The Intensive and Extensive Margins of Trade: Decomposing exports growth differences across Spanish regions

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Abstract

Why do exports grow faster in some regions than in others? The regional literature has traditionally answered this question using a shift-share analysis, which focuses on regional differences in the composition of international exports by industry and destination. In this paper we apply an intensive/extensive margin decomposition framework, which separates the role of new trade relationships, product survival and product deepening to explain the differences in international exports growth across Spanish regions. Unlike the predominance role of the intensive margin in country-level studies, our results show that both the intensive and the extensive margin can be very important components of regional exports growth. Moreover, the relevance of each component varies to a great extent across regions. Our findings suggest that policies implemented to promote exports should be designed at the regional level.

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1. Introduction

Export growth serves to assess the sources of international competitiveness of a region. Foreign exports differ substantially among the regions of a country, both in levels and as a share of gross regional output, giving reasons for the analysis of international exports at the regional level.[1] Most studies of export growth at the subnational level have used traditional trade models based only on supply conditions (Balassa, 1965; Erikson and Hayward, 1992) or on a shift-share analysis (or constant market share analysis) which provides comparative measures of the relative importance of both supply and demand factors in explaining regions´ export growth (Green and Allaway, 1985; Coughlin and Cartwright, 1987; Markusen et al, 1991; Kotabe and Czinkota, 1992; Niponen et al, 1997: Gazel and Schwer, 1998; Williamson, 2006). Our paper contributes to this literature by showing that the decomposition of exports growth into an extensive margin (i.e. the expansion of trade due to an increase in the number of new trade relationships) and an intensive margin (i.e. the expansion in export value among existing trade relationships) is also useful for regional policy since, as we will show, the long run international exports growth drivers differ substantially at sub-national level.

The number of papers examining the differences in exports growth across countries based on calculating the extensive and intensive margins of trade is increasing rapidly. Felbermayr and Kohler (2006) propose a simple accounting approach to decompose long-run export growth into the extensive and intensive margin. When they examine the expansion of world trade in manufactures during the period 1950-1997, their main conclusion is that the extensive margin accounts for around 40 percent of exports growth.[2] Using a similar approach, Brenton and

[1] Kitson et al. (2004) provide an interesting discussion about the concept of regional competitiveness and the importance of international trade indicators to measure it. Porter (1990) popularized the use of regional export shares as measure of regional competitiveness.

[2] Evenett and Venables (2002) is one of the first papers examining the importance of the extensive margin. Using a different approach, they show that the intensive margin and the extensive margin accounts for 63 percent and 37 percent, respectively, of exports growth among developing countries over the period 1970-1997.

Newfarmer (2007) notice that the extensive margin accounts for only 20 percent of the overall exports growth during the 1995-2005 period. Besedes and Prusa (2007) extent this methodology by decomposing the intensive margin into a survival component and a deepening component. The first term measures how long existing trade relationships last; the second term measures the change in the value of exports among surviving trade relationships. The authors find that the extensive margin has played a minor role in explaining export growth among developing countries and that survival component is the most important factor explaining the poor performance in export growth of developing countries compared to developed countries. Helpman et al. (2008) using a sample of 158 countries for the 1970-1997 period also found that most of growth is due to trade between partners that were already trading at the beginning of the period. However, these authors do not discriminate by products and, hence, part of the increase in the intensive margin can be attributed to exports of new goods between old partners. Finally, Hummels and Klenow (2005) also analyse the extensive and the intensive margins of trade. They do not analyse how exports growth is decomposed in these two margins, but rather why large countries export more than small countries. Using a sample of 126 countries in 1995, they find that the extensive margin accounts for around 60 per cent of larger countries' higher volume of exports.[3]

The papers mentioned above use country-level data. This paper applies the extensive/intensive margin decomposition approach to a regional setting, which is important for understanding the nuances of export growth in countries with large inter-regional heterogeneity. Specifically, we broaden understanding of the differential foreign trade involvement of Spanish regions in the period 1988-2006. We also develop recent work in two directions. First, we further decompose the extensive margin into an entry and a value

[3] Another line of research uses firm-level data to measure the role of the extensive margin and the intensive margin in a specific country (Eaton et al (2007) for Colombia; Gleeson and Ruane (2007) for Ireland).

component. This decomposition enable us to analyse which drives growth in exports at the extensive margin: is it the capacity to augment the number of new trade relationships or is it the ability to select those new trade relationships in which the value of exports is large? Second, we calculate partner-specific hazard, deepening, entry and extensive value rates. Such a novel decomposition allow us to analyse whether a region's higher growth in exports is explained by the superiority of its intensive and extensive growth components in all trade relationships, or by the superiority of its intensive and extensive growth components in some trade relationships.

Our results can be summarised as follows. First, the extensive margin plays a significant role explaining differences in international exports growth across regions. Second, within the extensive margin, both the entry and the extensive value are important to explain the differences in exports growth across Spanish regions. In particular, the extensive value plays a larger role explaining the differences in exports growth in non-traditional markets for Spanish regions, such as non-European Union markets, whereas the entry rate plays a larger role explaining the differences in exports growth in traditional markets (European Union). Finally, we find a great deal of heterogeneity across regions in the component that contribute the most to international exports growth.

These findings have implications for appropriate policy choice. First, in order to increase the value of exports at the extensive margin, in non-traditional markets, it is more effective the selection of markets with a high (potential) demand than to maximise the number of new export relationships. Second, since the main component of international export growth differs across regions, regional idiosyncrasy must be considered when designing export promotion policies.

The rest of the paper is organised as follows. Section 2 presents the methodology to decompose exports' growth between the extensive and the intensive margins, describes the extensions we introduce in this framework and explains how counterfactual calculations are performed. Section 3 describes the differences in the exports' growth components across Spanish regions and performs the counterfactual exercises. Finally, Section 4 summarises the main conclusions of the paper.

2. The exports growth decomposition methodology

In this section we present the methodology to decompose exports growth between the extensive and the intensive margins, explain the extensions we introduce in this framework and describe how counterfactual calculations are performed. Before we explain those analyses, it is necessary to determine how we define a trade relationship. We say that a trade relationship is created when a country (in our case, a Spanish region) starts exporting a new product to a destination country or an existing product to a new destination.

We start our analysis with the trade decomposition proposed by Felbermayr and Kohler (2006) and extended by Besedes and Prusa (2007). As we will explain in detailed below, we have also added two additional extensions. We decompose the absolute growth in exports between year *t* and year *t+1* as,

$$V_{t+1} - V_t = \underbrace{\left(x_{t+1} v_{t+1}^0\right)}_{\text{extensive margin}} + \underbrace{\left[\left((1-h)n_t\right)\left(v_{t+1} - v_t\right) - \left(h n_t v_t\right)\right]}_{\text{intensive margin}} \quad (1)$$

where V is the total value of exports, which is obtained multiplying the number of trade relationships (n) by the average value of a trade relationship (v); x is the number of new trade

relationships; *h* is the hazard rate of the trade relationship, which is defined as the probability that the export relationship fails and *t* is the year.

The absolute growth in exports is decomposed in three terms. The first term in equation (1) represents the extensive margin, $\left(x_{t+1}v_{t+1}^{0}\right)$, which gives the value of the new trade relationships that occur at year *t+1*. The second term is the product of the hazard component, $\left[(1-h)n_t\right]$ and the deepening component, $\left(v_{t+1}-v_t\right)$. The hazard component gives the amount of export relationships that survive between year *t* and year *t+1* and the deepening component is the absolute increase in the value of a surviving export relationship. The third term is the failure component, $\left(hn_tv_t\right)$ and gives the total value of those trade relationships that do not continue between year *t* and year *t+1*. The combination of last two terms yields the intensive margin of exports growth, that is, the increase in exports that stem from the change in value of the trade relationships that remain alive.

If we divide equation (1) by V_t, we can express the growth rate (*g*) between year *t+1* and year *t* as:

$$g_{t+1,t} = ef + (1-h)d - h \qquad (2)$$

where *e* is the entry rate: $\frac{x_{t+1}}{n_t}$, which is the number of new relationships relative to the number of trade relationships in year *t*; and *f* is the extensive value rate: $\frac{v_{t+1}^{0}}{v_t}$, which gives the average value of a new trade relationship relative to the average value of a trade relationship

in year *t*; *d* is deepening rate: $\frac{v_{t+1} - v_t}{v_t}$, which gives the rate of increase of the average value of a trade relationship that survives; finally, h is the hazard rate.

Since the growth decomposition is expressed in relative terms, the extensive margin is now decomposed into a volume (*e*) and a value (*f*) component. This decomposition enables us to investigate what drives exports growth at the extensive margin: the capacity to open a large number of new trade relationships or the ability to extend to those trade relationships where the value of exports can be higher.

In order to refine the counterfactual calculations, we extend the exports growth decomposition to take into account that hazard and deepening rates may vary by industry and year of service (length of the spell). In addition to that, we further disaggregate the counterfactual analysis in order to take into account differences in the hazard, deepening, entry and extensive value rates by group of countries. This additional decomposition allows us to analyse whether a region's higher exports growth is explained by the superiority of its growth components in all trade relationships, or by the superiority of its exports growth components in some trade relationships.

Algebraically the broaden decomposition can be expressed as:

$$g_{t+1,t} = \sum_c \left\{ \sum_z \left\{ \left(e_{c,z} f_{c,z} \right) + \left[\sum_i \left((1 - h^i_{c,z,t+1}) d^i_{c,z} \alpha^i_{c,z} \right) - \left(h^i_{c,z,t+1} \alpha^i_{c,z} \right) \right] \right\} \right\} \quad (3)$$

where *c* is a country (or group of countries), *z* is industry and *i* the year of service. Now $e_{c,z} = \frac{x_{c,z}}{n_t}$ is the ratio of new export relationships in industry *z* with partner *c* over the total number of export relationships in year t; $f = \frac{v^0_{c,z,t+1}}{v_t}$ is the ratio of the value of a new trade relationship in industry *z* with partner *c* over the average value of a trade relationship in year t; $d^i_{c,z} = \frac{v^i_{c,z,t+1} - v^i_{c,z,t}}{v^i_{c,z,t}}$ is the deepening that occurs in *z*-industry's *i*-th year of service trade relationship with partner *c*; $h^i_{c,z}$ is the hazard rate that occurs in *z*-industry's *i*-th year of service trade relationship with partner *c*; and $\alpha^i_{c,z} = \frac{n^i_{c,z,t} v^i_{c,z,t}}{n_t v_t}$ is the share of the *z*-industry's *i*-th year of service trade relationships with partner *c* in year *t* in total exports The new exports growth equation takes into account that the entry and the extensive value rates may change by partner, industry and year and that the hazard and the deepening rate may change by partner, industry, by year of service and by year.

We use a version of equation (3) to asses the contribution of each of the exports growth components to the differences in exports growth between EU countries (the traditional trading partners of Spanish regions) and the rest of the world. To do so we perform a series of counterfactual exercises. By substituting the growth elements (entry, the extensive value, survival and deepening) of a country with the growth elements of a counterfactual country characterised by having the largest export growth rate, we can identify which growth component is the main driver of the observed differences between countries. In particular, in order to asses the contribution of the entry rate component of exports growth differences across countries we can change equation (3) in the following way

Entry: $$g_{t+1,t} = \sum_c \left\{ \sum_z \left\{ \left(e^{CF}_{c,z} f_{c,z} \right) + \left[\sum_i \left((1 - h^i_{c,z,t+1}) d^i_{c,z} \alpha^i_{c,z} \right) - \left(h^i_{c,z,t+1} \alpha^i_{c,z} \right) \right] \right\} \right\} \quad (4)$$

where $e^{CF,i}_{z,t+1}$ is the counterfactual hazard rate for industry *z*, at the *i*-th year of service in year *t+1*.

If we change the extensive value rate, the equation becomes,

Extensive value: $$g_{t+1,t} = \sum_c \left\{ \sum_z \left\{ + \left(e_{c,z} f^{CF}_{c,z} \right) + \left[\sum_i \left((1 - h^i_{c,z,t+1}) d^i_{c,z} \alpha^i_{c,z} \right) - \left(h^i_{c,z,t+1} \alpha^i_{c,z} \right) \right] \right\} \right\} \quad (5)$$

If we change the deepening rate, the equation becomes,

Deepening: $$g_{t+1,t} = \sum_c \left\{ \sum_z \left\{ \left(e_{c,z} f_{c,z} \right) + \left[\sum_i \left((1 - h^i_{c,z,t+1}) d^{CF,i}_{c,z} \alpha^i_{c,z} \right) - \left(h^i_{c,z,t+1} \alpha^i_{c,z} \right) \right] \right\} \right\} \quad (6)$$

If we change the hazard rate, the equation becomes,

Hazard: $$g_{t+1,t} = \sum_c \left\{ \sum_z \left\{ \left(e_{c,z} f_{c,z} \right) \left[\sum_i \left((1 - h^{CF,i}_{c,z,t+1}) d^i_{c,z} \alpha^i_{c,z} \right) - \left(h^{CF,i}_{c,z,t+1} \alpha^i_{c,z} \right) \right] \right\} \right\} \quad (7)$$

In the next section we use equations (4)-(7) to analyse what explains the differences in exports growth across Spanish regions.[4]

[4] From a methodological point of view there is some resemblance between our approach and the well-known shift-share analysis. The two approaches require measurements on a variable of interest (an exported product) for each member group (Spanish regions) at the beginning and the end of the period of analysis. In addition, both techniques use a counterfactual to evaluate the performance of the variable of interest. In the shift-share analysis we are interested in computing the *net shift* or difference between the actual growth and the expected growth based on the average growth of all regions in the group. The magnitude of the gain or loss represents the difference between the region's actual performance and the performance it would have had if its growth rate had been equal to the average growth of the entire group. In our approach we are interested in measuring the difference between actual growth and the expected growth based on replacing the actual components of the margins by the components of the margins of the region with the highest export growth. The magnitude of the gain or loss represents the difference between the region's actual performance and the performance it would have had if its growth rate in each component had been equal to the growth of the best region.

3. The role of the intensive and extensive margins in Spanish regions exports' growth

3.1. Data

We use a unique database which offers a highly-disaggregated exports data at a regional level: the Spanish Agencia Tributaria Database (www.aeat.es). This database offers Spanish provinces' (NUTS 3) annual exports at the 8-digit Combined Nomenclature (CN) classification from 1988 onwards. First, in order to use data as close as possible to the firm level, trade relationships are defined at the more disaggregated province-level (NUTS 3). These trade relationships are then pooled at the regional-level (NUTS 2) in order to calculate exports growth components. Second, instead of using the more disaggregated 8-digit CN classification, which contains around 10000 product codes, we opt to collapse exports data at the 6-digit Harmonised System (HS) classification. This decision is due to the frequent changes in product classification that takes place at the CN. For example, during the 1988-2005 period, 5139 product lines were created and 4738 product lines were dropped from the CN (Eurostat, 2006). Those numerous changes may create substantial problems, because we may misclassify existing trade relationships whose product code changes as new relationships. Although the HS also experiences changes in product lines, they are smaller than those in the CN.[5] However, the disadvantage of the HS is its lower disaggregation level: 5000 product lines. At lower disaggregation level each product line may include a range of individual goods, leading to an undervaluation of the extensive margin. Finally, we use Banco de España's exports trade deflator to transform current values into constant values.

Our empirical analysis is divided in two sections. First, we describe the differences in the components included in the growth equation (the survival rate, the deepening rate, the entry

[5] At 2005, 91% of the HS product codes that were created at 1988 remain active.

rate and the extensive value rate) across Spanish regions. Next, in order to study the weight of those components in explaining the differences in exports growth across Spanish regions, we perform a series of counterfactual calculations.

3.2. An overall view on exports growth components

Table 1 presents the growth of Spanish regions' exports in the 1988-2006 period. As can be seen in the table, there are important disparities in their performance. The Spanish region with the highest growth rate is Galicia (697%), followed by Extremadura (449%), Balearic Islands (428%) and Castille-León (404%). Then, we find a group of six regions with a growth rate between 300%-400%: Asturias, Cantabria, Castille la Manche, Catalonia, Madrid, Navarre and Rioja. These regions are followed by a group with a growth rate which lies between 100%-200%: Andalusia, Aragón, Basque Country and Murcia. The bottom positions are occupied by Valencia (167%) and the Canary Islands, which experience a reduction in the value of exports between 1988 and 2006. It is important to note that all Spanish regions, except for Canary Islands and Valencia have a higher exports growth during the period 1988-2006 than the world average: 178%.[6]

Once we have presented the overall growth in exports, we describe next each of the components that contribute to explain the differences in growth across Spanish regions.

The entry and the extensive value component

The first two components of the exports growth equation are related to the extensive margin: the entry rate (*e*) and the extensive value rate (*f*). The first component is the ratio of the number of new trade relationship over the number of trade relationship the previous year, and

[6] Authors' calculation using data from the World Trade Organisation database.

the second component is the ratio of the average value of a new trade relationship relative to the average value of a trade relationship the previous year.

Table 2 presents the results of the analyses on the extensive components. The first thing we observe is the close correlation (0.71) that exists between the growth in exports and the growth in exports relationships in the 1988-2006 period across Spanish regions. This high correlation between the growth in exports value and the growth in exports relationships has also been found in previous studies using country-level data and has led some authors to argue that the extensive margin might play an important role in explaining exports growth.

As shown in the table, six Spanish regions have an increase in export relationships which is above 200%: Galicia, Castille la Manche, Cantabria, Aragón, Extremadura and Castille-León; the rest of the Spanish regions have an increase which is below 200%. We have to highlight the low growth in the Basque Country and, specially, in the Canary Islands. A reasonable explanation of the differences in exports relationships' growth across Spanish regions could be the number of trade relationships at the beginning of the period: those regions with few export relationships have more room to increase the number of export relationships than those regions that already have a large number of export relationships. Although there is a mild negative correlation between the amount of export relationships in 1988 and their growth (-0.25), Columns 3 and 4 of the table highlight that the room for new export relationships is very large for all regions. These columns present the number of trade relationships as a percentage of the maximum amount of trade relationships a region could have in 1988 and 2006. In order to calculate the maximum amount of trade relationships we multiply the maximum amount of products in the HS classification in 1988 and 2006 and the number of countries in 1988 and 2006. In particular, there were 5019 products in the HS1988

classification and 5224 products in the HS2006 classification; on its hand, there were 161 countries in 1988 and 193 countries in 2006. If we combine these figures the maximum amount of trade relationships in 1988 is 808059 and 1008232 for 2006. As shown in the table, the realised potential is very small for all Spanish regions, both in 1988 and 2006.

The final columns present the average values for the entry rate (*e*) and the extensive value rate (*f*). A striking conclusion of the data is the very large proportion that new relationships represent, as average, over total export relationships in the previous year. For all regions, except Catalonia, this ratio is above 40% and for eight regions the ratio is larger than 50%. These figures show the high activity that takes place at the extensive margin across Spanish regions. However, if we analyse the extensive value (*f*) column, we can see that the value of those new trade relationships is much lower than the average value of a trade relationship the previous year. Except for Asturias and the Balearic Islands, the average value of a new trade relationship is less than one-third of the average value of trade relationship the previous year; for seven regions is less than one-fifth.

The survival component

The third component of the exports growth equation, which is related to the intensive margin is the hazard rate. In order to calculate Spanish regions' exports survival rates we have to convert the annual data into spells of service for each trade relationship. The first spell of a trade relationship starts the first time the trade relationship occurs. The length of the spell of service is determined by the number of years that the trade relationship takes place without interruption. For example, if 1988 is the first year that Andalucia exports bicycles to Germany, this is the first spell of this trade relationship. If Andalucia also exports bicycles to Germany in 1989 and in 1990, but not in 1991, the length of the first spell is 3 years. If

Andalucia re-starts the export of bicycles to Germany in 1992, that trade relationship will constitute a new spell. As our period of analysis is 1988-2006 the maximum length of a spell is 19 year, and a trade relationship can have, as maximum, 10 spells.

Table 3 presents the Kaplan-Meier survival rates for Spanish regions. A striking result of the table is the low percentage of trade-relationships that survive after one year of service. For example, in the Canary Islands only a quarter of trade relationships last more than 1 year. Two regions, Catalonia and Galicia, have the highest first-year survival rates: 47%. The majority of Spanish regions have a first-year survival rate around 38%-40%. Finally, the two island regions, Balearic Islands and Canary Islands have the worst first-year survival rates. When we analyse longer time periods, there is a further drop in the trade relationships that survive; in particular, around 75% of the trade relationships disappear after two years of service and 85% after five years of service.

It is interesting to observe that, although there are differences in survival rates, the shape of the survival function is similar across Spanish regions. As can be seen in Figure 1, in the majority of the Spanish regions the survival function has a steep slope over the first 5-7 years and becomes flatter afterwards. The shape of the survival functions implies that new export relationships have a much higher failure risk than established ones. It is interesting to note, as well, that except for Canary Islands' survival function, the remaining survival functions are jammed at the beginning of the analysis. After the third year of exporting, we observe more differences in the survival rate across Spanish regions; however, as we enlarge the duration of the trade relationship, except for Catalonia at the top and the Canary Islands at the bottom, there is convergence in survival rates across Spanish regions. This convergence process is also confirmed when we compare the standard deviation of hazard rates across Spanish

regions by spell duration. As shown in Figure 2, the highest differences in the probability to fail across Spanish regions occur in the first three years of service. When the trade relationship lasts more years the difference in hazard rates across Spanish regions starts to diminish, and becomes smaller the longer the duration of the trade relationship.

The deepening component

The last component that explains exports' growth is the increase in the value, or deepening, of the relationships that survive. Firstly, we analyse the deepening of trade relationships that have lasted the whole period of analysis: 1988-2006. As shown in Table 4, long-term relationships only represent a small percentage of the trade relationships that took place in 2006: in nine of the regions they represent less than 20% of all relationships and in eight regions they represent between 20% and 30%. However what is more striking, compared to previous country-level studies, is the very low percentage that long-term trade relationships' value represents over total exports: in 14 regions they represent less than 10 per cent of the value, and in only three regions they represent between 10% and 20%. This result emphasize that there has been a large renewal in the composition of exports across Spanish regions. This conclusion is confirmed when we analyse the average annual growth rate of long-term relationships: for all regions, except for Canary Islands, the growth rate of long-term relationships has been lower than the total trade growth (Table 1).

The last column of Table 4 presents data on the median deepening for all surviving relationships irrespective of their eventual duration. We do not present average deepening, because the presence of extreme observations makes this statistic uninformative. As shown in the table, there are notable differences in the median deepening rate across Spanish regions. Galicia is the Spanish region that, by far, has the highest median deepening rate: 10.6%. After

Galicia, there are three Spanish regions with a median growth rate between 4%-5%: Aragón, Cantabria and Catalonia; five regions in the 3%-4% range: Asturias, Basque Country, Castille la Manche, Madrid and Murcia; four regions in the 2%-3% range: Andalusia, Navarre, Rioja and Valencia; two regions with a deepening rate close to 1%: Castille-León and Extremadura; and two regions with a negative deepening rate: Balearic Islands and Canary Islands.

3.3. Counterfactual calculations

We use equations (4)-(7) to perform the counterfactual exercises.[7] In these exercises we substitute the value of one of the growth components (entry, extensive value, survival or deepening), with a counterfactual value. If we observe a large change in the growth rate we can conclude that differences in the substituted component plays an important role in explaining exports growth differences; on the contrary, if the growth rate only changes a little, the substituted component does not play a decisive role in explaining differences in exports growth.

An important decision when performing counterfactual calculations is to determine whose exports' growth components are selected as counterfactuals. In the first exercise, we decide to take as counterfactual the Spanish region with the highest growth rate in the 1988-2006 period: Galicia. [8] Using as counterfactual the growth components of the Spanish region with the highest exports growth rate we can determine either the intensive margin or the extensive margin is explaining the differences in exports growth across Spanish regions. In particular, we can identify whether it is the entry rate, the extensive value rate, the survival rate or the deepening rate which drives the poorer performance of Spanish regions with respect to the

[7] All calculations have been performed using STATA 10.0. The codes and data are available on the web page: http://paginaspersonales.deusto.es/aminondo/Materiales_web/MR_Decomposition.rar

[8] In 2006, Galicia's GDP was 88% of Spanish regions' average GDP and its population was about 104% of Spanish regions' average population.

region with the highest export growth, i.e. Galicia. However, in order to analyse the robustness of these results, we perform a second set of counterfactual calculations using the average value of Spanish regions' growth components as counterfactual.

In each exercise, we perform two sets of counterfactual calculations. In the first set (Table 5), we use average growth components to calculate the counterfactual growth rates, whereas in the second set (Table 6) we use partner-specific growth components to calculate counterfactual growth rates. Moreover, the first set of counterfactual calculations is divided in two levels. In the first level, or benchmark case, we only allow the hazard and deepening rates to vary by year of service. In the second level, we allow the hazard and deepening rates to vary by year of service and industry, and the entry and extensive value rates by industry.

The first column in Table 5 reproduces the Spanish regions' average annual exports growth data presented in Table 1. The rest of the columns report how many percentage points would a regions' average growth rate increase or decrease if it happened to have Galicia's growth component. For example, if we take the first row, we can see that Andalusia's average growth rate would have been 1.52 percentage points higher if it had had Galicia's entry rate, 1.13 percentage points higher if it had had Galicia's extensive value, 3.05 percentage points higher if it had had Galicia's survival rate and 1.03 percentage points lower if it had had Galicia's deepening rate.

In the benchmark case, when we introduce Galicia's growth components as counterfactual, we observe that the most numerous positive impacts on growth occur under the counterfactual survival rate. In particular, if we analyse the counterfactual component that leads to a larger improvement in growth in each region, four times is the counterfactual the entry rate, three

times is the extensive value rate and nine times is the counterfactual survival rate. It is important to highlight that the deepening rate does not play any role in explaining Galicia's superior export growth. If we analyse region by region, we can see that an inferior survival is responsible for lower growth in Andalusia, Asturias, Canary Islands, Cantabria, Castille-León, Castille-La Mancha, Extremadura, Navarra and La Rioja. A milder entry rate explains the lower growth in Balearic Islands, Basque Country, Catalonia and Madrid. Finally, in the case of Aragón, Murcia and Valencia it is the extensive value which explains the lower growth. Therefore we conclude that the extensive margin plays an important role in explaining differences in exports growth across regions.

In the second exercise, we calculate separate growth components for industries. This exercise aims to analyse whether a few industries explain the differences between actual and counterfactual exports growth. The industry-specific components are calculated at the HS 1-digit disaggregation level. Although it is possible to compute growth components for a finer disaggregation (2, 4 or 6-digits industries), the results of the counterfactual exercises become less informative due to the influence of outlier components, specially in deepening and in extensive value. It is interesting to observe an increase in the role of the extensive margin and a reduction in the role of the intensive margin in explaining differences in exports growth across Spanish regions. In particular, the extensive margin (either the entry or the extensive value) constitutes the growth component that leads to the highest increase in growth in eleven regions; on its hand, the survival element of the intensive margin is the growth component that leads to the highest increase in exports growth in five regions. It is interesting to note, as well, that it is the value component, rather than the entry component, which leads to largest changes in growth within the extensive margin.

As explained above, the second set of counterfactual calculations use partner-specific growth components. In order not to ravel the analysis with too many partners, we decide to calculate separate growth components only for two groups of countries: the EU15 and the rest of countries. As can be seen in Table 6, the use of partner-specific growth components leads to very interesting results. The extensive value, and in particular the extensive value with non-EU15 countries, is the most important growth component. It constitutes the most important counterfactual growth component in Andalusia, Aragón, Asturias, Castille la Manche, Extremadura, Murcia, Navarre and Valencia. The entry rate with EU15 countries is the major driver of differences in exports growth in Balearic Islands, Basque Country, Catalonia and Madrid. Survival in EU15 countries is the third most important growth component, and it is the major driver of differences in Canary Islands and Castille-León. Finally, deepening with EU15 countries is the most important growth component for Cantabria. [9]

In order to analyse the robustness of these results, we perform a new counterfactual analysis using as benchmark the average of the Spanish regions' growth components.[10] The idea is to check whether Galicia's superior exports growth is based on components that also explained the better or lower performance of other Spanish regions. Although there are similarities between the results obtained in the first counterfactual exercise and the second counterfactual

[9] When we compare the results for some regions in the deepening component in Table 5 and Table 6 some apparently counter-intuitive situations emerge. For example, when we substitute Canary Islands' industry-specific deepening rates with Galicia's ones, Canary Islands' exports grow 7.15 percentage points more each year. But when we substitute Canary Islands' industry-specific deepening rates with EU15 countries with Galicia's industry-specific deepening rates with EU15 countries, Canary Islands' exports grow 7.45 percentage points less each year; in the case of non-EU15 countries Canary Islands' exports grow 3.29 percentage points less each year. Although it is an awkward result, it is possible to explain it due to the way the deepening rate, $d=(v_{t+1}-v_t)/v_t$ is calculated: v_t is the average value of all export relationships in year t, whereas v_{t+1} is the average value of those export relationships that survive between year t and year $t+1$. The relative number of non-EU15 countries and EU15 countries export relationships in year t, may be different from the relative number of non-EU15 countries and EU15 countries surviving relationships between t and $t+1$; due to this change, the relative position of the average value with respect to non-EU15 countries' value and to EU15 countries' value may vary between t and $t+1$. Due to this change the average deepening rate may be greater or smaller than both country-specific deepening rates, leading to the counter-intuitive results in the counterfactual calculations.

[10] We remove from the sample the two Spanish island regions: Canary Islands and Balearic Islands. The first region has had an atypical performance (negative export growth) compared to other Spanish regions; the second region has some growth components with outlier values.

exercise (Table 7a and Table 7b), the new results also introduce some nuances in the role played by some growth components. In the benchmark case, in 12 of the 16 regions, there is a coincidence in the growth component that contributes most to exports growth. As Galician deepening rate is below the average, in the new exercise the number of cases in which deepening is the most important component is as high as the number of cases for survival. In particular, deepening becomes the most important component for Balearic Islands, Canary Islands, Cantabria, Extremadura and Galicia. As was the case in the first exercise, in the benchmark analysis the intensive margin plays a larger role than the extensive margin, although the role of the latter is substantial.

When growth components are differentiated by industry, we also find that a large number of coincidences (10 over 16) in the growth component that leads to higher growth. We should stress the increase in the role of deepening, which becomes the component that drives the largest positive impact on exports growth for the majority of regions. On its hand, there is a reduction in the role of survival and the extensive value. Finally, the entry rate seems almost as important as the extensive value explaining the differences in exports growth along the extensive margin. Finally, when we calculate partner-specific exports growth components, we find, as well, a large number of coincidences (11 over 16); we also confirm the larger role for deepening and a lower role for the extensive value.

To sum up, the use of the average Spanish region as a counterfactual confirms most of the conclusions that are drawn from the first exercise, although it introduces some nuances in the role of some components. First, we still find that both the extensive and intensive margins play a role in explaining exports growth across Spanish regions. Contrary to the results obtained in the first exercise, we find that both the entry rate and the extensive value play a

role in the extensive value. As in the first exercise, we find that the extensive value plays a larger role in explaining the differences in exports growth in non-traditional markets, whereas the entry rate plays a larger role in explaining the differences in exports growth in traditional markets. Thirdly, the new counterfactual analysis gives a larger role to the deepening in explaining the differences in exports growth across Spanish regions. Finally, we still observe a great deal of heterogeneity across regions in the component that contribute the most to international exports growth.[11]

4. Conclusions

This paper investigates the role of extensive and intensive margins on international export growth among Spanish regions over the period 1988-2006. For that purpose we apply the accounting framework proposed by Felbermayr and Kohler (2006) and extended by Besedes and Prusa (2007) to measure the relative importance of these two terms in global export growth. We provide two innovative improvements to this new methodology. Firstly, we decompose the extensive margin into an entry and a value component; this decomposition enables us to determine whether the capacity to open a large number of relationships or the ability to choose new markets which command a large exports value drives growth at this margin. Secondly, we also take into account differences in the hazard, deepening, entry and extensive value rates by country destination. This partner-specific decomposition allow us to analyse whether a region's higher exports growth is explained by the superiority of some of its exports growth components in all trade relationships, or by the superiority of some of its exports growth components in some trade relationships.

[11] As an additional robustness test, we have also recalculated all growth components and counterfactual figures when trade relationships are defined at the regional level (NUTS-2). Our results are not altered either.

Our results show that the extensive margin plays a key role in explaining differences in exports growth across regions, much more than the one found using country-level data. In addition to that, the partner-specific decomposition shows that the extensive value plays a key role explaining the differences in exports growth in non-traditional markets for Spanish regions, such as non-European Union markets; on its hand, the survival, deepening and entry components play a larger role explaining the differences in exports growth in traditional markets (European Union). We also find a great extent of heterogeneity in component (survival, deepening, entry and extensive value) that contributes the most to exports growth across regions. Our results lead to relevant policy recommendations. First, in non-traditional markets, the capacity to select markets and products that command a high demand capacity is more important than the maximisation of new export relationships to achieve faster growth in exports. Second, due to the heterogeneity across regions in the component that can contribute most to exports growth, policies should be designed at a regional level.

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Table 1. Spanish regions' exports real growth, 1988-2006

Region	Total growth (%)	Average annual growth (%)
Andalusia	268	7.51
Aragón	222	6.71
Asturias	300	8.00
Balearic Islands	428	9.68
Basque Country	257	7.33
Canary Islands	-34	-2.29
Cantabria	352	8.74
Castille la Manche	358	8.82
Castille-León	404	9.40
Catalonia	379	9.10
Extremadura	449	9.92
Galicia	697	12.23
Madrid	311	8.17
Murcia	243	7.09
Navarre	365	8.92
Rioja	365	8.92
Valencia (Com. of)	167	5.60

Source: authors' calculations based on Agencia Tributaria's trade database.

Table 2. Extensive margin

	Growth of exports (%)	Growth in export relationships (%)	Realized potential in 1988 (%)	Realized potential in 2006 (%)	Entry rate (avg.; %)	Extensive value (avg.; %)
Andalusia	268	215	1.56	3.95	52.23	25.60
Aragón	222	228	0.73	1.92	49.32	13.39
Asturias	300	182	0.24	0.55	53.82	39.01
Balearic Islands	428	115	0.25	0.42	57.53	73.28
Basque Country	257	84	2.97	4.37	44.00	27.99
Canary Islands	-34	-11	0.35	0.25	69.40	20.10
Cantabria	352	236	0.20	0.55	51.32	30.77
Castille la Manche	358	313	0.44	1.46	55.61	27.51
Castille-León	404	202	0.68	1.64	52.66	15.85
Catalonia	379	125	7.87	14.21	36.62	17.07
Extremadura	449	216	0.17	0.44	50.40	20.94
Galicia	697	440	0.78	3.37	50.40	24.53
Madrid	311	109	3.20	5.35	44.81	26.73
Murcia	243	178	0.57	1.26	44.49	17.65
Navarre	365	153	0.51	1.03	46.61	15.04
Rioja	365	169	0.21	0.46	49.34	15.72
Valencia (Com. of)	167	179	3.02	6.76	45.76	12.21

Source: authors' calculations based on Agencia Tributaria's trade database.

Table 3. Survival rates

Region	% of exports that survive after 1 year	% of exports that survive after 2 years	% of exports that survive after 5 years
Andalusia	39.7	25.0	13.1
Aragón	42.4	27.9	15.4
Asturias	38.2	23.8	12.0
Balearic Islands	33.3	19.3	9.1
Basque Country	40.2	25.1	12.7
Canary Islands	24.8	11.3	3.8
Cantabria	41.0	26.7	14.4
Castille-La Mancha	40.4	26.2	14.2
Castille-León	39.2	25.5	13.2
Catalonia	47.0	31.6	17.9
Extremadura	40.9	27.8	15.9
Galicia	46.8	33.5	22.0
Madrid	41.3	25.6	12.9
Murcia	42.1	27.6	14.8
Navarre	41.6	26.8	14.0
Rioja	40.0	25.5	13.1
Valencia (Com. of)	42.1	27.1	14.4

Source: authors' calculations based on Agencia Tributaria's trade database.

Table 4. Export deepening

	Long term relationships			Year to year survivors
Region	Fraction of 2006 relationships (%)	Fraction of 2006 trade value (%)	Growth of trade value (average annual growth; %)	Median growth rate (%)
Andalusia	0.24	0.08	1.44	2.77
Aragón	0.19	0.05	1.50	4.74
Asturias	0.24	0.07	1.33	3.62
Balearic Islands	0.28	0.20	2.86	-0.19
Basque Country	0.19	0.08	2.09	3.13
Canary Islands	0.34	0.15	-0.14	-5.42
Cantabria	0.21	0.11	1.71	4.08
Castille la Manche	0.23	0.08	1.15	3.89
Castille-León	0.22	0.06	1.20	1.03
Catalonia	0.14	0.07	2.20	4.74
Extremadura	0.17	0.05	1.18	1.11
Galicia	0.16	0.08	1.58	10.61
Madrid	0.18	0.07	1.68	3.36
Murcia	0.18	0.07	1.69	3.70
Navarre	0.19	0.06	1.92	2.43
Rioja	0.22	0.05	1.83	2.39
Valencia (Com. of)	0.18	0.06	1.36	2.40

Source: authors' calculations based on Agencia Tributaria's trade database.

Table 5. Counterfactual calculations based on Galicia as a benchmark.

	By year of service (Benchmark)				By year of service and industry			
	Actual growth(%)	Entry	Extensive value	Survival	Deepening	Entry	Extensive value	Survival	Deepening
Andalusia	7.51	1.52	1.13	3.05	-1.03	0.17	2.30	1.66	-0.56
Aragón	6.71	1.15	3.82	2.59	-2.38	0.36	5.57	0.22	0.10
Asturias	8.00	2.03	-2.87	3.60	-0.86	-1.80	-0.02	2.41	-0.59
Balearic Islands	9.68	7.32	-25.93	6.15	4.28	6.67	-25.86	4.58	5.02
Basque Country	7.33	4.60	-1.34	2.50	-0.91	2.78	1.43	1.06	-0.22
Canary Islands	-2.29	7.03	6.96	11.93	5.81	4.86	9.03	10.68	7.15
Cantabria	8.74	1.62	-1.91	3.02	-0.04	0.37	-0.48	1.36	1.25
Castille la Manche	8.82	-0.09	0.87	3.10	-1.38	-1.17	2.23	1.92	-0.72
Castille-León	9.40	1.16	1.17	3.74	-3.78	0.62	1.92	2.40	-1.17
Catalonia	9.10	2.97	0.61	0.45	-0.71	2.60	1.28	-0.83	0.32
Extremadura	9.92	1.22	0.51	1.71	-0.56	-0.01	1.45	0.40	-0.72
Galicia*	12.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Madrid	8.17	3.87	-1.71	2.40	-0.18	2.90	-0.25	0.89	0.84
Murcia	7.09	2.09	2.25	1.85	-0.34	1.53	3.43	0.63	-0.34
Navarre	8.92	1.97	1.25	2.58	-2.25	1.04	2.76	0.40	0.20
Rioja	8.92	1.59	1.34	3.32	-3.40	1.45	1.95	2.48	-3.77
Valencia (Com. of)	5.60	1.53	4.41	2.27	-0.86	1.58	4.52	1.36	1.10

Source: authors' calculations based on Agencia Tributaria's trade database.
Note: * Benchmark region. The counterfactual figures report how many percentage points would a regions' average growth rate increase or decrease if it happened to have Galicia's growth component. For example, if we take the first row, we can see that Andalusia's average growth rate would have been 1.52 percentage points higher if it had had Galicia's entry rate.

Table 6. Counterfactual calculations with partner-specific growth components based on Galicia as a benchmark.

By year of service, industry and group of countries	EU15 countries				Rest of countries			
	Actual growth(%)	Entry	Extensive value	Survival	Deepening	Entry	Extensive value	Survival	Deepening
Andalusia	7.51	0.80	-0.34	1.40	0.07	-0.58	2.75	-0.55	0.22
Aragón	6.71	0.87	0.67	0.07	1.80	-0.18	5.59	-0.46	-0.03
Asturias	8.00	1.08	-2.14	1.30	-0.96	-2.64	2.14	0.27	0.75
Balearic Islands	9.68	9.44	-22.80	4.11	5.14	1.38	4.68	0.27	1.00
Basque Country	7.33	2.60	-0.69	0.46	0.20	0.63	2.46	-0.68	0.41
Canary Islands	-2.29	3.17	2.98	8.43	-7.45	2.39	8.04	5.54	-3.29
Cantabria	8.74	1.25	-2.25	0.88	1.74	-0.68	1.62	-0.21	0.45
Castille la Manche	8.82	-0.38	-1.74	1.26	0.69	-0.54	3.32	0.45	0.07
Castille-León	9.40	0.02	-0.43	2.58	0.20	0.45	2.13	0.31	-0.56
Catalonia	9.10	2.62	-0.45	-0.83	1.01	0.91	1.93	-1.08	0.08
Extremadura	9.92	-1.16	-0.45	0.64	-0.06	0.82	1.36	0.27	0.02
Galicia*	12.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Madrid	8.17	3.04	-0.92	0.11	1.06	0.55	1.15	-0.74	0.64
Murcia	7.09	1.62	0.16	0.10	0.64	0.25	3.55	-0.51	0.09
Navarre	8.92	1.17	-0.14	0.36	1.78	0.19	3.05	-0.50	-0.56
Rioja	8.92	1.17	-0.63	1.76	-1.11	0.56	2.50	0.44	-0.17
Valencia (Com. of)	5.60	1.68	0.58	0.28	2.11	0.32	4.60	-0.04	0.25

Source: authors' calculations based on Agencia Tributaria's trade database.
Note: * Benchmark region. The counterfactual figures report how many percentage points would a regions' average growth rate increase or decrease if it happened to have Galicia's growth component. For example, if we take the first row, we can see that Andalusia's average growth rate would have been 0.80 percentage points higher if it had had Galicia's entry rate with EU15 countries.

Table 7a. Robustness analysis. Counterfactual calculations based on the average Spanish region as a benchmark

		By year of service (Benchmark)				By year of service and industry			
	Actual growth(%)	Entry	Extensive value	Survival	Deepening	Entry	Extensive value	Survival	Deepening
Andalusia	7.51	-0.91	0.32	0.99	0.68	-0.76	0.07	0.44	0.87
Aragón	6.71	-0.32	3.25	-0.11	-0.53	-0.50	3.48	-0.79	-0.76
Asturias	8.00	-1.22	-4.37	1.75	1.56	-3.31	-3.58	1.41	1.70
Balearic Islands	9.68	1.80	-26.13	4.19	6.53	4.36	-26.33	3.94	5.97
Basque Country	7.33	2.48	-2.11	0.35	0.76	1.99	-1.21	0.08	0.70
Canary Islands	-2.29	3.31	5.81	10.45	12.74	3.68	5.55	9.62	-3.63
Cantabria	8.74	-1.25	-3.03	0.69	1.79	-1.19	-3.20	0.13	1.73
Castille la Manche	8.82	-2.78	0.02	0.87	0.76	-2.53	-0.31	0.44	0.70
Castille-León	9.40	-0.53	0.59	1.45	-2.45	-0.21	0.41	1.58	-3.38
Catalonia	9.10	1.60	0.22	-2.36	-0.04	1.75	0.04	-2.75	-0.31
Extremadura	9.92	-0.53	-0.08	-0.76	0.24	-0.80	-0.22	-1.49	0.22
Galicia	12.23	-1.61	-0.56	-2.19	0.95	-0.58	-1.37	-1.30	-0.25
Madrid	8.17	1.70	-2.52	0.02	1.13	1.77	-2.80	-0.30	0.80
Murcia	7.09	0.36	1.65	-0.74	0.69	0.51	1.54	-1.09	0.96
Navarre	8.92	0.48	0.74	-0.01	-1.37	0.15	1.03	-0.58	-1.45
Rioja	8.92	-0.03	0.79	1.01	-1.97	0.29	0.39	0.51	-1.96
Valencia (Com. of)	5.60	0.12	3.86	-0.45	0.00	0.77	3.08	-0.95	-0.66

Source: authors' calculations based on Agencia Tributaria's trade database.
Note: Average Spanish regions' (except Canary Islands and Balearic Islands) growth components are used as counterfactuals. The counterfactual figures report how many percentage points would a regions' average growth rate increase or decrease if it happened to have Galicia's growth component. For example, if we take the first row, we can see that Andalusia's average growth rate would have been 0.91 percentage points lower if it had had the average Spanish regions' entry rate.

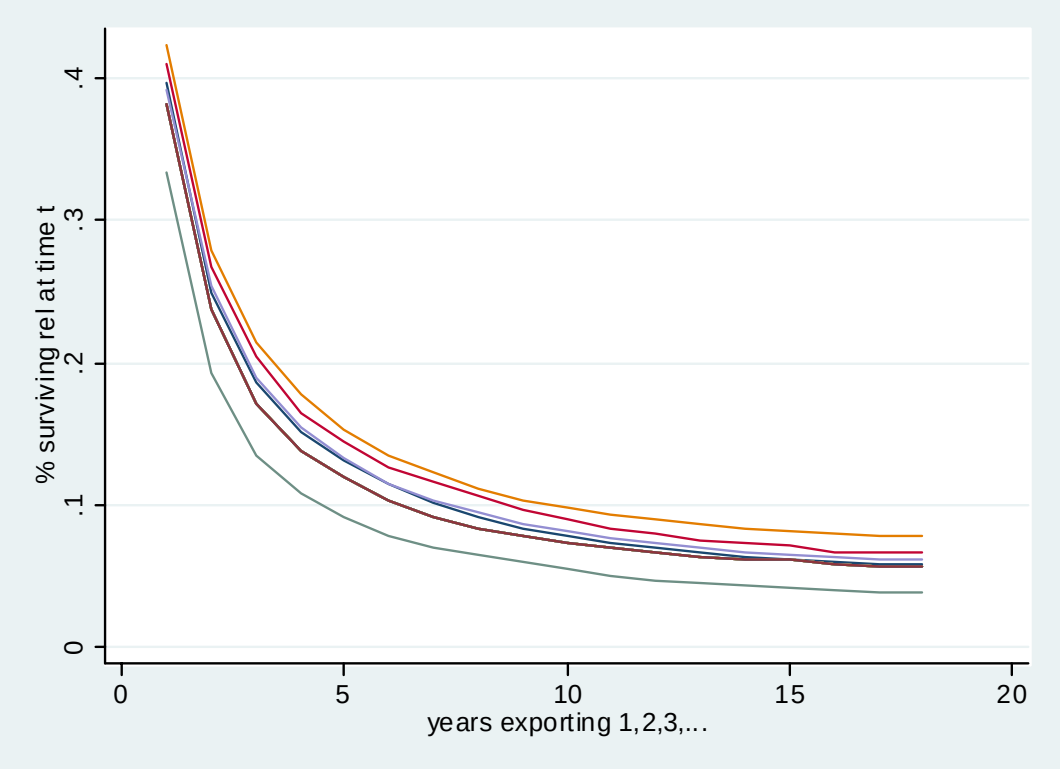
Table 7b. Robustness analysis. Counterfactual calculations with partner-specific growth components based on the average Spanish region as a benchmark.

By year of service, industry and group of countries	EU15 countries	Rest of countries

	Actual growth(%)	Entry	Extensive value	Survival	Deepening	Entry	Extensive value	Survival	Deepening
Andalusia	7.51	-0.18	0.40	0.63	0.41	-0.50	-0.33	-0.32	0.54
Aragón	6.71	-0.05	1.22	-0.60	0.43	-0.35	2.66	-0.32	-0.09
Asturias	8.00	-0.24	-1.24	0.61	0.36	-2.63	-1.98	0.57	1.25
Balearic Islands	9.68	6.00	-22.58	3.58	5.09	0.82	-13.37	0.77	1.47
Basque Country	7.33	1.54	-0.26	-0.17	-0.04	0.72	-1.05	-0.37	0.78
Canary Islands	-2.29	0.80	4.50	7.68	-1.13	3.11	2.61	5.21	1.08
Cantabria	8.74	-0.31	-1.37	0.11	1.39	-0.83	-1.34	-0.09	0.64
Castille la Manche	8.82	-1.82	-0.82	0.24	1.23	-0.74	0.65	0.22	0.35
Castille-León	9.40	-0.97	0.31	2.01	-2.53	0.33	0.42	0.43	-0.52
Catalonia	9.10	1.60	-0.25	-1.83	-0.05	0.68	0.16	-1.33	1.11
Extremadura	9.92	-2.09	0.35	-0.74	0.39	0.69	0.01	0.25	0.13
Galicia*	12.23	-0.46	0.50	-0.87	-0.90	0.05	-1.82	-0.04	0.30
Madrid	8.17	1.85	-0.60	-0.59	-0.12	0.32	-2.23	-0.60	1.71
Murcia	7.09	0.63	0.60	-0.93	1.11	0.01	0.90	-0.65	0.94
Navarre	8.92	0.20	0.29	-0.24	-0.29	0.02	0.80	-0.33	-0.53
Rioja	8.92	0.08	-0.08	0.41	-0.57	0.23	0.52	0.12	-0.30
Valencia (Com. of)	5.60	0.87	1.11	-0.89	0.52	0.11	2.15	-0.94	0.73

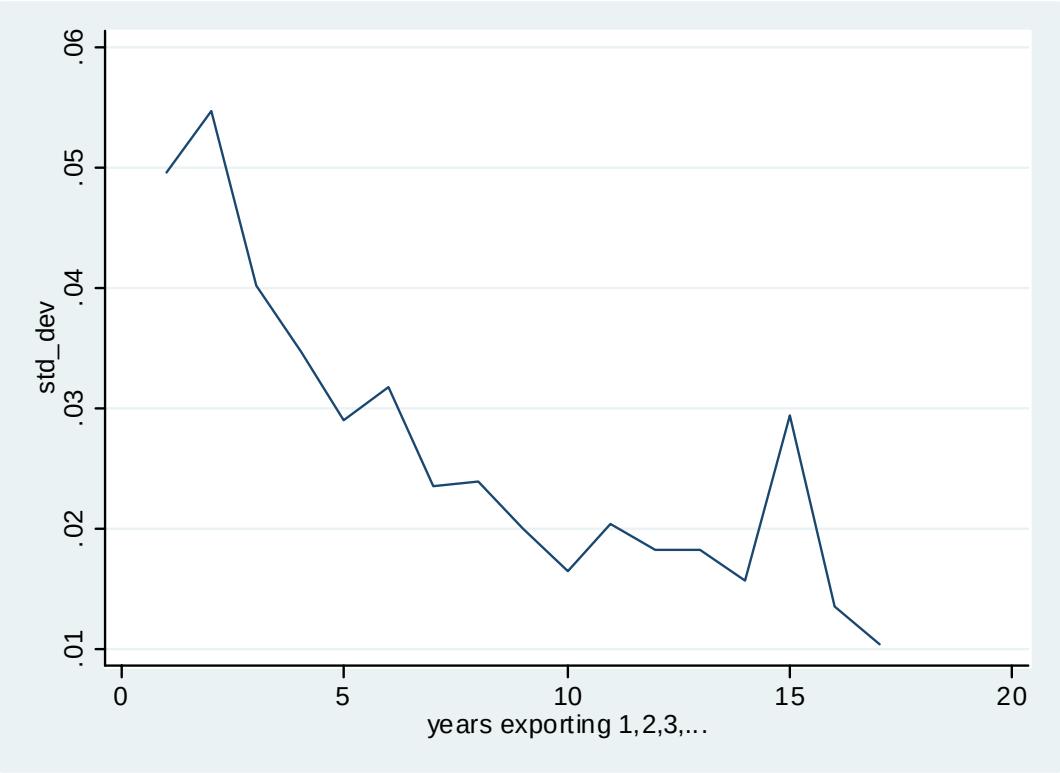
Source: authors' calculations based on Agencia Tributaria's trade database.
Note: Average Spanish regions' (except Canary Islands and Balearic Islands) growth components are used as counterfactuals. The counterfactual figures report how many percentage points would a regions' average growth rate increase or decrease if it happened to have Galicia's growth component. For example, if we take the first row, we can see that Andalusia's average growth rate would have been 0.91 percentage points lower if it had had the average Spanish regions' entry rate.

Figure 1. Export survival



Source: authors' calculations based on Agencia Tributaria's trade database.

Figure 2. Hazard rate standard deviations across Spanish regions by year of service



Source: authors' calculations based on Agencia Tributaria's trade database.