somewhat "fuller" in the West relative to the Tigers and the Others. By contrast, the employment share of 500+ firms in the West is substantially higher than that in the Tigers and Others , about 20 percent against 12 and 7 percent, respectively. Table 8 provides some clues about dynamics: it shows changes in the employment share of different size categories between 2006 and 2010. In all regions the share in employment of the 1-9 category has decreased. The shares in employment of 20-

[13] See the classification at http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/htec_esms_an3.pdf

500 categories has increased in all regions as well, and the increase in the share of these mid-size categories is slightly higher in the Tigers and Others. Hence over time it seems the Tigers have filled the middle a bit faster than the West, reducing the extent of the missing middle.

Labor productivity increases with size in all regions, as shown in Figure 5. Since in the Tiger region a larger portion of labor is employed in very small firms (1-9 workers) the distribution of employment among size classes explains part of the productivity difference between the West and the Tigers. One also wonders about inter-regional productivity differentials across size classes. Figure 6 shows the ratio of labor productivity in the West to that in the Tigers region by size categories. Because there is some variability across time, data for 2006, 2008 and 2010 are presented. Overall, it can be said that the difference in labor productivities is higher among smaller firms, generally above 40 percent for firms with employment lower than 50, and somewhat lower for larger firms. For firms larger than 250 employees, the ratio is around 30 percent. For the largest size category, in 2010 the level of productivity is actually higher in the Tigers relative to the West. It can be said that part of the aggregate productivity difference between the West and the Tigers is also explained by the fact that productivity differentials between the West and Tigers is larger among small firms.

Entry exit dynamics

Table 9 provides data on entry and exit characteristics of the regions. The table covers all firms with at least 20 employees. The data reported are averages of annual figures over the period 2007-2009.[14] The variables are defined as in Dunne et. al. (1988). Entry and exit is defined at NACE Rev.1 subsection level (2 digit alphabetical code) that contains 31 subsectors,[15] and aggregated using sectoral value added shares.[16] Several interesting patters emerge. First, entry rates are higher in the Tiger and Other regions. Exit rates are similar in the West and Tigers but higher in Other. Second, relative size of entrants, defined as the average size of an entrant divided by the average size of firms that existed one period earlier, is higher in Tigers relative to the West. Hence in the Tigers region, relative to the West, a higher proportion of new firms entered the data set and their size relative to incumbents was larger than was the case in the West. The value added and employment shares of entrants and exiters are also higher in the Tigers (and the Other region) relative to the West. This partly may explain the increase in the employment share of mid-size firms in the Tigers region mentioned above.

Decomposition of productivity growth

Table 10 presents data on the decomposition of aggregate productivity growth on a regional basis. The decomposition that is used is due to Griliches and Regev (1995). The decomposition indicates that

[14] For example, for the year 2007, an entrant is a firm that was not in the data set in 2006 but which has appeared in 2007.

[15] In the data set we use we have only 24 sectors because, as mentioned above, the AISS does not contain the agriculture, fishery, public administration, activities of private households, and extraterritorial activities and part of financial intermediation. Also, we have excluded the sector "Manufacture of coke, refined petroleum products and nuclear fuel" (subsection DF) from the analysis because of too few observations.

[16] Entry and exit variables for 2010 could not be calculated at this level of (dis)aggregation because in 2010 the classification system has changed from NACE Rev 1 to NACE Rev 2 so there is no continuity between 2009 and 2010.

aggregate productivity growth in the industry between periods t and $t-\tau$ can be decomposed into four terms. The first term is often called the "within-firm" or "intra-firm" effect and is the sum of productivity growth in each firm weighted by the mean (average of values at t and τ) share in employment. The second term is the "between-firm" effect expressed as the sum of changes in the employment share of the firm multiplied by the difference between average firm-level productivity and average industry-level productivity, averages being taken across beginning and end of period. The third term captures the contribution of entry and is positive if the productivity of new entrants is higher than the industry average. Finally, the last term is *minus* the contribution of exiters; this term increases aggregate productivity growth if the productivity of the exiters is less than the industry average.

This decomposition is applied to the 20+ AISS data set for each year and the averages of annual results are reported in Table 10.[17] The decomposition has been applied to each region separately, and in addition, for manufacturing and non-manufacturing industries within each region.

The first observation to be made relates to manufacturing: Overall productivity growth in manufacturing is higher in the Tigers, confirming the earlier finding obtained on the basis of the full data set. The contribution of the within component is higher in the Tigers relative to the West. In all regions there is substantial contribution from the between component. The contribution of exit is also substantial in both cases but larger in the case of the West. The contribution of entry is negative, suggesting entrants have lower productivity than industry averages in both regions. The interpretation seems to be that starting from lower levels of productivity, the Tiger region is experiencing both higher productivity growth within firms and a larger amount of reallocation of employment towards higher productivity firms (the between component), resulting in higher overall productivity growth: Hence both the within component and the between component help explain the catch-up that is occurring. The contribution of net entry is close to zero in both regions.[18]

Productivity dynamics in non-manufacturing is different. Productivity growth is negative in both regions, but is it less negative in the Tigers. Low overall productivity growth in the West is driven by a high and negative contribution of the between component, a finding that warrants further investigation.[19] The contribution of net entry is negative and less than 1 percentage points in both the West and the Tiger regions. Overall, it can be concluded that there is catch-up by the Tiger region in non-manufacturing as well, and the contribution of the within component seems important.

[17] Note that overall productivity growth figures reported in Table 10 are different from those reported in Table 5. This is because the latter is based on all firms in the AISS whereas the former are based on only 20+ firms.

[18] As discussed above, there is a huge amount of new entry into the dataset in 2010. If many of these firms have lower than average productivity and if at least some of them were actually alive in 2009 and not caught by the survey, then the 2009 aggregate productivity estimates will be biased upwards and productivity growth between 20009-10 will be biased downwards. Also note that the within and between components are not affected by this bias because it is defined over continuing firms. This bias will be reflected in the contribution of entrants. Indeed, a closer look at the data reveals that the (negative) contribution of entry is abnormally high in 2010 in both regions. When the averages are taken over 2006-2009, the contribution of net entry becomes positive for both the West and the Tigers.

[19] Similar results are obtained when the year 2010 is excluded.

Regional dimension of exports

An important dimension of the discourse about the emergence of the Tigers is that they are export oriented, and that they are especially active in exporting towards the Middle East and North Africa. For example, Özkan and Akgün (2010) argue that the conservative civil society organization TUSKON has been actively promoting its members to develop trade relations with Africa. In this section we explore the role of Tigers in overall exports, its role in the re-orientation of exports towards the Middle East and North Africa as well as assess the degree of sophistication and quality of exports from the West vs. the Tiger region.

Figure 7 provides data on the regional distribution of exports. The table is constructed from TUIK aggregate export data which is available on a provincial basis. The figure shows that over the 2000s the share of the Tigers in total exports has increased from about 6 to 12 percent and that of the West has decreased from about 92 to 85 percent. Clearly the West continues to provide the lion's share of exports but the increase in the share of the Tigers is substantial. A closer look at the aggregate data reveals that the largest drop in the West comes from Istanbul (a decline of about 8 percentage points between 2002 and 2012) and Bursa (2.3 percentage points). This is partly compensated by an increase in the share of Kocaeli (about 4.7 percentage points). Among the Tigers, Gaziantep and Manisa stand out, with an increase of about 1.9 percentage points each.

We now move to the matched microdata and first explore the changes in the destination of exports. It is well known that as a result of the global crisis and the shrinking of markets in the EU, the shares of EU and North America (EUNA) in total exports from Turkey have declined and the share of the Middle East and North Africa (MENA) region has increased (see, for example, Cebeci and Fernandes, 2013). We would like to see whether the Tiger region played a special role in this re-direction of exports.

Table 11 presents a breakdown of total exports in the matched data set by the originating region and destination markets in 2006 and 2010. The table shows a redirection of exports away from EUNA towards MENA in both the West and Tiger regions. While in each of the regions the share of MENA in total exports of the region has increased, there is a reshuffling of shares in total exports to MENA: The share of the West in total exports to MENA declines from about 78 to 73 percent, the share of Tigers remains almost constant at about 21 percent, and the Other region increases from about 2 to 6 percent.

Next we try to assess the quality of exports from the West and the Tigers. One indicator that is used to measure the degree of sophistication of exports is the PRODY statistic. For each product PRODY measures the weighted average of the per capita income of all countries that export that product.[20] For the year 2010, we have calculated PRODY for each export product in the matched data set at the 6 digit Harmonized System (HS6) and then calculated aggregate PRODY for each region, using the share of that product in total exports of the region as weights. The result of this exercise is presented in Figure 8: The West has a higher PRODY than both the Tiger and Other regions. Products exported by firms in the West seem to be more sophisticated than those exported by firms in the Tigers or Other regions.

[20] For details see Hausman, Hwang and Rodrik (2006) and Reis and Farole (2012).

Figure 9 reflects a similar exercise but this time at the level of manufacturing subsectors in 2010. It reports the ratio of weighted average of PRODY at the 2 digit sectoral level in the West to that in the Tigers. A value of 1 means that in that sector the level of export sophistication is similar in the West and the Tigers. It can be seen that in some manufacturing industries exports of Tigers are higher than the West: These sectors include textiles, wearing apparel, leather, rubber and plastic, chemicals, electrical equipment, other motor vehicles.

A measure that is often used to compare different qualities of the same product is unit values. Following Reis and Farole (2012) for each HS6 export product, we calculate the relative unit value of that product as follows: We divide its unit value to the 90th percentile of the unit value distribution of the same product across all countries exporting that product. We then aggregate to the region (region/manufacturing sector) level by using the share of each firm-HS6 product in total exports of the region (region/manufacturing sector). One should be clear about what is being compared here: Since the composition of exports at the two digit level are not likely to be the same in the West and the Tigers, what is being compared is *not* the quality of the same basket of products. Rather, what is being compared is the average quality level of exports at the two digit level, or how the average exports of the firms in 2 digit industries in two regions are placed in the global distribution of unit values. The results are displayed in Figure 10. In many industries the quality levels are similar. In several industries, the Tiger region stands out as exporting higher quality products: Wearing apparel, leather, computer electronics and optical instruments, other transport equipment are among those sectors. In motor vehicles, pharmaceuticals, and chemicals the West seems to be exporting products that fetch higher value.

In Figure 11 we carry out a similar exercise, but this time we control for the composition of exports at the 2-digit level. More specifically, we assume that at the two digit level, the West has a similar composition of 6 digit HS products to that in the Tiger. This amounts to aggregating relative unit values for the West using export shares of the Tigers at the two digit level. While there are some differences, the results show a high degree of similarity in the relative unit values between the West and Tigers. Hence, *for products exported by the manufacturing firms in the Tiger region*, quality of exports in the West and the Tigers does not seem to be too different. Industries that show some differences are non-metallic minerals, chemicals, leather, electrical equipment and leather, and relative unit values in these industries are higher in the West. By contrast, relative unit value in the machinery and equipment industry is higher in the Tiger region.

R&D and investments in knowledge based capital (KBC)

Several indicators about firms' R&D expenditures and investments in knowledge-based capital are provided in Table 12. Data on R&D expenditures is taken from the Research and Development Activities Survey dataset, which has been merged with the AISS through firm codes. The first column reports R&D expenditures average per worker in constant 1998 TL. The table shows that firms in the West make higher R&D expenditures per worker, and the indicator is especially low in the Other region. Moreover, the value of this indicator has increased between 2006 and 2010 for all regions, but it has increased

faster in the West (about 70 percent) than the Tiger region (47 percent). The second column shows the ratio of R&D personnel expenditures to total personnel expenditures. Again, this ratio is higher in the West and the rate of increase between 2006 and 2010 is higher in the West relative to the Tigers. Similar observations can be made for the third indicator, the ratio of R&D expenditures to total sales.

The next two columns provide information on expenditures on knowledge-based capital (KBC). Information on KBC is available in the AISS and includes the following expenditures on intangibles: computer software, rights (concessions, patents, trademarks, licenses, etc.) and other intangible investments (goodwill, organizational expenditures, R&D, etc.). The share of KBC investments in total investments is higher in the West, but it has declined over the period. The behavior of the ratio of KBC investments to sales is similar. The 2010 figures for KBC in the Other region are especially high, perhaps reflecting the presence of influential observations.

To summarize, then, the West seems significantly ahead of the Tiger region in terms of R&D investments and investments in KBC. However, in the West, measures of KBC investments show a decline over time as well.

4. Conclusion

This paper has presented some preliminary results on the economic performance of the new growth centers in Turkey over the period 2006-2010. The main conclusions can be summarized as follow:

Productivity is higher in the West, however, the Tiger region seems to be in the process of catching up. Productivity catch-up seems to be happening in both manufacturing and non-manufacturing. Size distribution of employment seems to be an important dimension of the productivity differential between the West and the Tigers: Larger firms are more productive in both regions, and a larger share of employment in the Tigers is still located in very small firms employing 1-9 workers. There is also some but milder evidence that productivity differentials between the West and the Tiger decline with firm size. With respect to size distribution of employment, the middle is fuller in the West, but the Tigers seem to be filling the middle a bit faster. Evidence also suggests that productivity differences between the West and the Tigers are larger in non-manufacturing sectors.

Evidence presented above also suggests a surge of exports in the Tiger region in the last decade. While all regions take part in the re-orientation of exports towards MENA after the crisis, the share of the West in total exports to MENA declines, and this is compensated by the increase in the share of the Other region. Regarding the quality of exports, the overall conclusion seems to be that in terms of sophistication of exports, and in terms of quality as captured by relative unit values of products, the Tigers seem to be doing better that what would be suggested by the differences in labor productivity between the West and the Tigers.

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Tables

Table 1: Number of observations in the AISS data set

	All firms				manufacturing			
	Nt	Nc	Ne	Nx	Nt	Nc	Ne	Nx
2003	26285			2855	13040			1368
2004	30571	23430	7141	4201	15214	11672	3542	2246
2005	43201	26370	16831	6344	18893	12968	5925	2192
2006	45533	36857	8676	5396	19912	16701	3211	2555
2007	44164	40137	4027	6388	19500	17357	2143	2578
2008	42120	37776	4344	8089	19024	16922	2102	4045
2009	37871	34031	3840	5438	16540	14979	1561	2392
2010	59192	32433	26759		21737	14148	7589	

Table 2: Regional distribution of exports - Micro_ vs. aggregate trade data

	2006		2010	
	Microdata	Aggregate	Microdata	Aggregate
West	84.89	90.32	81.72	84.68
Tigers	12.28	7.01	13.77	11.66
Other	2.83	2.68	4.51	3.66

Note: the term “Microdata” refers to data obtained after matching firm-level trade data set with the firm-level Annual Industry and Service Statistics. The term “Aggregate” refers to province-level trade statistics downloaded from the TurkStat web site.

Table 3: Regional distribution of employment and value added (%)

	Share in employment			Share in value added		
	west	tiger	other	west	tiger	other
2006	70.08	21.86	8.07	80.11	15.78	4.11
2007	69.70	22.02	8.28	80.08	15.81	4.11
2008	70.04	22.01	7.95	81.04	15.52	3.45
2009	69.75	21.88	8.38	80.23	16.36	3.41
2010	69.72	21.99	8.29	76.96	18.55	4.49

Table 4: Distribution of employment and value added across main economic activities (2010, %)

	west		tigers		other	
sector	Empl.	VA	Empl.	VA	Empl.	VA
Mining and quarrying	0.80	0.56	1.96	2.32	1.11	3.26
Manufacturing	28.62	46.26	30.29	50.41	17.16	32.35
Electricity, gas and water	1.29	3.05	1.59	12.91	1.12	2.67
Construction	8.60	7.57	7.45	7.67	10.89	21.68
Wholesale and retail trade; repair	25.13	20.78	28.73	16.09	31.18	23.57
Hotels and restaurants	6.86	2.60	6.75	2.31	7.46	2.47
Transport, storage and comm.	10.25	12.20	9.44	3.66	13.69	6.17
Real estate, renting and business acti	12.25	4.26	7.54	2.47	10.49	4.58
Education	1.92	0.83	1.90	0.47	2.03	0.73
Health and social work	2.23	1.45	1.93	1.33	2.49	2.28
Other community, social and persona	2.05	0.44	2.42	0.36	2.38	0.25

Table 5: Labor productivity across regions

		west	tiger	other	west/tiger	west/other
2006	manuf	5297	3851	3200	1.38	1.66
	non-manuf	2754	1546	1255	1.78	2.19
	total	3512	2217	1567	1.58	2.24
2010	manuf	5520	4345	3163	1.27	1.75
	non-manuf	2572	1857	1370	1.38	1.88
	total	3416	2611	1678	1.31	2.04

Note: Value added per worker. The last two columns measure ratios of productivities across regions.

Table 6: Structure of manufacturing industry, 2010 (NACE Rev.2, %)

	west		tiger		other	
	emp_sh	va_sh	emp_sh	va_sh	emp_sh	va_sh
Food	9.35	9.08	19.87	19.05	33.49	31.56
Beverages	0.51	1.75	0.24	0.31	0.64	1.26
Tobacco	0.24	0.24	NA	NA	NA	NA
Textiles	9.60	6.86	19.11	18.06	4.35	3.49
Wearing apparel	17.11	7.68	7.17	3.36	8.90	3.91
Leather	2.00	0.98	1.22	0.58	1.22	1.31
Wood except furniture	1.94	1.31	2.90	2.04	6.24	4.11
Paper and paper products	1.90	2.28	0.84	1.01	0.42	0.42
Printing and media	2.08	1.44	1.01	0.38	1.77	1.28
Coke and refined petroleum	0.29	2.30	0.11	0.12	0.04	0.07
Chemicals and chemical products	2.66	5.79	0.87	1.53	0.50	0.33
Pharmaceuticals	1.52	3.95	0.08	0.07	NA	NA
Rubber and plastic	5.91	6.41	4.91	4.10	4.90	1.93
Other non-metallic mineral	5.10	6.63	10.16	10.33	14.14	28.53
Basic metals	3.60	6.61	3.90	14.73	2.01	4.80
Fabricated metal products	9.04	6.29	8.89	6.53	6.18	2.23
Computer electronic, optical	0.92	1.50	0.85	1.70	NA	NA
Electrical equipment	4.61	6.35	3.03	4.77	1.86	1.48
Machinery and equipment, nec	6.02	5.87	4.13	3.49	2.73	2.16
Motor vehicles	5.70	10.01	1.77	1.92	1.00	1.06
Other transport equipment	1.27	2.08	0.44	0.64	0.37	0.17
Furniture	4.87	1.85	6.75	4.62	5.28	1.69
Other manufacturing	2.03	1.40	0.89	0.39	2.09	1.54
Repair installation of mach. & equip.	1.74	1.33	0.86	0.22	1.05	0.60

Table 7: Technological content of manufacturing industry (2010, %)

	West		Tigers		Other	
	emp_sh	va_sh	emp_sh	va_sh	emp_sh	va_sh
LT	44.72	30.75	60.65	48.10	66.95	53.71
MLT	25.71	30.41	22.87	33.75	23.27	40.09
MHT	25.40	31.67	14.88	16.06	9.52	6.01
HT	4.17	7.17	1.60	2.09	0.27	0.18

Table 8: Changes in employment shares by size (2010-2006, %)

	west	tiger	other
s000-009	-6.95	-8.17	-12.61
s010-019	-1.07	1.57	-1.89
s020-049	1.29	2.46	5.66
s050-099	1.12	1.43	2.35
s100-249	1.55	2.23	3.06
s250-500	0.53	0.82	1.88
s500+	3.54	-0.33	1.55

Table 9: Entry exit variables, 20+ firms, 2007-2009 averages

	Entry Rate	Exit Rate	Entrant relative size	Exiter relative size	Entrant share in value added	Exiter share in value added	Entrant share in employment	Exiter share in employment
west	13.20	18.72	44.64	37.54	6.51	7.57	8.80	10.97
tiger	14.98	18.46	50.45	50.07	8.48	9.96	9.87	12.54
other	21.21	21.03	62.55	55.72	12.79	13.27	16.65	17.93

Table 10: Decomposition of labor productivity growth (2006-2010, %)

	Within	Between	Entrants	Exiters	Overall LP growth
Manufacturing					
west	0.93	0.68	-2.90	3.04	1.74
tiger	1.53	1.14	-2.33	2.30	2.64
other	1.05	2.33	-4.07	2.38	1.69
Non-manufacturing					
west	3.98	-5.72	-2.85	2.08	-2.50
tiger	0.72	-0.36	-3.23	2.47	-0.39
other	-2.63	3.99	-3.39	3.75	1.73
Overall					
west	1.04	-1.41	-3.74	3.10	-1.02
tiger	3.31	0.34	-5.13	3.83	2.35
other	-1.23	4.15	-7.92	5.42	0.42

Note: Average of annual values over 2006-2010.

Table 11: Distribution of exports by originating region and destination 2006 and 2010 (%)

		EUNA	MENA	Others	Total
2006	West	58.68	11.25	14.96	84.89
	Tiger	7.53	2.90	1.85	12.28
	Other	1.85	0.34	0.64	2.83
	Total	68.06	14.48	17.46	100.00
2010	West	47.92	17.30	16.51	81.72
	Tiger	5.97	5.14	2.65	13.77
	Other	1.35	1.40	1.76	4.51
	Total	55.24	23.85	20.92	100.00

Note: EUNA – EU and North America; MENA – Middle East and North Africa

Table 12: R&D expenditures and investments in knowledge based capital

		R&D expenditures per worker	Share of R&D personnel expenditures in total personnel expenditures	Ratio of R&D expenditures to sales	Share of KBC investments in total investment expenditures	Ratio KBC expenditures to sales
2006	West	58.60	5.46	0.19	16.30	2.37
	Tiger	23.48	2.43	0.11	3.25	0.51
	Other	2.71	0.24	0.01	3.66	0.27
2010	West	100.12	14.41	0.33	13.77	0.98
	Tiger	34.43	6.20	0.14	8.38	0.61
	Other	3.80	0.91	0.02	12.57	0.89

Figures

Figure 1: Nuts2 sub-regions: Per capita value added in 2004 vs. employment growth 2004-2012

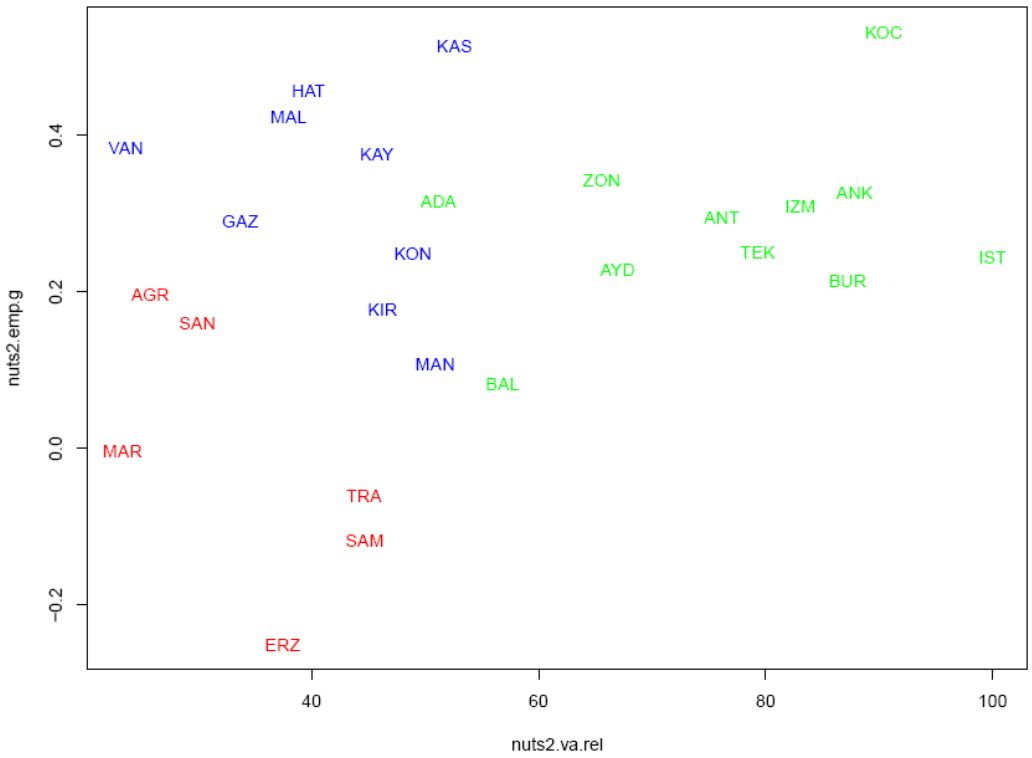


Figure 2: Distribution of log labor productivity (2010)

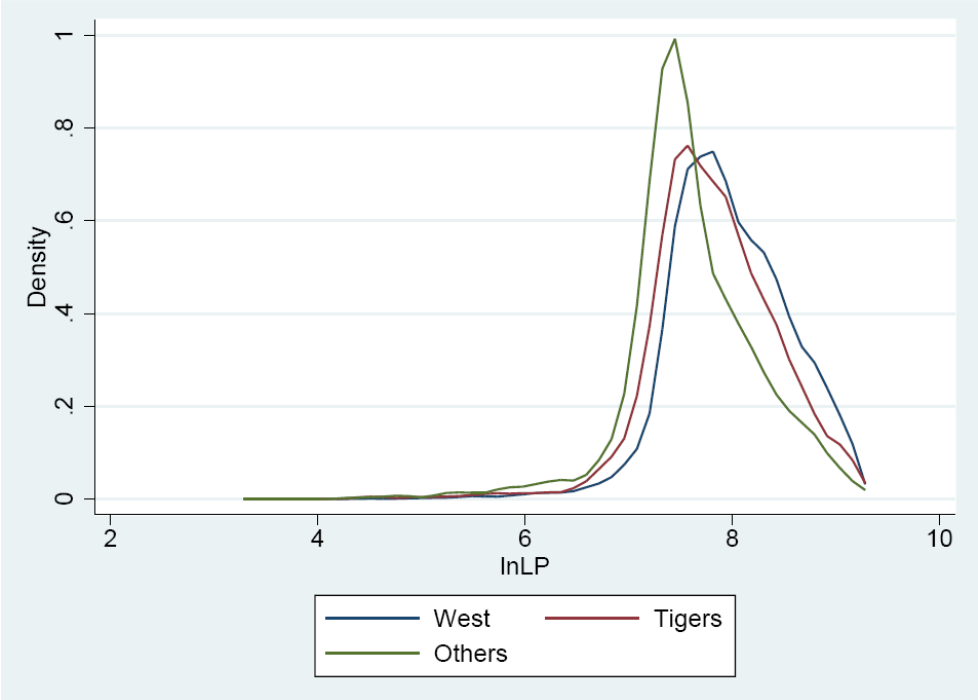
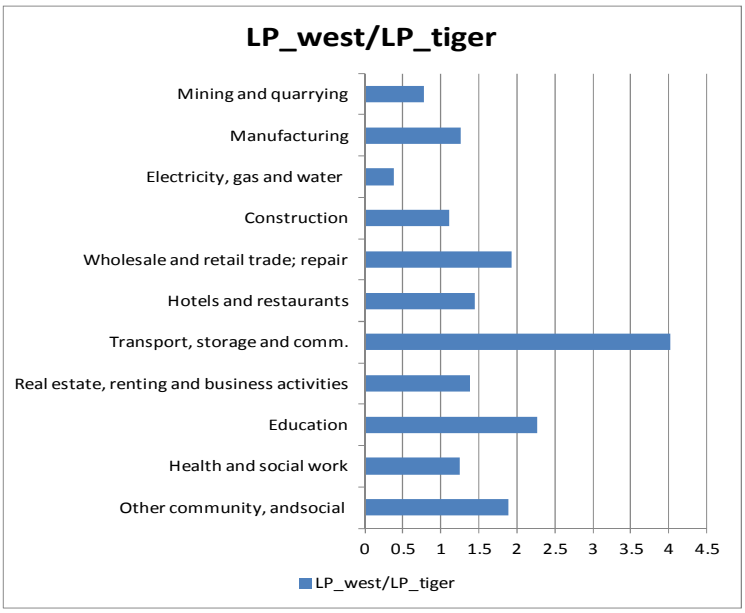


Figure 3: Labor productivity West vs Tiger (2010)



Note: Ratio of labor productivity in the West to that in the Tigers

Figure 4: Distribution of employment according to size classes (2010)

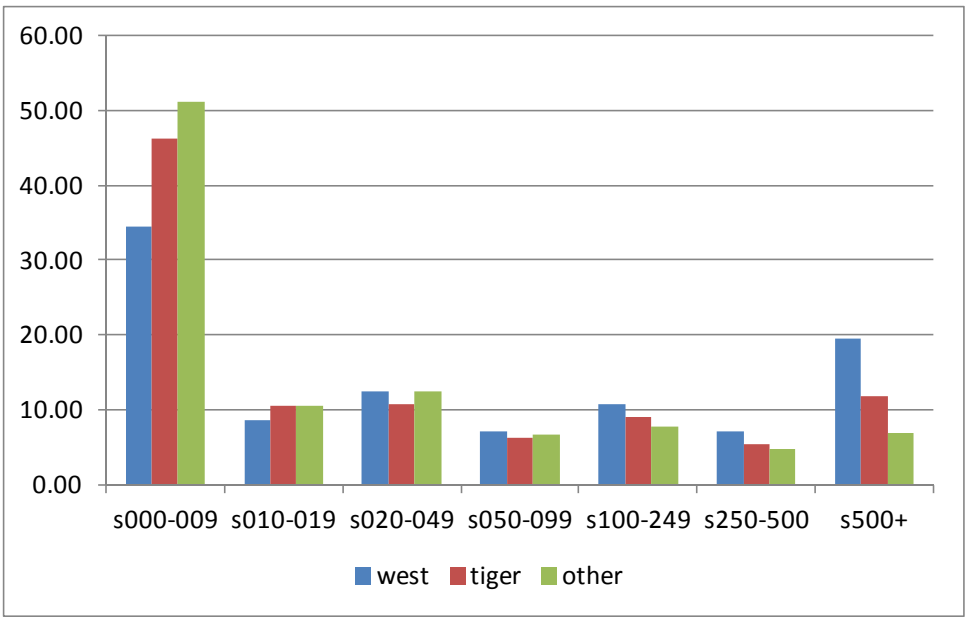


Figure 5: Labor productivity by size classes in 2010 (1998 constant TL)

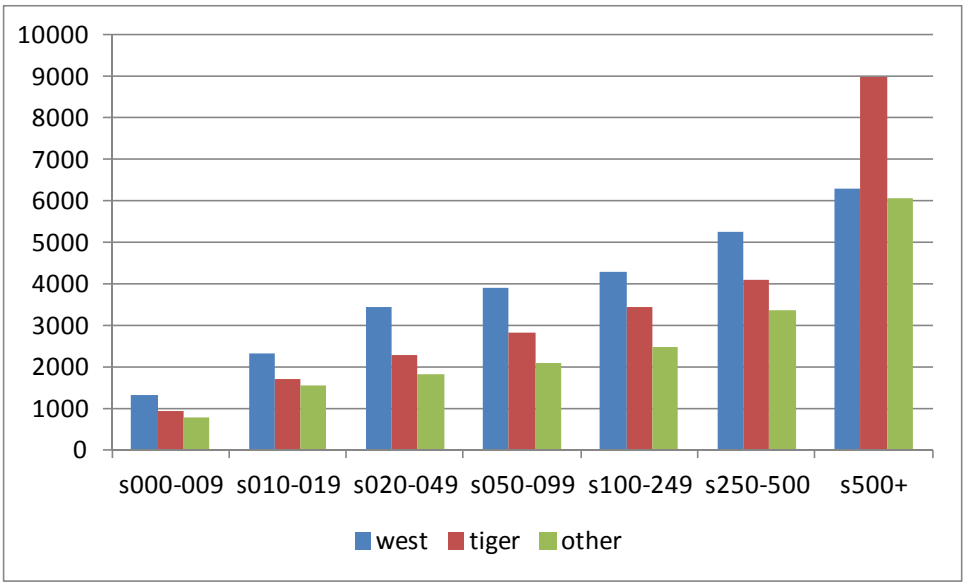


Figure 6: Relative labor productivity by firm size: West vs Tiger

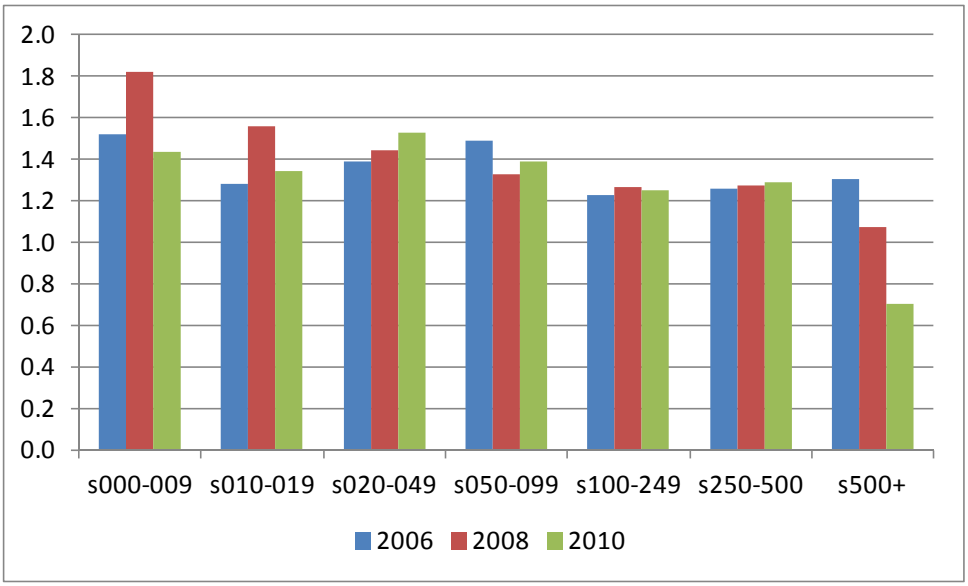
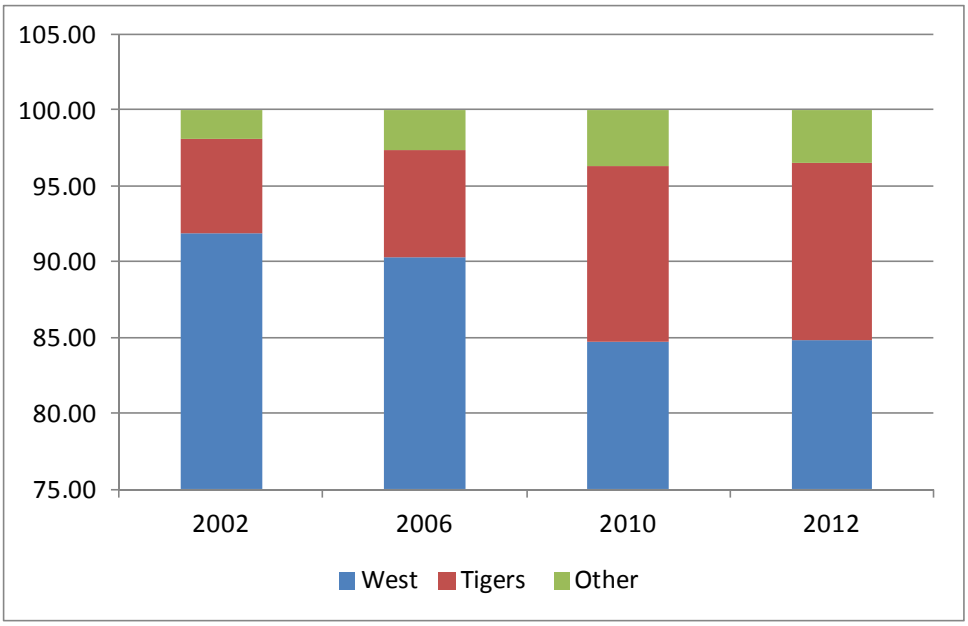


Figure 7: Regional distribution of exports (%)



Note: Calculated from TUIK aggregate data

Figure 8: Regional PRODY, 2007 and 2010

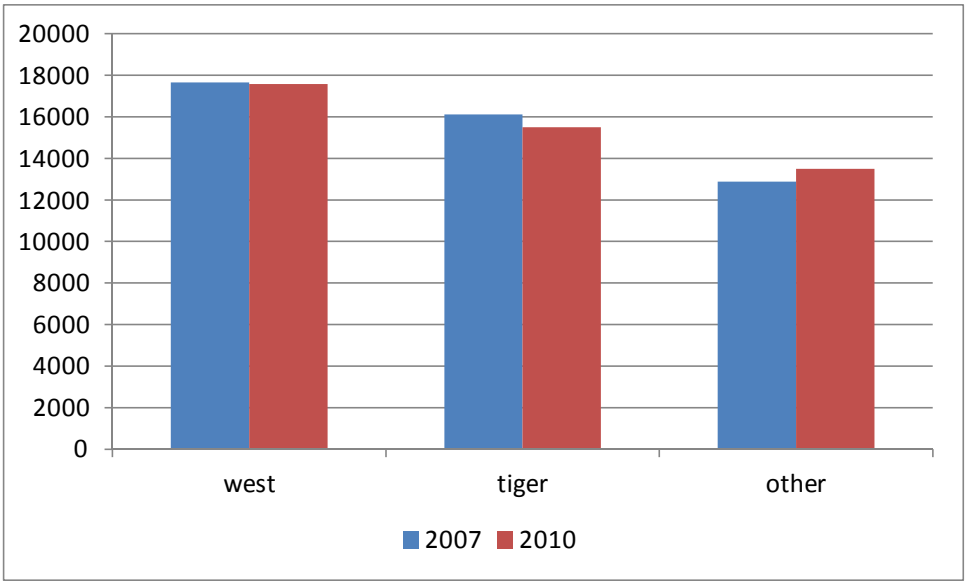


Figure 9: Relative sophistication of exports: PR0DY_West/ PRODY_Tiger (Manufacturing subsectors, 2010)

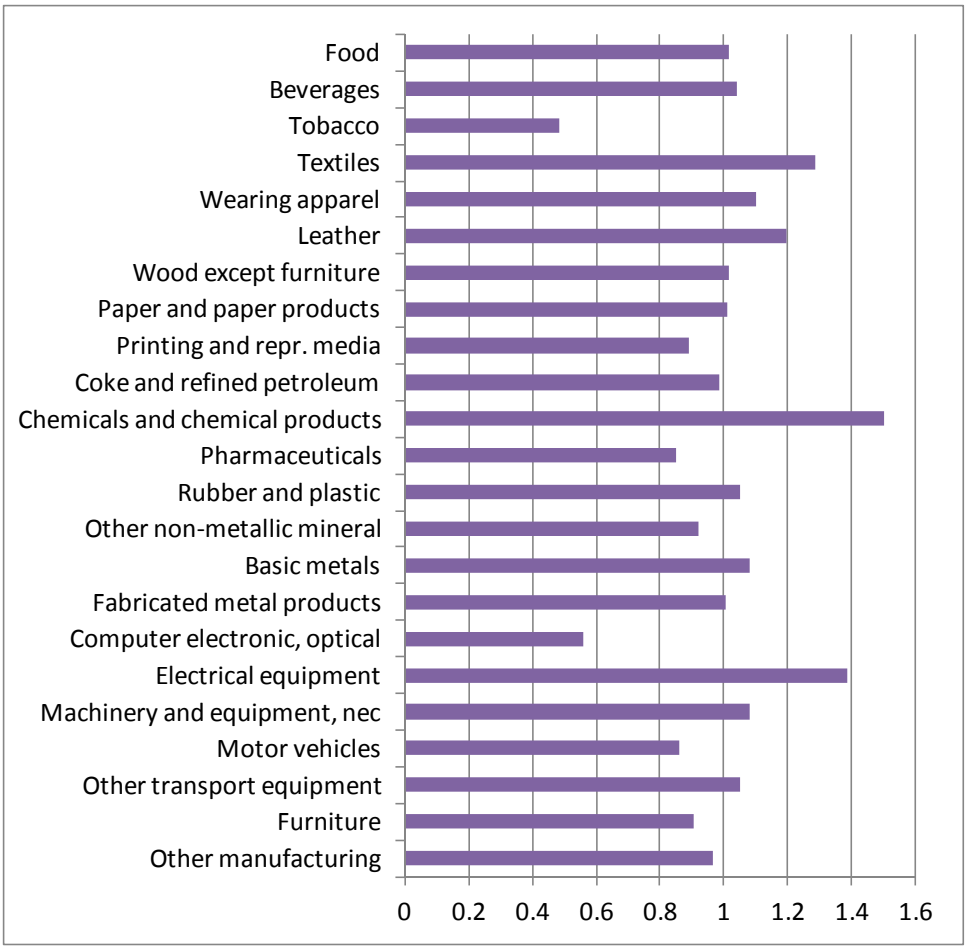


Figure 10: Relative unit values of exports (2010)

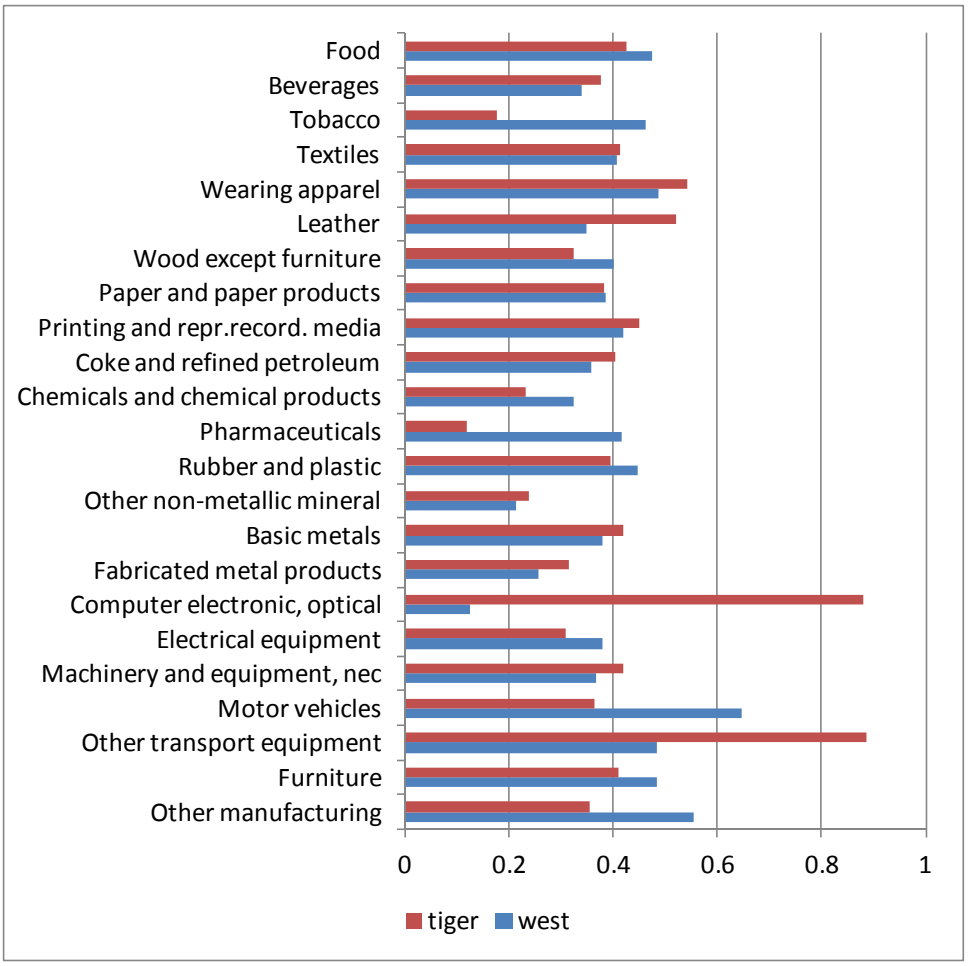


Figure 11: Relative unit values of exports, Tiger composition (2010)