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Small and internationalized firms competing with Chinese exporters

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Abstract

The import competition literature suggests that Chinese industrial policies and technological trends have altered the nature of competition with China so that it does not take place on a level playing field anymore. Empirical evidence about firms' reactions in developed economies to competition with China is inconclusive, however. This paper studies how small, highly internationalized and specialized firms react to the growing penetration of Chinese exporters on their markets. We use a sample of Austrian manufacturing companies to explore the impact of increasing competition on changes in corporate strategy. We propose a novel indicator capturing import competition that highly internationalized companies face. We examine how firms adapt their search strategies related to technological capabilities and markets. While the exposure to Chinese competition has been on average relatively low, its impact on diversification choices has been significant. Companies exposed to growing Chinese competition are more likely to diversify their geographic markets, but less likely to diversify their product portfolio or broaden their competence base. These patterns are also reflected by changes in trade data.

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1. Introduction

The last decades have seen a wave of internationalization of firms from, often state-owned, Chinese firms appearing as global competitors (Athreye and Kapur 2009) offering cost-competitive and increasingly technologically advanced products (Hoberg, Li, and Phillips 2021). The effects of competition from Chinese firms on incumbents in industrialized economies have become subject of growing interest of multiple research disciplines, such as general management, strategy, or economics.

The debate has been triggered by Autor, Dorn, and Hanson (2013) showing regional labor displacing effects of Chinese import competition in the United States, even though cross-country differences have become evident (Bloom, Draca, and Van Reenen 2016; Yamashita and Yamauchi 2019). The management literature has studied the topic in terms of the strategic adjustment of firms to import penetration where the latter is defined as an increase in the number of competitors in a company's core markets. Import penetration has been found to increase efficiency pressures due to tighter profit margins and lower prices (Zahra 1996; Frésard and Valta 2015). As competition becomes fiercer and affects profits and bankruptcy risk (Amiti and Konings 2007), firms adjust their strategies. The strategy literature has mainly focused on three distinct strategic dimensions: internationalization, product diversification (Becerra, Markarian, and Santalo 2020; Ljubownikow and Ang 2020) and technological search (Morandi Stagni, Fosfuri, and Santaló 2021).

This paper empirically studies the strategic responses to Chinese competition by small, highly specialized, and heavily internationalized firms. Drawing on granular industry-level trade data, we propose an indicator measuring competition on both domestic and foreign markets. We rely on survey data from 2016 that allows studying multiple aspects of diversification simultaneously. We use within-sample differences of a unique dataset of Austrian

manufacturing firms to identify the impact of both levels and changes in Chinese import competition on diversification and competence building choices.

Our contributions to the literature are threefold:

First, it expands previous research on diversification by simultaneously studying firms' choices related to their geographical market, product portfolio, competence base and business fields. The strategic reaction to international competition depends on the characteristics of the competition (Jansen, Van Den Bosch, and Volberda 2006). Low cost – low quality entrants will trigger different responses than high-cost high-quality entrants. We argue that China captures a low-cost – high quality segment, for which the literature does not offer stylized response patterns.

Second, we make a methodological contribution by proposing a novel indicator of import competition for highly internationalized firms that considers both domestic activities and the weighted breadth of internationalization of export activities.

Third, our results have practical implications. We provide a micro-foundation to macroeconomic trade analyses by providing evidence if and how firms react to competition from Chinese exporters. This is relevant for policy makers, managers and the implications of the strategic management and international business literatures.

2. A short survey of the literature

Characteristics of competition with China

There is ample literature on the strategic behavior of firms facing international competition (Bowen and Wiersema 2005; Bowen, Baker, and Powell 2015), which leads to the question, why should competition from China be different? The particular characteristics of the Chinese competition have already been highlighted by a burgeoning literature arguing that it differs from both other low-wage and OECD countries (Mion and Zhu 2013). Discussing the nature of import competition with China, we draw on literature that argues that

- Technology has changed the nature of the international division of labor, and that
- Chinese industrial policies have led to an uneven level-playing-field.

Baldwin (2011) argues that the dynamics of international competition has changed due ICT which facilitates knowledge transfer. This led to a more granular division of labor, shifting international competition from the firm-level to the production stage. Companies with more sophisticated manufacturing know-how offshored some production stages to China, which led to a knowledge transfer. China attracted production stages in its earlier stages of development rather than establish more complex sectoral structures. This sped up otherwise lengthy industrialization processes. Also, the transformation of the Chinese firm base was driven by a proactive state implementing a multifaceted range of industrial policies (Mazzucato 2011). Pivotal has been technology imitation, which especially in the years prior to the survey year, was combined with indigenous R&D. The technologies have added to local competence base that eventually enter overseas markets through exports rather than global value chains with international partner firms (Zhang and Zhou 2016).

Over and above technology, the Chinese industrial development has been accompanied by subsidies and an institutional setup that allows keeping wages from increasing at pace with the productivity development. The promotion of selected firms distorts competition (Barwick, Kalouptsidi, and Bin Zahur 2019; Barbieri et al. 2019; Tian 2020). This has affected international markets. For instance, Chinese subsidies caused over-capacities in the global steel industry. Chinese producers gained a competitive advantage at the cost of incumbent producers (Price et al. 2016). In other cases, the combination of technology transfer, imitation -esp. since firms were not allowed entry to China without establishing joint ventures that transferred technology- and subsidy policies have undermined competitors of Chinese firms, like in the photovoltaic industry (Zhang and Gallagher 2016).

Altogether, this put Chinese firms into a highly competitive position. Incumbents -often from high-income countries- competing with Chinese firms not only face price competition, but also

compete against an increasingly sophisticated product portfolio. Imports from China rose sharply after its WTO accession on December 11, 2001. Its export portfolio has rapidly become sophisticated. Chinese exports are not confined to low-tech, low-cost sectors as was the case during the first phase of rapid industrial development in the 1990s (Athukorala 2009; Ding, Sun, and Jiang 2015).

Multiple studies have shown that imports from China tend to drive less productive firms in industrialized countries out of the market. More productive, technologically advanced firms are able to escape import competition by innovation and technological upgrading (Bernard, Redding, and Schott 2011; Bloom, Draca, and Van Reenen 2016; Yamashita and Yamauchi 2019; Mion and Zhu 2013). However, recent empirical studies cast doubt on the growth enhancing effects of import competition with China, with firm heterogeneity (e.g., R&D or technology intensity) playing a moderating role (Hombert and Matray 2018; Mion and Zhu 2013). The magnitude of the adverse effects is new when compared to older results for competition from low wage economies (Bernard, Jensen, and Schott 2006).

Small and highly internationalized firms

Drawing on Austrian data, we rely on a country context that poses a viable setting for the discussion of conjectures posed. Austria is a small, open economy whose firms are well embedded in value chains of medium-high tech sectors (Reinstaller and Friesenbichler 2020; Hölzl et al. 2019). Being an economy that is at the technological frontier, its firm growth pattern is driven by innovation and internationalization (Friesenbichler and Hoelzl 2022). Its firms tend to be small, highly specialized, and internationalized. Its competitive positioning has increasingly been challenged by firms from emerging economies (Friesenbichler and Reinstaller 2022), especially from China. China's manufacturing firms have undergone rapid technological upgrading since the early 2000s, and – at least in certain industries - now compete on a technological level playing field with firms from high-income countries (Athukorala 2009;

Ding, Sun, and Jiang 2015). This may put the manufacturing base of developed economies, a productivity growth driver (Friesenbichler and Glocker 2019), at risk.

Austria is small enough compared to its trading partners that its policies do not alter overall economic outcomes. Its home market is small, and its companies are characterized by a relatively higher degree of reliance on international markets with respect to both production networks and sales orientation. While there are examples of large global players from small open economies, most exporting companies tend to be small niche players with a narrow specialization that allows them developing competitive advantages through deepening their knowledge and competence base. In this way they escape price competition through quality upgrading (Autio and Yli-Renko 1998; Kahiya 2020). Given their size, their competence base for the creation of new foreign markets is more limited than that of large, more resource rich multinational companies (Barney 2001). Smaller, highly specialized companies are thus likely to react differently than bigger companies enjoying larger domestic markets. The bulk of the literature focuses on the latter.

Stylized response patterns

Discussing product diversification and the international scope, the literature has identified three distinct response patterns to import penetration:

- escape-competition,
- globalfocusing,
- retrenchment

The “escape hypothesis” posits that companies react offensively when facing foreign competition and entry into their markets (Rumelt 1974; Rumelt, Schendel, and Teece 1991). They diversify into new areas both in terms of the scope of their product portfolio and in terms of the international scope of their activities. This is in line with the “trapped factor model” (Bloom et al. 2013), in which firm specific factors (e.g., skillsets) prevent the movement of

inputs across firms. This reduces the opportunity cost of fixed inputs in firms exposed to import competition, which yields an increase in innovative activity leading to a permanent increase in the level of technological varieties in the economy. Using data from a survey among managers, Bowen, Baker, and Powell (2015) show that increased foreign competition induces managers to increase the international scope of their export activities and the diversification of their product portfolios.

Bowen and Wiersema (2005) document a more defensive response pattern referred to as "globalfocusing". They show for the US that firms exposed to foreign competition increased their strategic focus. They were found to reallocate resources towards their key portfolio and core competencies, supporting the idea that competition leads to firms concentrating on their most successful products. Similarly, Hutzschenreuter and Gröne (2009) find that firms reduce the diversification of their product portfolio in response to increased import competition. However, replicating the analysis of Bowen and Wiersema (2005) with alternative econometric methods, Becerra, Markarian, and Santalo (2020) find that the negative relationship between product diversification and import penetration vanishes once one controls for firm level fixed effects. This indicates systematic unobservable differences between firms.

The most defensive response pattern has been found for firms in South East Asia (Chakrabarti, Vidal, and Mitchell 2011). Studying firms' economic reconfiguration when exposed to growing foreign competition, the authors observe the adoption of a "retrenchment strategy". This is especially pronounced for companies on the lower end of the performance spectrum. Less productive and technologically less capable firms are more likely to withdraw to both their core competencies and their core geographic markets.

These response patterns are evidently heterogenous and difficult to generalize. While there are some generic criteria that firms consider in their strategic response, the economic characteristics and the framework condition constraining the choices of both entrants and firms exposed to

increased competition eventually shape the observed reaction patterns. This may be the reason why prior research has not found a clear cut and systematic response pattern.

3. Theoretical considerations and conjectures

The stylized response patterns are likely to be shaped by the expected likelihood of entry and subsequent displacement by Chinese competitors at given prices, quantities, and market sizes. Hence, a generic response to increased competition in a core market is to focus on products where the likelihood of displacement is minimized and both the price-cost margin and the likelihood of successful innovation are maximized. The entry of cost-competitive Chinese competitors with similar technological capabilities in multiple international markets will trigger multiple adjustments, especially when incumbents are highly internationalized with a rather narrow product portfolio and a broad international scope.

We propose a conjecture on the potential response of Austrian exporters to Chinese market entry. We consider the factors shaping the displacement probabilities and the cost of adjusting the international scope. Given their relatively limited resource base in relation to exporting, Austrian firms are likely to adjust their international scope and diversify into related markets. The exploration of geographically and culturally more unrelated markets requires additional competencies, whose development is costly and risky. Yet, Chinese exporters are likely to be culturally (and geographically) more remote to the markets served by Austrian companies. Minimize the displacement risk may entail entering geographically more distant, but culturally closer markets, from which follows our first conjecture:

Conjecture I: The more intense competition from China in multiple geographical markets, the greater the likelihood to diversify into new geographic markets.

We next propose conjectures of the impact of Chinese market penetration on Austrian firms on competence development. Small internationalized firms tend to have comparatively narrow competence bases and draw on economies of specialization. They are able to generate improvements of existing products more efficiently or develop new products if these build on this competence base.

While this increases the likelihood of successful innovation, it negatively affects the displacement likelihood if the competence base is specific and cumulative, and if competitors have similar generic technological capabilities but less specific niche competencies. The cumulativeness implies that a competitive price-cost margin can be achieved relative to competitors with more generic capabilities (Breschi, Malerba, and Orsenigo 2000).

On the other hand, the literature has shown that broader technological search and exploration is key for long term survival in changing competitive environments (Bottazzi and Secchi 2006; Saviotti and Frenken 2008; Reinstaller and Reschenhofer 2019). Firms reduce the displacement likelihood if they broaden their competence base and change their product scope by developing complementary or new capabilities (Klepper 2010). They therefore trade-off short-term and long-term firm value. However, Morandi-Stagni et al (2021) argue that the time of gestation of these innovations is critical. If the development time is relatively long compared to competitive pressures, then firms have an incentive to exploit their cumulated capabilities and reduce explorative competence building and innovation.

Firms focus on their cumulated capabilities and core competencies if they have a specialization advantage over Chinese entrants, a relatively narrow competence base and perceive the Chinese entrants as an imminent threat. From this follows the second conjecture:

Conjecture II: More intense competition from China in multiple geographical markets will be negatively related to the development of new technological competencies.

Conjecture III and IV are derived from Conjecture II. The diversification of products and the competence base are intrinsically linked as sequential choices about market entry and are shaped by the firm-specific competence base (Helfat and Raubitschek 2000; Helfat and Eisenhardt 2004; Teece et al. 1994; Bryce and Winter 2009). If firms are narrowly specialized, serve small market niches and focus on strategies exploiting existing capabilities and competencies, then it is likely that they will refrain from increasing their product scope. They will rather focus on binding customers through better product performance. This is a consequence of their exploitation strategies in the competence space and their limited resources relative to large multinational firms. These mechanisms should also be reflected in their business strategy on core business fields.

Conjecture III: More intense competition from China in multiple geographical markets will be negatively related to product diversification.

Conjecture IV: More intense competition from China in multiple geographical markets will be positively related to a focus on core business fields.

4. Measuring Chinese market penetration

Relevant market

Testing these conjectures empirically requires data containing both firms' strategic reactions (see below) and changes in market penetration (Aguinis, Ramani, and Cascio 2020). The literature on import competition with Chinese exporters focuses on domestic markets. This approach may be suitable for large, relatively closed economies. Yet, it may lead to a biased picture when studying firms in a small, open economy that trade heavily and compete internationally. For instance, 57% of the firms in our sample generate at least three quarters of their sales revenue from exports. To overcome this issue of defining the relevant market, we

compute a weighted, international competition indicator which captures trade ties. We use granular trade data at the six-digit level of the Harmonised System (HS) aggregated to the NACE 4-digit level using correspondence tables from Eurostat (see the Annex for a detailed data description).

The importance to study the Chinese competition in export markets is illustrated by Figure 1 which plots the development of the share of Chinese imports and market penetration measures over time. Chinese import penetration ratios have increased globally, from 8.2% in 1999 to 22% in 2017. In Austria, this increase in this period was more modest: it increased from 2.3% to 6.6%. However, using the weighted indicator for the intensity of competition with Chinese exporters in Austrian export markets changes the picture. With a rise from 3.6% to 10%, this indicator is more in line with the international trends and lesser with the Chinese import penetration in Austria, even though the exposure remains relatively modest by international (or US) standards. The indicator underscores that Austrian firms have encountered Chinese competition to a greater degree on international markets than they have in their home market.

Figure 1 about here

Defining a competition measure for heavily internationalized firms

The measure of competition from Chinese exporters is computed in a stepwise approach. First, we compute Chinese market shares for all product-market combinations in which Austrian exporters are active to obtain an industry-level intensity of competition in markets abroad. Second, we calculate the import penetration of Chinese exporters on domestic markets. We then construct an indicator capturing both competition of foreign and domestic markets at the firm level. Using information from the survey about export intensities allows us to generate an overall import competition indicator considering both domestic and export markets (see Annex

for details). In the analysis, we jointly use the level of the intensity of competition $IC_{CN:AT,I,t}$ for the base year 2011 and the changes of the intensity of competition ΔIC in the period between 2011 and 2016.

This indicator captures the exposure of highly internationalized firms to Chinese competition more adequately than measures of domestic import penetration. Yet, there are two notable shortcomings. First, albeit using survey weights based on firms' export shares, there is no exact match between the firm level and the indicators $IC_{CN,k,t}$ and $\Delta IC_{CN,k}$, i.e. they are imputed values that do not perfectly correspond to the factual import intensity experienced by the surveyed firm. However, the industry-level chosen is highly granular which, in a small economy like the Austrian, reduces possible bias due to the imputation. In the survey year 2016, fewer than 2,000 firms with more than 50 employees were active in Austrian manufacturing. Given that the NACE-4-digit level provides a total of 133 distinct classes for which we observe exports, the average number of firms allocated to each class is very low. In our sample, only 2.1 firms are on average assigned to a NACE-4-digit class. Exports are concentrated on the larger firms. The average firm size across NACE-4-digit classes is 377.5 employees, which is relatively large by Austrian standards.

Second, one could argue that the development of the exposure to Chinese import competition is driven by general developments in trade such as ICT imports from China. In the period analyzed, both global trade and exposure to Chinese exporters have expanded fast. We address this concern statistically in the regression analysis by using instrumental variable approaches.

The distribution of the intensity of competition, $IC_{CN,k,t}$, in 2011 in the left panel of Figure 2: shows that more than 40 percent of the firms faced relatively little competition from Chinese importers.[1] The distribution is skewed to the right indicating that a large number of firms in our sample has experienced some competition from Chinese exporters in their key markets in 2011.

[1] The backward-looking questions of the survey asked to characterize firm strategies five years prior to the survey year. The indicator values for 2011 therefore characterize the intensity of competition at the point in time to which these questions refer.

Yet, for a small subsample the intensity was substantial. For the median company the indicator value is close to 0.03 or 3% imputed market share of Chinese exporters in the firms' markets, for the company at the 75% percentile it increases to 0.08 and for the company at the 90% percentile it increases to 0.18.

Figure 2: about here

The right panel of Figure 2: shows the changes in the intensity of competition from Chinese exporters $\Delta IC_{CN,k}$ over the observed five-year period. The changes have been positive, but moderate. The average increase has been 0.0004 or 0.04 percentage points with a minimum of -0.26 and a maximum of 0.09, i.e. some companies have experienced a marked decrease in the intensity of competition. For the company at the 75% percentile, the change was 0.01 or 1 percentage points and for the company on the 90% percentile the change was 0.035 or 3.5 percentage points. This indicates that the exposure of Austrian manufacturing firms to Chinese competitors was rather modest and that, on average, the intensity of competition has been increasing only moderately.

Changes in properties of trade and the proposed competition indicator

To obtain a first validation of the proposed competition indicator, we contrast its changes with changes of properties of Austria's trade performance. These are in line with the properties presently analyzed at the firm level. The descriptive results suggest that the proposed measure bears discriminatory power.

The characteristics of exported products have changed with the intensity of competition from China. Using a product relatedness indicator (Hidalgo et al. 2007; 2007) capturing the proximity of a product in the product space relative to the other products a country exports, we find that product relatedness has increased in industries experiencing a faster increase in the intensity of

competition. This suggests that firms have given up exporting in more weakly related product lines.

We also calculate product complexity scores (Klimek, Hausmann, and Thurner 2012) which capture the uniqueness of a product line in global trade due to the underlying breadth and depth of the knowledge base required to export it. The boxplots indicate that product complexity has increased more markedly in industries experiencing faster increases in the intensity of Chinese competition. This suggests that firms have reduced exports of less unique products.

Moreover, we draw on a geographic distance indicator and compute a Herfindahl index of geographic market concentration. We find that industries experiencing faster increases in import competition from China have tried to reach new, more distant export destinations. The variation of adjustments in the geographic diversification tends to decrease with increasing intensity of competition (see Annex for computational details). The geographic diversification measures' results seem to be more ambiguous than those of the measures for product characteristics.

Figure 3 about here

5. Methods

Survey of Austrian manufacturing firms

Our main data source is a survey of Austrian manufacturing firms about their corporate strategies. Methodological evidence on survey design was considered (Krosnick and Presser 2010). The survey was conducted between June and September 2016. The aim of the survey was to gather information about the past, current and future strategies of firms. The respondents were CEOs or senior managers who were involved in strategy setting. The questionnaire focused on product and market diversification efforts, competence building and their

positioning in their competitive environment and in global value chains. The questionnaire design relies on both management literature and in-depth pilot interviews with high-level industry representatives. Pretests were used to calibrate the questions. It was implemented in German, the local language.

The adjusted gross sample comprised all firms of the NACE Rev.-2, an industry classification, segment C ("Manufacturing") which reported more than 250 employees in the Herold database, an Austrian provider of firm addresses. This led to a sample of 498 firms. This list was augmented by a sample of manufacturing firms which reported between 100 and 250 employees and were classified as 'hidden champions' in a publication by Advantage Austria (2015). These additional firms are (i) either positioned among the top three in their respective global markets in terms of market share, (ii) have revenues which do not exceed four billion USD, and (3) have a low level of public awareness (Simon 2009).

The adjusted gross sample comprised 1005 Austrian, of which 323 responded to the questionnaire, corresponding to a response rate of 32.1%. The likelihood to respond is unrelated to the number of employees, the amount of sales revenue, sales per employee and industry affiliation. The number of persons employed by the companies included in the net sample represents slightly less than one sixth or 15.7% of total employment in Austrian manufacturing in 2017.

Sample description

The sample is a balanced mix of firms broadly assigned to manufacturing that take their strategic decisions mainly in Austria. Approximately 80% of the observations are assigned to manufacturing according to the NACE Rev. 2 classification. Few surveyed firms are active in the services sector (6%), a broadly defined trade and distribution sector (8%) with the remainder being in mining and utilities. Yet, almost all sampled firms (97%) describe themselves as manufacturers: 17% of the sample identify themselves as manufacturers of consumer goods, 28% as providers of capital goods and 14% as producers of industrial consumer goods. In

addition, 16% reported to be manufacturers and suppliers of systems and 23% classified themselves as manufacturers and suppliers of components. About 54% indicate to produce exclusively in Austria and the remaining 46% produce at least partially outside the country. 82.8% report to conduct central parts of R&D themselves.

Asked about their basic strategic orientation, approximately 33% of all respondents indicate to pursue quality leadership in generic markets and 29% indicate to focus on niche strategies. Hence, more than sixty percent of the surveyed firms either target specific customers with specialized offerings or the top-quality segments in broader, less focused markets. Only 7% of the firms consider price leadership in broader markets as their primary strategic goal. The remaining responses are almost evenly split between the pursuit of a broad diversification strategy (15%) and a reactive attitude in terms of the capability to react flexibly to changing market needs as a primary strategic attitude (16%).

The average firm size in the sample is 377 employees. The firm size ranges from 7 to 7500 employees. The companies at the 25%, 50% and 75% quantiles employ 150, 239 and 391 people, respectively.

The degree of internationalization

Austria's manufacturing sector is dominated by highly internationalized firms, which is mirrored by our sample. With regard to the degree of internationalization, Table 1 shows that only 1.4% do not export. A total of 80.2% had an average export share of more than 25% during the five years prior to the survey. More than 35% had an export share of more than 90%. The high degree of internationalization is a precondition when studying the impact of foreign competition in key markets on firm level strategies.

Table 1 about here

We have seen that, despite the high level of internationalization, the exposure of the firms in our sample to Chinese competitors was generally low. Additional calculations put this picture into perspective. Data from the survey show that about one third of the most internationalized firms consider the German-speaking neighboring countries as their main market. For another 37%, the EU Member States pose their main market, and only 37% consider industrialized nations outside Europe or emerging economies as their main markets (23% and 14% respectively). The exposure to Chinese competitors is therefore determined by their presence in these markets.

Outcome variables

We use a set of retrospective questions (looking back to the year 2011) on three strategic diversification choices as primary dependent variables to assess the impact of Chinese competition on Austrian industrial firms. Cognizant of the difficulties to collect reliable recall data (Dex 1995; de Nicola and Gine 2006), we draw on information about decisions taken in a five-year span prior to the survey. The possible bias with respect to the adequacy of the answers is likely to be small given the strategic relevance of the events asked. Even respondents who have not been employed in the entire period are likely to be able to answer the questions posed. The length of the period was identified as appropriate in the pilot interviews. The answers are dichotomous conduct variables, measuring how firms changed their behavior in the past regarding changes in their export destinations, changes in their product portfolio and the development of new competencies. In a second step, we examine more specifically how Chinese competition has affected strategic choices regarding changes of business fields.

The question ‘Has your company entered one or more new geographical target markets in the last five years?’ is used to capture changes in geographical market diversification. About 56% of all responding firms gave a positive answer to this question. To examine changes to the product portfolio, we used answers to the question: ‘Has your company made changes to its product portfolio in the last five years?’. 79%, the vast majority of responding firms, gave a

positive answer to this question. Finally, the answers to the question 'Has your company built up new competencies required for product portfolio changes in the last five years?' provide the basis for the analysis of competence changes. Around 60.3% of firms replied affirmatively to this question. Slightly more than half of the firms that did not change their competence base did not change their portfolio, either.

The question about the product portfolio changes does not inform about its directionality. Hence, we assess whether these reactions have been predominantly defensive or offensive by a follow-up question capturing the effects of portfolio changes on specific changes to business fields. The question about changes to the product portfolio serves as a filter question, after which firms were asked if portfolio changes were also related to changes in their business fields. The questionnaire defined business fields as self-contained fields of activities inside the broader spectrum of business activities executed by a company. These differ from one another in terms of products and customer segments, i.e. they were defined to reflect specific product-market combinations.

The respondents could specify whether changes in their product portfolio were related to (i) the development of new business fields, (ii) the re-alignment of existing business fields, (iii) the withdrawal from business fields, or (iv) whether no change to existing business fields were made. Given that companies may operate in different business fields multiple responses were possible. 54.8% of respondents indicated that changes in the product portfolio went along with the development of new business fields, 38.2% have re-aligned and another 12.4% have withdrawn from business fields and 13.3% of respondents indicated not to have changed business fields at all.

Explanatory variables

The target variables measure behavioral changes with respect to diversification or business fields. Even though the data is cross-sectional, we draw on the dynamic nature of the questions and regress the outcome variables on logarithmic changes in import competition over a five-

year period to obtain an estimation in first differences. While the mean growth rate of import competition is close to nil (0.1%), there is substantial variance. The standard deviation of the growth rate is 2.9%, the minimum lies at -20.2% and the maximum is +7.1%.

The second explanatory variable is the intensity of import competition in logarithmic terms in the base year to capture level effects. This indicator reflects initial conditions (Blundell and Bond 1998; Wooldridge 2005) and thus controls for path dependence of trade relations. The mean of the intensity of Chinese imports was 5.7%, ranging from zero to 36.6%. The standard deviation was 7.5%.

Each specification includes four control variables:

First, the logarithms of sales revenues serves as a proxy for firm size capturing economies of scale and scope and size-related differences in strategic decision making processes (Smith, Guthrie, and Chen 1989; Wolff and Pett 2000; Darnall, Henriques, and Sadorsky 2010). The absolute values are strongly skewed: the median sales revenue is approximately 69 million Euros while the mean is 177 million with a standard deviation of 470 million. We use the logarithmic terms to obtain a substantially smoother distribution.

Second, we construct a dummy variable taking on the value of one if a firm reports its markets to be growing, and zero otherwise. Since innovation and product adjustments have been found to be procyclical (Barlevy 2007), this indicator captures dynamics which may affect diversification or business field adjustments over and above import competition. 31% of the firms in the sample report growing markets.

Third, we control for a firm's geographical presence which may affect diversification (Bowen and Wiersema 2005). We define a dichotomous variable taking on the value of one if a firm serves an emerging economy (e.g., BRICS) as a main market, and zero otherwise. Merely 17% of the firms in our sample report to be active in emerging markets.

Fourth, we include a dummy variable taking on the value of one if a firm conducts R&D, and zero otherwise. In-house R&D provides a measure of a firm's ability to generate creative

outputs and maintain its competitiveness by diversification (Franko 1989). At 83%, most of the firms in the sample report own R&D.

Analysis

We use regression analysis to examine the impact of both levels and changes in the globally observed intensity of imports from China on the strategic choice across firms. Conducting our analysis, we considered presented several critical methodological issues. The structure of the data imposes a differentiated approach with respect to the estimation techniques.

The first set of predictors measures aspects of diversification. While the control variables capture much of the heterogeneity between firms, the import competition literature typically argues that there may be an issue of reverse causality (Hombert and Matray 2018; Autor, Dorn, and Hanson 2013). Even if a firm's diversification behavior is found to be unrelated to imports, the direction of causality could still be affected by omitted variables. This poses a concern to the changes in import intensities, which may be driven by global technology shocks leading to a growing import intensity from China. Statistically, this imposes an endogeneity problem for which we control in a two-stage least-squares (2SLS) instrumental-variable estimator. The estimator's objective is to "purge" the estimated coefficients from possible bias (Antonakis et al. 2010; Angrist and Pischke 2009).

In the first stage, the endogenous regressor "import intensity" is regressed on the instruments over and above the other control variables. The instrumental variables are required to be strongly related to the endogenous variable, but weakly related to the respective outcome variable. Also, instruments must be exogenous and independent of other variables in the estimated equation. In the second stage, the equation of interest is re-estimated using the same variables, except that the predicted values of the first stage replace the endogenous variable. We estimate robust variances to control for heterogeneity of standard errors.

Even though we only face one endogenous variable and using one instruments would suffice to estimate an exactly identified model, we use two instrumental variables. We overidentify the model to be able to implement a test of overidentifying restrictions. We define two instrumental variables along these lines: First, we follow the literature on import competition at the firm level (Bloom, Draca, and Van Reenen 2016; Yamashita and Yamauchi 2019) and define the degree of import competition from China in other industrialized countries. The countries are all located outside of the EU to be largely independent from Austria's import structure. The countries used are Australia, New Zealand, the USA, Canada, Israel, and Japan. Second, we define a dummy variable taking on the value of one if a firm exclusively produces domestically, and zero otherwise. This variable measures a firm's ability to spread the exposure to import competition across a wider production network.

To test for the validity of the instrumental-variable estimation, we conduct a series of post-estimation tests (Greene, 2003), indicating that the instruments are strong and relevant. We use a Hansen-J test to examine if the applied instruments are appropriately independent of the error term of the prediction of the respective outcome variable. The Hansen-J test cannot be rejected, which supports the exogeneity assumption of the instruments. We run a test based on a Kleibergen and Paap (2006) rank Lagrange multiplier statistic and can reject that the instruments are weak, and the model is under-identified. In an unreported robustness check, we included both instrumental variables in the second stage and uncovered statistically insignificant results for both coefficients, which further supports the estimation strategy.

The second set of outcome variables measures whether changes were made to business fields. These questions are posed after the filter question whether firms have changed their product portfolio. Hence, the responses to the question about changes to business fields are nested. We therefore fit maximum-likelihood Probit models with a Heckman sample selection (Greene 2003). The estimator is based on a selection equation which contains at least one variable that is not in the outcome equation. The dependent variable of the selection equation is portfolio

change. Its likelihood is estimated as a function of the variables of the outcome equation in addition to the selection variable "competence", which takes on the value of one if a firm has changed its competencies in the past or intends to change its competence in the future, and zero otherwise. This allows us to remove the sample selectivity bias in the second stage, which is the equation of interest. We again estimate robust variances to control for heterogeneity of standard errors and apply a correction for the small sample size in survey data.

6. Results

We have argued that manufacturing firms from small, industrialized countries are typically export intensive due to their small home market, relatively small and highly specialized. Hence, they tend to occupy specific market niches where they can bring their technological advantages to fruition despite lacking economies of scale and scope. The reaction to competitors with strong cost advantages and increasingly competitive technological capabilities entering their markets is to diversify geographically and focus on business fields in which they have their strongest comparative advantages.

Column (1) in Table 2 shows the first stage results of the 2SLS regressions modelling the change in the intensity of Chinese competition over the period covered by the retrospective questions underlying the outcome variables of the second stage. The intensity of competition from Chinese exporters in the exogenous base year is significantly and negatively related to the subsequent change in the intensity of competition. This points towards a selection effect. Firms seeking to avoid Chinese competition are more likely to choose markets with lower Chinese presence and therefore experience smaller increases in the intensity of competition. The two instruments indicate positive and statistically significant coefficients. Firms experiencing an increase of Chinese competition are active in markets where firms from other industrialized economies also face increasing Chinese competition. This instrumental variable

captures the presence of not directly observed supply and demand shocks that affect import and export intensities. Firms that produce exclusively in Austria have experienced mildly higher increases in the intensity of competition from China as opposed to firms with a more diversified production structure. Locally producing firms are less able to spread the exposure across different company divisions or affiliates. The postestimation tests support the validity of the instrumental variable approach in all specifications. The Hansen-J test is statistically insignificant (p-value > 0.1) and the under-identification tests suggest that the excluded instruments are relevant (p-value < 0.01).

Columns (2) through (4) report how changes in the intensity of competition from China have impacted strategic choices on new geographical markets, product portfolios and competence changes.

The five-year change in the intensity of competition from Chinese exporters has a positive and statistically significant impact on the propensity of firms to enter new geographic markets and a negative impact on the propensity to change the product portfolio or build new competencies. A one percentage point increase in the intensity of competition from Chinese exporters increases the probability that companies enter new geographic markets by about 6% on average. However, it decreases the likelihood of a product portfolio change by 4.9% and the likelihood of the development of new competencies by about 5.2%. The statistical significance of these two coefficients is only given at the 10% level, however.

The initial level of the intensity of competition from China does not have a statistically significant impact on the propensity to enter new geographical markets. Yet, the effect is statistically significant and negative for both changes to the product portfolio and the development of new capabilities. A one percent difference in the weighted market share of Chinese exporters on its markets leads to an average decrease in the probability of a firm changing its product portfolio by -1.4% and of a firm developing new capabilities by -1.6%.

Hence, these results support the first three conjectures posed above. This is, the results support Conjecture I, stating that firms exposed to more intense competition from Chinese exporters are more likely to diversify into new geographic markets. We also find support for Conjecture II, arguing that there is a negative relationship between the development of new competencies and fiercer competition from Chinese exporters. Conjecture III argued that there is a negative relationship between product diversification and competition from Chinese exporters.

Altogether, these coefficients of the different strategic choice dimensions suggest that, on average, Austrian firms pursue a "globalfocusing" strategy when they face increases in competition from China. The dynamic change of market shares by Chinese exporters has a larger effect on strategic choices than the exposure at the beginning of the period analyzed. Despite the relatively mild exposure of Austrian firms to Chinese competitors this still seems to have notable and sizable effects on their strategic choices.

Table 2 about here

The control variables largely perform as expected. We find that firm size, measured by the log of sales, is more likely to have both changed their product portfolio and developed new competencies in the five years prior to the survey. Firm size does not have an impact on the likelihood of firms entering new markets. The likelihood of past entry into new geographical markets is most strongly influenced by market opportunity, which is captured by the growing market dummy. This indicator also has a positive impact on the likelihood of firms changing their product portfolio, but no significant impact on past changes of competencies. Finally, own product development or in-house R&D have a positive and statistically significant impact on all three strategic choice dimensions. The inclusion of a dummy variable capturing

the presence of a firm on emerging markets does not yield statistically significant coefficients in any of the second stage regressions.

Table 3 about here

Eventually, we test Conjecture IV, stating that firms that face more intense competition from Chinese exporters in their sales destinations will rather focus on their core business fields. Table 3 shows how the exposure to Chinese competitors has influenced choices on the development of business fields related to changes in the product portfolio.[2] Increases in the intensity of competition in the five years prior to the survey have lowered the likelihood of firms' re-alignment of business fields and increased the likelihood of firms keeping their business fields unchanged. The intensity of competition in 2011, the base year, has a negative effect on the likelihood of firms re-aligning or withdrawing from business fields and a positive effect on the likelihood of firms not changing their business fields. Neither the dynamic changes of the intensity of competition nor the intensity of competition in the base year have an impact on the creation of new business fields.

Overall, this evidence hints at a defensive reaction vis-à-vis the challenges related to the new competitive environment. Firms facing higher levels and greater increases in the intensity of competition from Chinese exporters opt to focus on their current business fields and "stand the ground". The creation of new business fields seems to be more closely related to the presence in specific markets. The control variables included in these regressions are not significant. This may point at the heterogeneity of possible determinants of choices related to

[2] The Heckman estimates are shown in the Annex.

the development of business fields. Then again, this may be related to the relatively small subsample sizes.

Robustness checks

In addition to our preferred statistical approaches, we implement further estimation techniques to ensure the robustness of our results (see Annex). We report 2SLS estimations explaining diversification patterns, because the linear probabilistic model allows us to implement post-estimation tests verifying the validity of the instrumental variables used. Cognizant of possible bias due to the dichotomous nature of the outcome variables, we implement instrumental variable Probit models. The results are qualitatively comparable with our preferred specification. When explaining business fields, the favored estimator is a nested Probit model using a Heckman sample selection. The results are robust to estimating the same specifications linear probabilistically or disregarding possible selection bias and implementing a Probit model. All models have been implemented with standard errors corrected for small sample size.

7. Conclusions

We aimed at bringing two strands of literature together. We departed from the expanding literature on import competition from China, which argues that the nature of competition differs from competition from other industrialized and catching-up economies. Chinese firms enjoy cost advantages and, at the same time, start competing on a level-playing-field in terms of their technological capabilities. Hence, companies from advanced industrialized nations find it increasingly difficult to escape price competition through quality upgrading. This leads to the question about the strategic response of firms and thus to the diversification literature, whose findings are put into question by the different nature of competition.

The bulk of the previous literature focuses on large economies (Bowen and Wiersema 2005; Ljubownikow and Ang 2020; Bloom, Draca, and Van Reenen 2016). We study the behavior of Austrian manufacturing firms. These face competition from Chinese exporters on their

internationally dispersed markets. It is unclear if previous findings on large economies are applicable to this setting. To capture the intensity of Chinese market penetration, we develop an indicator measuring the degree of import competition to small and highly internationalized companies, which lack a large home market and are typically active in multiple geographical markets, both domestic and abroad.

We simultaneously study a range of aspects of diversification that allows identifying the overall strategic of firms. These are firms' geographical markets, product portfolios, their competence base and business fields. The results suggest that a low exposure to Chinese competition has, on average, has significant impact on strategic choices. While they rather tap into new geographical markets, they are less likely to explore new opportunities. Jointly these adaptations indicate that these firms pursue a "globalfocusing" strategy. This is also reflected in the development of industry level trade data. The strategy choice is likely to be moderated by the resources available to develop new competencies and the technological distance of incumbents. While smaller, highly specialized and technology-intensive firms, like those in our survey, react to Chinese import competition by globalfocusing, larger, resource-abundant companies may be in a better position to escape competition proactively. The latter may also expect to be able to maintain a certain technological distance to their rivals. Firms that lack resources to respond to increased competition are likely to be forced into a "retrenchment" strategy, which may be common in developing economies.

Certainly, there are limitations of our study that warrant further investigation. First, our study relied on firm-level observations. Further research could shed light on the role of within-firm structures and dynamics. For instance, we treat the strategic changes as homogeneous, even though the extent of the decisions can be heterogeneous. Qualitative research about the micro-mechanisms may produce additional insights. Second, the outcome indicators measure changes in strategies, which we regress on changes in competition from Chinese exporters. Even though great strides towards establishing causality were made, the data are cross-sectional.

Longitudinal data would render additional statistical methods feasible. Third, even though the country context poses an appropriate setting for studying small, highly internationalized firms, competitive advantages are somewhat idiosyncratic and may differ across countries. A replication of this study in another country context would corroborate the results.

These findings are not only relevant to managers coping with rising import competition from China, but also to policy makers. Since the firm-level results correspond to Austria's overall pattern of trade performance, the results can be generalized to the whole economy. Austrian firms in industries experiencing faster increases in the intensity of Chinese competition have realigned their export portfolio to products closely related to the factors determining the country's comparative advantage, while diversifying geographically. This strategy is likely to be unsustainable given the fast expansion of Chinese export portfolio and its rapid technological upgrading.

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Tables and figures

Table 1: Distribution of firms over export share brackets

Average export share over the past five years (2011-2016)	Frequency	Percent	Cumulated
0 % -no exports	4	1.42	1.42
1 to 25 %	51	18.15	19.57
26 to 75 %	68	24.20	43.77
76 to 90 %	59	21.00	64.77
more than 90 %	99	35.23	100.00
Total	281	100.00	

Source: WIFO Industry Survey 2016. Own calculations.

Table 2: Strategic diversification choices and the intensity of competition with Chinese exporters

	(1)	(2)	(3)	(4)
	1st stage	Entry into new geographical markets	Portfolio Change	Competence Change
Import intensity increase $\Delta IC_{CN,k}$,, (market share change 5yrs)		5.98**	-4.86*	-5.16*
		(2.607)	(2.490)	(2.809)
Intensity of competition $IC_{CN,k,t}$, (log weighted 2011)	-0.35***	0.01	-1.43**	-1.63**
	(0.084)	(0.626)	(0.597)	(0.656)
Sales rev. (logs)	0.00	-0.02	0.05**	0.06**
	(0.001)	(0.026)	(0.022)	(0.026)
Growing market (dummy)	-0.00	0.36***	0.11*	0.10
	(0.003)	(0.066)	(0.058)	(0.071)
Emerging market presence (dummy)	0.01***	0.00	0.09	0.00
	(0.005)	(0.091)	(0.077)	(0.099)
R&D (dummy)	-0.00	0.16*	0.19**	0.25***
	(0.004)	(0.088)	(0.089)	(0.092)
IV: Intensity of competition from all other countries	0.14***			
	(0.031)			
IV: Production exclusively in AT	0.01**			
	(0.003)			
Constant	-0.01	0.71	-0.19	-0.56
	(0.027)	(0.461)	(0.400)	(0.476)
Observations	212	212	212	211
R-squared	0.338	0.147	0.027	0.041
Hansen J-test (p-value)		0.734	0.964	0.800

*Source: Own calculations. Note: This table shows the results of the 2SLS regressions explaining strategic diversification choices. The chosen instruments are regarded as sufficiently exogeneous because Hansen-J test is statistically insignificant in all specifications except for the realignment of business fields. The instrumental variables chosen are sufficiently strong. The Kleiberger-Paap rank sum Lagrange multiplier statistics highly significant in all specifications (p-value: 0.000).In addition, the Kleibergen-Paap rank Wald F-statistic value exceeds the critical Stock-Yogo threshold of a 10% maximum instrumental variable size (Stock and Yogo 2002). Robust standard errors in parentheses, Significance levels: *** p<0.01, ** p<0.05, * p<0.1.*

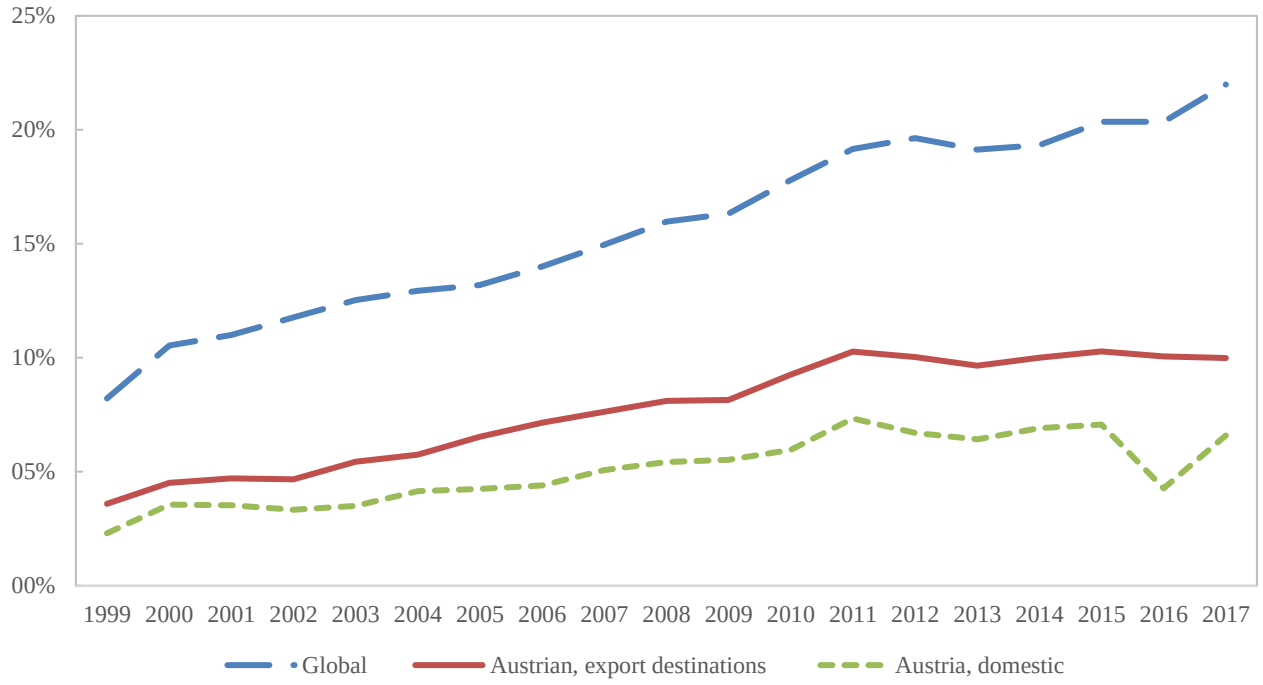
Table 3: Product portfolio diversification choices and the intensity of competition with Chinese exporters

	(1) Creation of new business fields	(2) Re-alignment of business fields	(3) Withdrawal from business fields	(4) No change
Import intensity increase $\Delta IC_{CN,k}$, market share change 5yrs	1.60	-3.25**	-1.19	2.00**
	(1.385)	(1.443)	(0.740)	(0.985)
Intensity of competition $IC_{CN,k,t}$, log weighted 2011	0.21	-1.08*	-0.96**	0.88*
	(0.665)	(0.645)	(0.464)	(0.531)
Sales rev. (logs)	-0.02	-0.01	0.00	0.01
	(0.035)	(0.032)	(0.021)	(0.025)
Growing market (dummy)	-0.07	0.04	-0.04	0.02
	(0.086)	(0.083)	(0.055)	(0.060)
Emerging market presence (dummy)	0.18*	-0.03	0.05	-0.08
	(0.108)	(0.104)	(0.065)	(0.093)
R&D (dummy)	0.11	-0.14	0.09	-0.04
	(0.129)	(0.108)	(0.078)	(0.096)

Source: Own calculations.

*Note: This table shows the marginal effects at the mean of a two-stage Heckman regression reported in the Annex. Robust standard errors in parentheses, Significance levels: *** p<0.01, ** p<0.05, * p<0.1.*

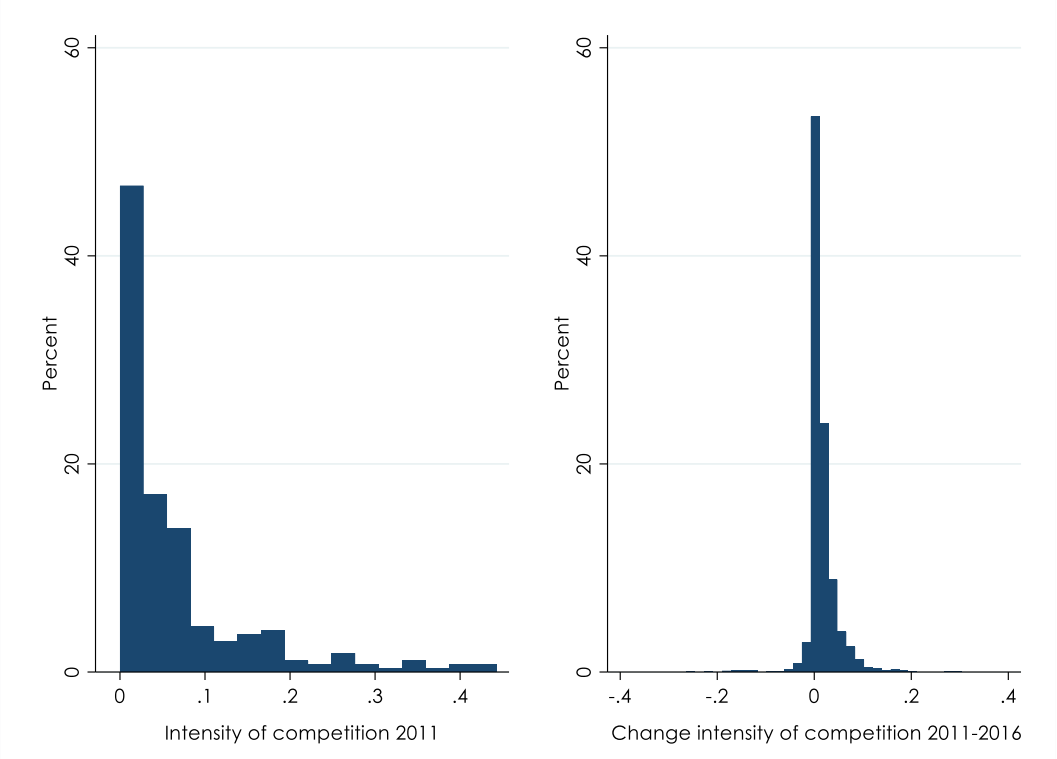
Figure 1: Chinese exports globally, to Austria and Austrian export destinations 1999-2017



Source: Own illustration.. BACI database.

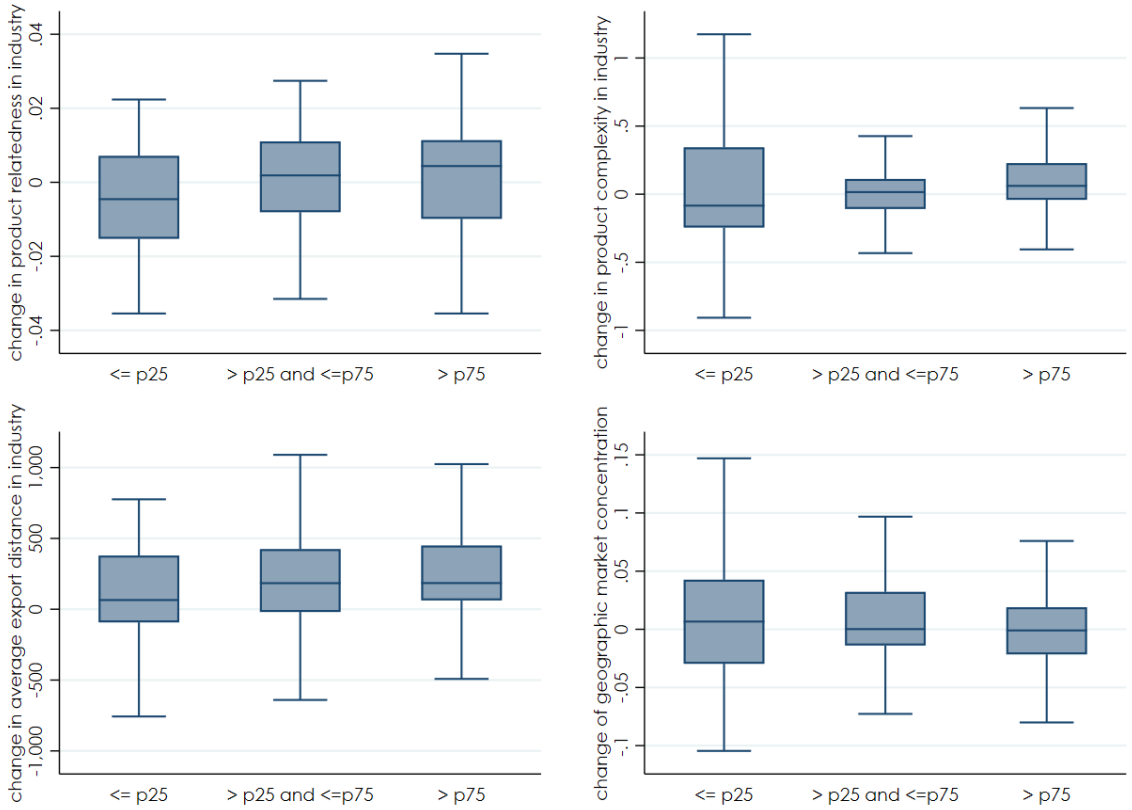
Note: The graphs show import competition with China in Austria, the intensity of competition with Chinese exporters on export destinations of Austrian goods (weighted by market shares) and intensity of competition with Chinese exporters on global scale. The lines show means values across all industries.

Figure 2: Distribution of the intensity of competition, $IC_{CN,k,t}$, from China in 2011 for Austrian firms in the sample, and change of the intensity of competition, $\Delta IC_{CN,k}$, between 2011 and 2016 (percent of firms in the sample)



Source: Own illustration. BACI database.

Figure 3: Changes in product relatedness, complexity, average trading distance and export market concentration at the industry level (4-digit) over a period of five years for different quantiles in the distribution of changes in the intensity of competition from China over the same period



Source: Own illustration. BACI database.

Note: <= p25 stands for the first quartile, <p25 and <=p75 stands for the intermediate quartile, and p>75 for the top quartile of observed changes in the intensity of competition from China over a five-year period.

Annex

Harmonized trade data

We use harmonized trade data obtained from the BACI database to construct an indicator that captures the intensity of competition from Chinese exporters to which Austrian firms are exposed in their core markets.[3]

Descriptive indicators from trade data

All indicators were calculated using the BACI database and at the level of HS6 producers.

Product relatedness and product complexity have been calculated following Hidalgo et al. 2007; Klimek, Hausmann, and Thurner 2012; Hausmann, Ricardo and Klinger 2007.

Geographic concentration

The geographic concentration of exports at the product level has been calculated as follows

$$HHI_p^c = \sum_r \left(sp_{l,p}^2\right),$$

where $sp_{c,p}$ corresponds to the export share of target destination r in product line p in the total goods exports of country c in this product line. The indicator thus shows how strongly the exports in a product line are spread across different export markets. This indicator is then aggregated with the export share of the product line in the total exports of a NACE 4-digit industry to the industry level.

[3] See Gaulier and Zignago 2010 and http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=37 (retrieved on 5th February 2021).

Matching industry and trade data

Matching trade with industry information is a common issue in trade research because different classifications are used and classifications themselves are changed over time to consider technological and structural developments reflected by economic activities. Correspondence tables are, if at all, only available for certain versions. To be able to match these data with industry level information, we generate a chained correspondence table by linking different correspondence tables.

BACI's trade data is available at the product level using the Harmonised System (HS) Codes. To obtain a sufficient time coverage for our analysis, we use the classification from 1992 (hs92, 6-digit level). The HS classification differs from the industry classification (Nace Rev. 2., 4-digit), which is used in the firm level dataset. To match the trade with the industry classification, we draw on correspondence tables. However, these are not available for hs92, which is why we recode hs92 to hs02, a later classification. This allows us to match the hs02 codes with NACE Rev1, an older industry classification. Since the classification is available at a granular, 4-digit level, we are able to recode the data from NACE Rev. 1 to NACE Rev. 2, which is used in the firm level dataset. The conversion process led to a division of some 4-digits classes to multiple other classes. We distributed these values evenly across the respective classes.

Construction of the indicator for the intensity of competition from Chinese exporters

To calculate the intensity of competition on export markets in the first step, we define the market share of Chinese exports for each geographical destination *j* to which Austrian firms export as well as the HS-6-digit product level p as $ms_{j=CN:AT,j,p,t} = ex_{j=CN,p,t} / \sum_i ex_{i,p,t}$. This market share is calculated for all cross section of destinations *j* to which both China and Austria export at a specific point in time over the time *t* with t=2011,..,2016. Using the product level destination weight of

destination j in total Austrian exports of product p at time t defined as $w_{AT,j,p,t} = ex_{i=AT,j,p,t} / \sum_j ex_{i=AT,j,p,t}$ we obtain the product level intensity of competition from China in Austrian export destinations at the product level. This is then a weighted average of the market share of Chinese exports at the level of each HS-6-digit line an Austrian industry exports:

$$ICF_{CN:AT,p,t} = \sum_j w_{AT,j,p,t}\, ms_{i=CN:AT,j,p,t} \,.$$

This indicator is then again aggregated to the NACE-4-digit industry level over all product lines a NACE-4-digit industry in Austria exports using the export shares of each product line p in total exports of industry I across all destinations as importance weights:

$$ICF_{CN:AT,I,t} = \sum_{p \in I} w_{i=AT,I,p,t}\, ICF_{CN:AT,p,t}, \text{ with } w_{i=AT,I,p,t} = ex_{i=AT,p,t} / \sum_{p \in I} ex_{i=AT,p,t}.$$

This is the base line indicator for the intensity of competition from Chinese exporters in Austrian export markets at the level of a NACE-4-digit industry.

We then look at the Chinese exports to Austria in product lines where Austrian firms export themselves. The import penetration of China in Austria is simply given by the Chinese import share in all product lines Austria imports at the NACE-4-digit level:

$$ICD_{CN:AT,I,t} = \sum_{p \in I} ex_{i=CN,j=AT,p,t} / \sum_i \sum_{p \in I} ex_{i,j=AT,p,t}$$

From these two industry level measures we compute a firm-specific import competition indicator by using the industry affiliation and firm level weights for their degree of internationalization.

The firm level weights are obtained from the survey where firms were asked to indicate their export intensities. These were reported in brackets. We use the median intensity of the bracket as weight

$q_{k,t}$, i.e. we use 12.5% for company k, if it reports an export share in total sales of below 25%, 50% if the export share lies the bracket between 26% and 75%, 82.5% for export shares between 76% and 90% and 95% if it reports an export share in total sales higher than 90%. For non-exporters the weight is set to zero. The firm level indicator for the intensity of competition from Chinese exporters is therefore given by:

$$IC_{CN,k,t} = q_{k,t} ICF_{CN:AT,p,t} + (1 - q_{k,t}) ICD_{CN:AT,I,t}.$$

Finally, we compute also the difference $\Delta IC_{CN,k}$, $\Delta IC_{CN,k} = IC_{CN,k,2016} - IC_{CN,k,2011}$, as a dynamic indicator for the change of the intensity of competition over the period preceding the survey. The time difference matches the questions in our econometric analysis that draw on changes in firm level strategies in the five years preceding the survey.

In the analysis, we then use the level of the intensity of competition $IC_{CN:AT,I,t}$ for the base year 2011 jointly with the changes of the intensity of competition ΔIC in the period between 2011 and 2016. Finally, we use additional information on export intensities of surveyed firms to generate an overall import competition indicator considers both the domestic and export markets.

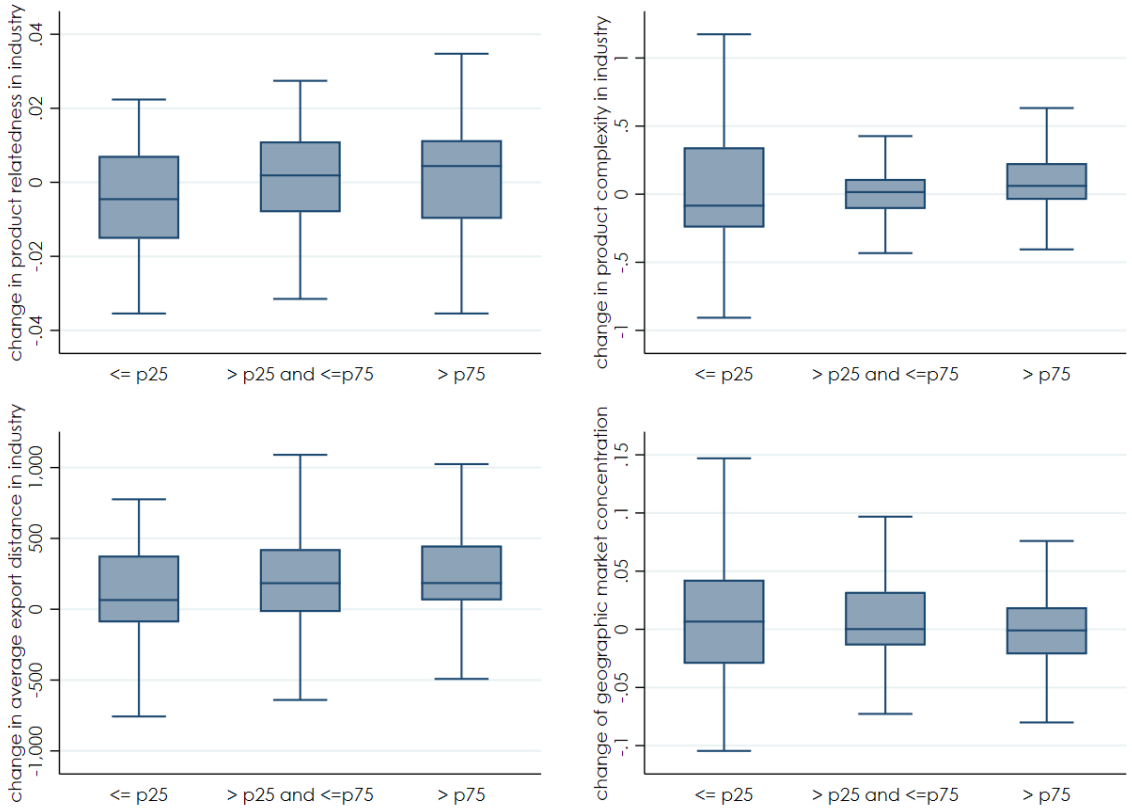
Changes in import competition, export relatedness and complexity in Austria

Figure 3 provides descriptive evidence for the Austrian economy. The characteristics of exported products have changed with the changes in the intensity of competition from China. The panel in the upper right quadrant shows how the average relatedness of the products exported by 4-digit industries has changed in the industries experiencing the lowest (<=p25), intermediate (>p25 and <=P75) and the highest (>p75) increases in the intensity of competition from China. The product relatedness has been calculated following the product space method developed by Hausman –

Klinger (2007) and Hidalgo et al (2007) and captures the proximity of a product the product space relative to the other products a country exports with comparative advantage. Calculations were executed at the HS-6-digit level of exported products which were then aggregated to the NACE-4-digit level using export weights and HS-NACE correspondence tables provided by Eurostat.

The data indicate that product relatedness has increased in industries experiencing a faster increase in the intensity of competition. While this evidence should not be interpreted causally, it indicates that in industries more exposed to competition from Chinese firms the export portfolios at the industry level haven been adjusted to product lines that are more closely related to the core specialization of the country. In these product lines firms can better draw on local spillovers and a local competence base.

Figure 4: Changes in product relatedness, complexity, average trading distance and export market concentration at the industry level (4-digit) over a period of five years for different quartiles in the distribution of changes in the intensity of competition from China over the same period



Source: Own illustration. BACI database.

Note: <= p25 stands for the first quartile, <p25 and <=p75 stands for the intermediate quartile, and p>75 for the top quartile of observed changes in the intensity of competition from China over a five-year period.

The panel in the upper right quadrant shows how average product complexity in 4-digit industries has changed in different brackets of changes in the intensity of competition. The product complexity has been calculated using the product space method proposed by Klimek et al (2011) and may be conceived as capturing the breadth and the depth of the knowledge base needed to export a product with comparative advantage.

Again, the results indicate that product complexity has increased more markedly in industries experiencing faster increases in the intensity of Chinese competition. Firms in industries

experiencing faster increases in the intensity of competition from China have apparently also adjust their export portfolio towards products requiring a broad and a unique competence base.

The panels in the lower quadrant show changes in the average export distance in an industry (left) and changes in geographic market concentration (right). Both indicators have been calculated for all bilateral trade relations at the HS-6-digit level and aggregated to the NACE-4 level using product level export shares. Distances have been assigned to each destination using the GEODIST database from CEPII. Geographic market concentration instead has been calculated using a Herfindahl concentration index for market shares by destination.

The data indicate that while firm in industries experiencing faster increases in the intensity of competition from China have increasingly tried to reach new more distant destinations with their exports, the firms in these sectors have by and large tried to keep the geographic diversification of their export portfolios constant. The variation of adjustments in the geographic diversification also tends to decrease with increasing intensity of competition.

To summarize, this first descriptive evidence suggests that Austria firms in industries experiencing faster increases in the intensity of competition have tried to realign their export portfolio to products that are more closely related to the factors determining the comparative advantage of the country, that are more complex, have reached out to more distant markets and tried to keep the geographic diversification constant.

Econometric robustness checks

Table 4: Heckman-Selection Regressions underlying Table 3

	(1) Creation of new business fields	(2) Selection	(3) Re-alignment of business fields	(4) Selection	(5) Withdrawal from business fields	(6) Selection	(7) No change	(8) Selection
Import intensity increase,	4.16	-0.59	-8.61**	-0.77	-6.22*	-0.76	9.17**	-0.51
	(3.642)	(3.894)	(4.048)	(4.053)	(3.760)	(3.869)	(3.754)	(3.974)
Intensity of competition, base year	0.53	-1.73	-2.87	-1.76	-5.02**	-1.77	4.03**	-1.71
	(1.732)	(1.661)	(1.779)	(1.699)	(2.346)	(1.684)	(1.990)	(1.678)
Sales rev. (logs)	-0.06	0.15*	-0.04	0.16*	0.00	0.15*	0.03	0.15*
	(0.092)	(0.083)	(0.085)	(0.083)	(0.108)	(0.085)	(0.114)	(0.084)
Growing market (dummy)	-0.19	0.46*	0.10	0.45*	-0.23	0.44*	0.08	0.46*
	(0.226)	(0.240)	(0.221)	(0.237)	(0.282)	(0.239)	(0.283)	(0.240)
Emerging market presence (dummy)	0.48*	0.31	-0.09	0.28	0.27	0.34	-0.38	0.30
	(0.286)	(0.354)	(0.276)	(0.337)	(0.333)	(0.376)	(0.381)	(0.351)
R&D (dummy)	0.29	0.32	-0.37	0.38	0.49	0.29	-0.20	0.32
	(0.337)	(0.281)	(0.289)	(0.277)	(0.426)	(0.285)	(0.420)	(0.281)
Portfolio (Selection)		1.28***		1.26***		1.29***		1.28***
		(0.261)		(0.266)		(0.258)		(0.261)
Constant	0.86	-3.26**	1.02	-3.38**	-1.40	-3.19**	-1.72	-3.25**
	(1.773)	(1.501)	(1.593)	(1.499)	(2.099)	(1.549)	(2.171)	(1.510)
Observations	210	210	210	210	210	210	210	210

Source: Own calculations.

Note: This table shows the results of IV-Probit regressions as a robustness check. Standard errors corrected for small samples in survey data in parentheses. Postestimation tests are unfeasible due to the s.e. correction. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 5: IV Probit and Probit models of strategic choices

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ Import intensity	Market entry	Δ Import intensity	Portfolio change	Δ Import intensity	Comp. change	Market entry	Portfolio change	Comp. change
	IV-Probit		IV-Probit		IV-Probit		Probit	Probit	Probit
Import intensity increase, market share Δ5yrs		18.676**		-16.311**		-14.064**	11.676***	-2.583	-3.442
		-2.45		(-2.36)		(-2.10)	-3.32	(-0.77)	(-1.11)
Intensity of competition, log weighted market share 2011	-0.346***	0.085	-0.345***	-4.637***	-0.346***	-4.327***	-1.134	-2.459*	-2.635**
	(-4.21)	-0.05	(-4.20)	(-2.62)	(-4.22)	(-2.68)	(-0.81)	(-1.76)	(-2.00)
Sales rev. (logs)	0	-0.058	0	0.168**	0	0.153**	-0.06	0.177**	0.158**
	-0.21	(-0.79)	-0.23	-2.12	-0.19	-2.01	(-0.80)	-2.2	-2.08
Growing market (dummy)	-0.003	1.013***	-0.003	0.419*	-0.003	0.259	0.995***	0.510**	0.32
	(-0.91)	-4.62	(-0.91)	-1.78	(-0.92)	-1.28	-4.56	-2.2	-1.6
Emerging market presence (dummy)	0.015***	-0.022	0.015***	0.364	0.015***	0.002	0.061	0.238	-0.118
	-2.98	(-0.08)	-2.97	-1.32	-2.99	-0.01	-0.23	-0.83	(-0.47)
R&D (dummy)	-0.001	0.436*	-0.001	0.549**	-0.001	0.637***	0.445*	0.599**	0.671***
	(-0.30)	-1.75	(-0.30)	-2.21	(-0.30)	-2.64	-1.77	-2.32	-2.71
IV: Other countries	0.143***		0.142***		0.143***				
	-4.63		-4.61		-4.64				
IV: Domestic production	0.007**		0.007***		0.007**				
	-2.48		-2.66		-2.53				
Constant	-0.007	0.48	-0.008	-2.626*	-0.006	-2.830**	0.585	-2.930**	-3.057**
	(-0.26)	-0.36	(-0.29)	(-1.83)	(-0.24)	(-2.04)	-0.43	(-2.03)	(-2.23)

Source: Own calculations.

Note: This table shows the results of IV-Probit and Probit regressions explaining strategic choices. Standard errors corrected for small samples in survey data in parentheses. Postestimation tests are unfeasible due to the s.e. correction. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Probit results, business fields

	Creation of new business fields	Re-alignment of business fields	Withdrawal from business fields	No change
Import intensity increase, market share change 5yrs	-9.754**	4.446	-6.003	9.147**
	(-2.46)	-1.22	(-1.52)	-2.45
Intensity of competition, log weighted market share 2011	-3.666**	0.822	-4.694*	3.916**
	(-2.29)	-0.5	(-1.88)	-2.07
Sales rev. (logs)	-0.012	-0.079	-0.029	0.037
	(-0.14)	(-0.90)	(-0.27)	-0.34
Growing market (dummy)	0.193	-0.234	-0.315	0.092
	-0.9	(-1.11)	(-1.15)	-0.35
Emerging market presence (dummy)	-0.018	0.482*	0.27	-0.372
	(-0.06)	-1.7	-0.82	(-1.00)
R&D (dummy)	-0.241	0.246	0.401	-0.166
	(-0.80)	-0.81	-0.97	(-0.42)
Constant	0.201	1.256	-0.633	-1.884
	-0.13	-0.79	(-0.32)	(-0.96)
Observations	165	165	165	165

Source: Own calculations.

Note: This table shows the results Probit regressions explaining changes in business fields. The standard errors reported in parentheses use a small sample size correction. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Business fields, Linear Heckman selection

	(1) Selection	(2) Creation of new business fields	(3) Re-alignment of business fields	(4) Withdrawal from business fields	(5) No change
Competence change	1.27***				
	(0.262)				
Import intensity increase, market share change 5yrs	-0.52	1.57	-3.12**	-1.22**	2.09**
	(3.966)	(1.319)	(1.328)	(0.533)	(0.915)
Intensity of competition, log weighted market share 2011	-1.72	0.23	-0.88*	-1.01***	0.99*
	(1.677)	(0.660)	(0.530)	(0.386)	(0.519)
Sales rev. (logs)	0.15*	-0.02	-0.02	0.00	0.01
	(0.084)	(0.036)	(0.033)	(0.027)	(0.023)
Growing market (dummy)	0.46*	-0.07	0.04	-0.04	0.02
	(0.240)	(0.087)	(0.083)	(0.061)	(0.062)
Emerging market presence (dummy)	0.29	0.18*	-0.03	0.07	-0.08
	(0.349)	(0.105)	(0.096)	(0.079)	(0.072)
R&D (dummy)	0.32	0.12	-0.16	0.13	-0.04
	(0.281)	(0.132)	(0.126)	(0.097)	(0.089)
Constant	-3.27**	0.83	0.94	-0.03	0.03
	(1.512)	(0.688)	(0.651)	(0.547)	(0.433)
Observations	210	164	164	164	164
R^2		0.042	0.066	0.042	0.044
Pseudeo-R^2	0.207				

Source: Own calculations.

Note: This table shows the results linear Heckman regressions explaining changes in business fields. The standard errors reported in parentheses use a small sample size correction. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.