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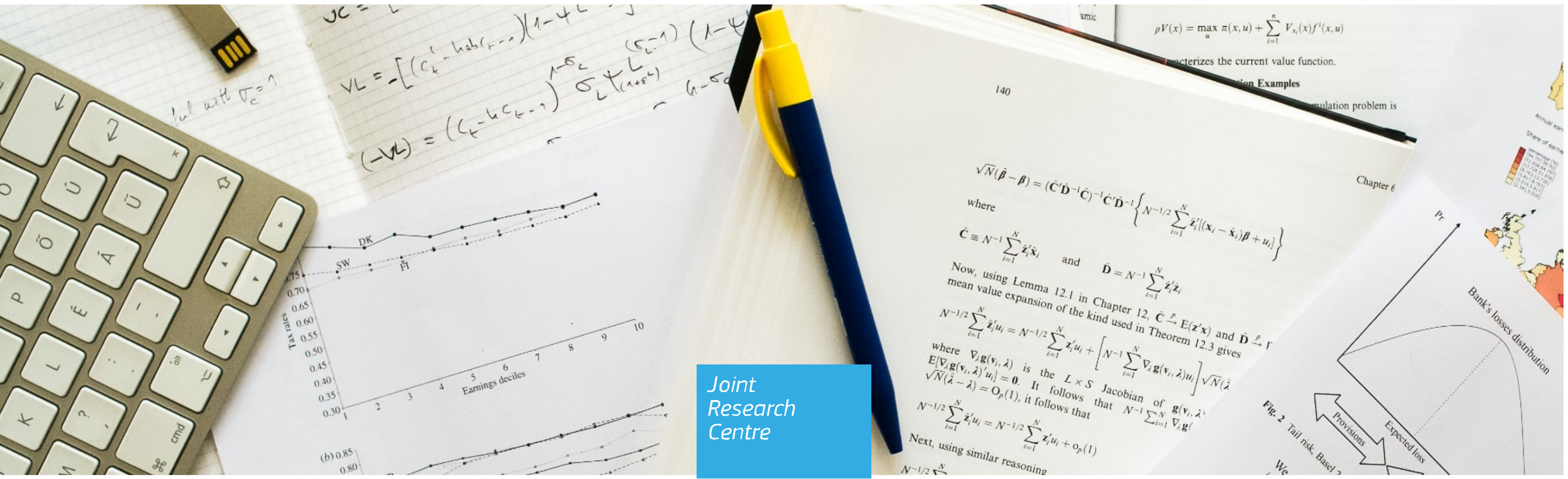

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Delivery Times in International Competition: An Empirical Investigation*

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Abstract

This paper investigates the role of timely delivery in international competition. Using a demand-side, industry-specific measure of time-sensitivity, we assess the effect of Chinese competition on the export performance of Eastern European transition economies into Western European (EU15) destination-product markets. Our empirical analysis relies on exploiting the increase of Chinese competition in global markets during the first decade of the 2000s. We find evidence of heterogeneous adjustments to Chinese competition among Eastern European exporters due to the differential importance of timely delivery across sectors (i.e. time-sensitivity). While we observe sizable real displacement effects, they appear to be at least 50 percent smaller for time-sensitive exports. Relying on firm-level customs data, we establish that this mechanism also plays a role for responses to Chinese competition within firms.

JEL-Classification: F14, F15, F61, L25

Keywords: Time sensitivity, International competition, China

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1 Introduction

The global fragmentation of production and the rise of China denote two major developments in the world economy during the recent decades (Autor et al., 2013, 2015; Arkolakis et al., 2018).[1] When different stages of production take place in different parts of the world, timely and reliable delivery becomes crucial.[2] Delivery times can also be a relevant factor in international competition, in particular for emerging economies competing with China in specific destination markets.

This paper argues that exporters residing in relatively close geographic proximity to their destination markets can stand international competition by specializing in goods for which the time of delivery matters. More specifically, we document that the negative effects on export performance due to the rise of Chinese competition in a common destination market are significantly smaller for exporters of products on which customers are willing to pay a higher price for an earlier delivery. Our evidence comes from data on EU15 import markets for manufacturing goods.[3] We evaluate the performance of Eastern and Southeast European (ESE) exporters within narrow product-destination markets and assess heterogeneous responses to intensifying Chinese competition during the first decade of the 2000s.[4] During this period, most ESE countries were in the midst of their transition towards economic liberalization, gaining improved access to high-income EU15 markets, while China's WTO entry furthered its international economic integration and expansion.

Long shipping times can impose considerable depreciation and inventory-holding costs for importers, while they bear the uncertainty associated with final demand once having agreed on specific product characteristics. Conversely, when shipping times are short, firms can respond more flexibly to changes in market conditions (Evans and Harrigan, 2005; Harrigan and Venables, 2006). Considering shipping times as a component entering the utility function of a customer, faster delivery increases the appeal of a product (Hummels and Schaur, 2013). Following this reasoning, suppliers residing in closer geographic proximity to the customer will, other things equal, be preferred over a more distant supplier, due to a shorter delivery time.

[1] From 2000 to 2007, global value chains (GVCs), especially complex ones, expanded at a faster rate than world GDP. More than two thirds of world trade nowadays occurs through global value chains (WTO, 2019). In 2000, the value of China's exports of goods totaled 3.25 percent of global exports. By 2010, Chinese exports had jumped to 7.88 percent of global exports (UN Comtrade data).

[2] This issue surfaced prominently during the Covid-19 pandemic and similar discussions revamped recently during the obstruction of the Suez canal by one of the largest container ships in the world, in March 2021.

[3] EU15 countries include: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

[4] ESE exporters are more proximate to the EU15 than China. To illustrate this: a container vessel travelling from the port of Guangzhou in China to the port of Rotterdam (via the Suez channel) has to bridge almost 18,000km. This takes almost three weeks, excluding export and import processing times at the port, document clearance times, and any other transport times between origin and final destination. Numbers are based on an average vessel speed of 20 knots, using calculations from sea-distances.org. An average Eastern or Southeast European exporter in our sample has to bridge about 1,500km to an average EU15 destination, while goods are shipped mostly by rail or truck. For a given transportation mode, delivery times to EU15 are clearly lower for Eastern European countries.

We employ 6-digit HS (Harmonized System) product-level data on imports by EU15 member states from 16 ESE countries during the period 1997-2007.[5] In addition to this, and in order to assess within-firm adjustments, we use detailed customs data from Bulgarian firms exporting to the same destination markets in the period 2001-2006.

To evaluate the relationship between intensifying Chinese competition and Eastern European countries' exports, we exploit variation in China's market shares *within* destination-product pairs over time. Our primary strategy to establish causality draws on an instrumental variable approach pioneered by Autor et al. (2013), which we redesign to generate additional dispersion across EU15 destinations. This enables us to address an important challenge for identification arising from simultaneous technological change and other product-level dynamics that are potentially correlated with the trade flows under study. We perform robustness checks by (i) exploiting the full variation in our data and including, for example, product-year or exporter-product-year fixed effects; and by (ii) employing alternative instrumental variables that rely on trade policy changes affecting China's access to high-income markets (Pierce and Schott, 2016; Mau, 2017).

We find strong evidence of export competition between China and the emerging economies located in the East and in the South-East of Europe within narrow EU15 product-destination markets. The estimated coefficients are not only statistically significant, but also economically meaningful. Although both Eastern Europe and China increased their shares in EU15 manufacturing imports during the period under investigation, we identify a 10 percent reduction in Eastern European export volumes and a 12 percent reduction in export revenue due to China's expansion.

Results from our Bulgarian firm-level sample are almost identical for adjustments in export volumes, but relatively smaller in terms of revenues. Moreover, multi-destination exporters experience comparatively smaller reductions in their shipments. Results also show that Eastern European countries with lower price levels and higher FDI inflows (as percent of GDP) are generally less affected by Chinese competition.[6]

Our core finding is that export volumes in time-sensitive sectors are substantially less affected by Chinese competition: the displacement effect is at least 50 percent lower. Differential effects for time-sensitive industries are inferred using a measure proposed by Hummels and Schaur (2013). This measure is obtained from a structural estimation of a model in which consumers attach value

[5]ESE countries include: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Northern Macedonia, Poland, Romania, Serbia-Montenegro, Slovak Republic, Slovenia, and Turkey. In this manuscript, we use the terms Eastern European exporters and ESE exporters interchangeably, unless otherwise indicated.

[6]Studies focusing on the performance of Romanian (Bajgar and Javorcik, 2020) and Bulgarian (Ciani and Imbruno, 2017) exporters document that FDI inflows in Eastern European economies significantly improved firm-level export performance. Our analysis suggests that these attributes are relevant for Bulgaria, where also unit-value responses differed remarkably from the patterns in the pooled sample of ESE exporters and partly explain the milder reductions in export revenue.

to shorter delivery times. We find timely delivery as a source of resilience to international competition that is distinct from other product and industry characteristics, such as skill-intensity or contracting intensity (Nunn, 2007). Time-sensitive sectors cover products that partly (yet not fully) include intermediate inputs.

Our envisioned mechanism finds further support in a set of placebo regressions in which we estimate displacement effects of Chinese competition for other low-wage Asian exports to the EU15. We find that the differential effects for time-sensitive industries become weaker — or even disappear — while those for skill-intensive industries remain quantitatively and statistically unchanged. This supports the idea that geographic proximity co-determines fast delivery and competitiveness in time-sensitive industries. Additionally, we find that relative resilience in time-sensitive industries tends to be weaker the greater the distance between an ESE exporter and its EU15 destination market. Nevertheless, Bulgarian exporting firms, which are located relatively far away from the EU15, confirm a significantly lower impact of Chinese competition on their exports in time-sensitive sectors.

The findings reported in this paper establish a connection between the literature on international competition and research highlighting the role of time in international trade (e.g. Evans and Harrigan, 2005; Nordås et al., 2006; Djankov et al., 2010; Hornok, 2012; Hummels and Schaur, 2013). Indeed, the importance of time in the context of international competition has received little attention in empirical applications. We use the case of China's economic expansion to investigate its implications for global trade patterns and find that timely delivery can shield countries (or firms) from external competition in a similar way as skill-, technology- or quality-upgrading do (Bernard et al., 2006; Khandelwal, 2010). To this end, our paper relates to a literature that uncovers alternative margins of adjustments to intensifying low-wage competition. For example, Holmes and Stevens (2014) find that firms can successfully escape such competition by specializing in market niches for smaller-scale, customized or non-routine product varieties. Fernandes and Tang (2020) document that Portuguese clothing and apparel firms shifted exports to varieties with shorter product life-cycles and more frequent shipments (i.e. "fast fashion"). Our findings suggest that shorter delivery times can give exporters a competitive edge, which is in line with — but not limited to — observations of regionally concentrated just-in-time (JIT) supply chains (e.g. Pisch, 2020).

Our paper also relates to a literature that highlights the existence of a "local comparative advantage" in the presence of trade costs (Deardorff, 2014). Delivery times constitute a cost that is distinct from other (monetary) trade costs, such as freight charges, and that is passed on to consumers (Hummels, 2001; Harrigan and Venables, 2006). If increasing transportation speed is costly, this implies a role for geographic proximity in determining competitiveness *vis-à-vis* other exporters in time-sensitive products. Similar predictions follow from theoretical frameworks where the physical composition of goods determines their transportation costs (Harrigan and Deng, 2008;

Harrigan, 2010).

Finally, we contribute to a body of work on the impact of China's economic expansion during the early 2000s.[7] Despite its abundance, our study is the first attempt to quantify China's impact on Eastern European exports employing detailed trade data.[8] Our findings are in line with conjectures of Dauth et al. (2014), who emphasize that German importers perceive Chinese and Eastern (South) European varieties as substitutes, and generalize them to the entire EU15. Quantitatively, our estimates suggest similar, yet lower, average displacement effects than those found by Utar and Torres Ruiz (2013) for Mexican *maquiladora* plants facing Chinese competition in the US during the same period. Nevertheless, magnitudes across ESE countries in our sample show a substantial variation.

Overall, our results suggest that regional economic integration through trade-facilitating infrastructures — i.e. lowering the cost of shorter delivery times — can be an appropriate response to external competition and enable firms to benefit from their proximity advantage in specific sectors and market niches. Regional and shorter supply chains might be able to quickly respond to exogenous trade shocks, thus making trade flows more stable. At the same time, the local nature of this proximity advantage denotes a restriction. While it prevents other competitors from entering an existing integrated market, it also limits the potential of accessing new and distant markets for exporters specializing in time-sensitive products. Recent events and debates highlight the relevance of these implications for development policies based on trade integration.[9]

The rest of the paper unfolds as follows. Section 2 presents descriptive evidence of a differential export performance in time-sensitive industries facing Chinese competition and provide some basic theoretical intuition. Section 3 presents our data and empirical approach taken to evaluate these patterns econometrically, together with a discussion of our identification strategy. Section 4 reports our main findings and robustness checks both for the evidence on export competition and for differential adjustments in time-sensitive industries. Additional results are discussed in Section 5, before Section 6 concludes.

[7]This literature can be divided into studies focusing on Chinese import competition in the US (e.g. Autor et al., 2013, 2014; Pierce and Schott, 2016) and Europe (e.g. Bugamelli et al., 2015; Bloom et al., 2016; Dauth et al., 2014; Utar, 2014, 2018), and studies investigating displacement effects of China's expansion on other countries' exports (e.g. Adams et al., 2006; Eichengreen et al., 2007; Greenaway et al., 2008; Amann et al., 2009; Hanson and Robertson, 2010; Utar and Torres Ruiz, 2013; Flückiger and Ludwig, 2015; Mattoo et al., 2017; Mau, 2019).

[8]Silgoner et al. (2015) evaluates China's impact on exports of Eastern European countries relying on a descriptive decomposition analysis, which makes it difficult to compare their findings with the literature discussed above.

[9]China's investments into the transcontinental trade infrastructure (i.e. the Belt and Road Initiative, BRI) can be viewed as an attempt to reduce shipping times between China and Europe.

2 Time sensitivity

2.1 Descriptive patterns

Our main objective is to analyze whether timely delivery can be a critical factor in international competition. To do so, we consider the performance of ESE exports facing Chinese competition in EU15 markets. To detect the advantage of timely delivery, we rely on a measure that indicates the sector-specific elasticity of demand with respect to a change in shipping times. Focusing on this dimension is in line with empirical evidence on the trade-response to delays in shipment, which suggests that timely delivery matters more in some sectors than in others (Djankov et al., 2010). We obtain our measure using the data and methodology of Hummels and Schaur (2013) to estimate the HS2-sector specific mark-up importers are willing to pay for a one day earlier delivery. The estimation is based on a discrete transport-mode choice model in which changes in shipping costs are exploited to estimate the relative demand for (fast) imports via air cargo versus (slow) imports via ocean shipment. We explain the details of this approach in Appendix B.

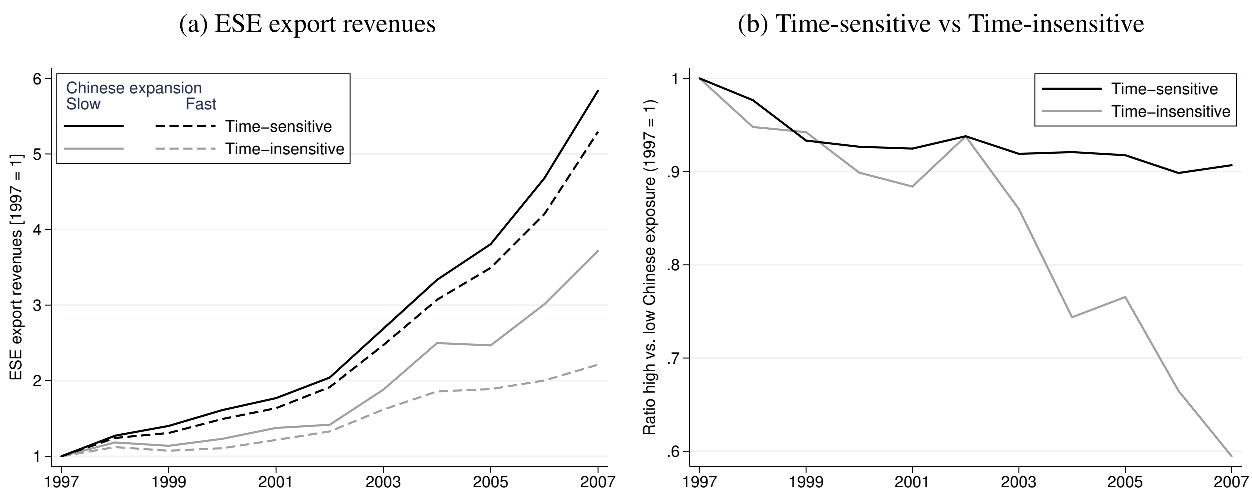
Measuring time-sensitivity in this way has two important advantages. First, since the measure is obtained from estimating a structural import demand equation, we can identify and control for potential confounding factors at an early stage. This includes, for example, exporter, distance, or price effects on import demand. We also avoid subjective judgements about the time-sensitivity of particular goods, which would be based on the description of the HS6 product codes. A second advantage is that our indicator will be based on US import data. This avoids potential measurement errors stemming from the endogeneity of transport mode choices that are related to importer-specific characteristics. One caveat, however, arises from imprecisely estimated time-sensitivity parameters. To address this, we consider two alternative indicators of time-sensitivity. One based on a simple (i.e. broad) measure, based solely on the magnitude of the point estimate, while the other reflects an adjusted (i.e. strict) measure, where we set time-sensitivity equal to zero whenever the point estimate does not pass the 10 percent significance threshold.[10]

In Figure 1, we use the strict classification to inspect how ESE exports performed in time-sensitive versus time-*in*sensitive industries. Panel (a) shows that exports in the latter group expanded slower throughout our sample period. If we further distinguish between products where China expanded fast or slow, within each industry group, we see that potential displacement effects appear larger in the time-*in*sensitive sectors. This becomes evident in Panel (b), which displays the ratio of the dashed over solid lines from Panel (a). ESE exports seem to be relatively more re-

[10] We report the respective frequency distributions of these two measures in Figure B1. Table B1 presents the full ranking of the different sectors with respect to time-sensitivity, relying on the strict measure. Four of the five most time-sensitive sectors belong to the chemical and allied industries. The fifth sector is motor vehicles and parts and accessories thereof. The five least time-sensitive sectors are: (i) explosives and pyrotechnic products; (ii) wood pulp and recovered paper; (iii) raw hides and skins; (iv) pearls and precious stones or metals; (v) silk.

silient to Chinese competition in time-sensitive sectors (bold line). In the following section we present a simple theoretical framework to rationalize these patterns and to derive hypotheses for our empirical analysis.

Figure 1: ESE exports and Chinese expansion in time-sensitive vs. time-insensitive sectors



Note: Authors' calculations based on the strict measure of time-sensitivity. Time-sensitive denotes those sectors reporting time sensitivity above median. Panel (a) denotes aggregate export revenues in respective group relative to the base year (1997). Panel (b) displays the ratio of ESE exports in fast-versus-slow expansion sectors, normalized to the base year (1997). Chinese expansion is measured as the average annual change in import market shares over the sample period. Fast (slow) expansion denotes HS6 products with above (below) median Chinese expansion within respective time-sensitivity group.

2.2 Theoretical intuition

Our aim is to illustrate that if timely delivery matters (and all other things equal), exporters residing in relative geographic proximity to their destination market enjoy an advantage over more distantly located competitors. To remain consistent with our empirical measure of time-sensitivity, we adopt a specification that is similar to the one proposed by Hummels and Schaur (2013), albeit deviating slightly for expositional convenience.

Demand and timely delivery. We consider a general industry-specific sub-utility function of the following form (subscripts suppressed):

$$C = \left(\int_z \lambda(z) q(z)^\eta dz \right)^{1/\eta} \qquad \eta = (\sigma - 1)/\sigma, \tag{1}$$

where $\sigma > 1$ is the elasticity of substitution between varieties of a good, and $\lambda(z) = v(z)t(z)^{-\zeta}$ is a demand shifter that depends positively on the quality v of a firm's goods and negatively on delivery time t; given a time-sensitivity parameter $\zeta \geq 0$ and $t > 0$.[11]

Firms operate under monopolistic competition. Adding origin-destination subscripts, Equation (1) yields the following demand function faced by firm z operating in country i and selling in destination market j:

$$q_{ij}(z) = E_j P_j^{\sigma-1} \left(\frac{p_{ij}(z)}{v_{ij}(z) t_{ij}(z)^{-\zeta}} \right)^{-\sigma} \tag{2}$$

Given nominal expenditure in country j, E_j and the local price index P_j, the price $p_{ij}(z)$ charged by firm z affects demand for its product. Furthermore, both higher quality and a shorter delivery time of the good sold yield higher demand. The latter can be inferred from the negative elasticity of demand with respect to t_{ij}; $-\zeta\sigma$.

The Price index in destination market j equals:

$$P_j = \int_{z'} \left[\left(v_{nj}(z') t_{nj}(z')^{-\zeta} \right)^{\sigma} p_{nj}(z')^{1-\sigma} d(z') \right]^{\frac{1}{1-\sigma}} . \tag{3}$$

It shows that demand faced by firm z is co-determined by the prices charged by all firms z' that are operating in the market, as well as their product quality $v_{nj}(z')$ and delivery times $t_{nj}(z')$. Price changes could follow, for example, from a trade liberalization that entails the removal of an import tariff. Product quality describes the physical and visual appearance of the good, which is determined by the kind of material inputs used, training of employees or more generally production technologies. Delivery time is a distinct feature. It captures the "availability" of a good to customers, which is determined by trade and transportation infrastructure or the mode of transport.

International competition. To investigate the impact of international competition on z's sales, we consider how demand changes following a change in the price index, P_j. As long as $\sigma > 1$, we find that $(\partial q_{ij}/\partial P_j) > 0$. This implies that *intensifying* competition, i.e. a *lower* market price index, will decrease demand $q_{ij}(z)$ faced by firm z. Taking the cross-derivative with respect to delivery time, we find:

$$\frac{\partial^2 q_{ij}}{\partial P_j \partial t_{ij}} = -\zeta\sigma\left(\sigma - 1\right) t_{ij}(z)^{-\zeta\sigma-1} E_j P_j^{\sigma-1} \left(\frac{p_{ij}(z)}{v_{ij}(z)} \right)^{-\sigma} . \tag{4}$$

Given $\zeta > 0$ and the other conventional parameter restrictions introduced above, the expression shown in Equation (4) is negative. This suggests that any increase in demand faced after an increase

[11] Since delivery times depend on the distance a good travels and the speed of transportation, assuming $t > 0$ is realistic as long as distances are greater than zero and speed is less than infinity.

in P_j is smaller, the larger $t_{ij}(z)$. In other words, exporters that take longer to deliver their goods to a destination market benefit less from a reduction in competition intensity. Conversely, and most relevant for our case, intensifying international competition results in lower sales for exporters z, but less so if they can deliver their goods relatively fast; i.e., whenever $t_{ij}(z)$ is small. Moreover, exporters enjoying a competitive advantage due to shorter delivery times do so especially in sectors S with higher time-sensitivity ζ_S.

Potential caveats and further assumptions. Our empirical analysis seeks to test the prediction that intensifying competition has a smaller detrimental effect on exports in time-sensitive industries, if exporters have short delivery times. The choice of our setup implicitly assumes that ESE exporters deliver faster than the competitors entering these markets, i.e. China. Delivery times become endogenous, however, when exporters can use alternative transportation modes.

To address this, we describe the time it takes for firm z to deliver to j as a function of some (potentially country-pair specific) fixed export administration and infrastructure costs, a_{ij},[12] as well as the distance d_{ij} it has to bridge and the speed $s_{ij}(z)$ at which it chooses to ship its good:

$$t_{ni}(z) = a_{ij} + \frac{d_{ij}}{s_{ij}(z)}. \tag{5}$$

Firms can reduce t_{ij}, by increasing s_{ij}, but they cannot influence a_{ij} and d_{ij}. Assuming that increasing s_{ij} is costly (e.g. $(\partial c_{ij}(z)/\partial s_{ij}(z)) > 0$ and $(\partial^2 c_{ij}(z)/\partial s_{ij}^2(z)) > 0$, where $c_{ij}(z)$ summarizes the unit cost of producing and delivering a good), firms face a trade-off between the gains from earlier delivery and the disadvantage of selling at a higher price.

Without having to derive the firm's optimal transportation speed, we notice that faster transport modes are more likely to be chosen in more time-sensitive (i.e. high-ζ) sectors. Equation (5) also implies that, given a transport cost function, the *absolute* value of t_{ij} depends critically on d_{ij} and its lower bound a_{ij}, as they dampen any gains from faster transportation speed. The question is, hence, whether Chinese exporters have increasingly used faster transport modes to overcome the geographical disadvantage we outline in this section. Aggregate data from Eurostat suggests that such efforts are not generally evident during our period of investigation. On average, about 20 percent of EU15 imports from China arrived via air cargo. This share remained fairly constant in the years 2000-2007 and was about the same for EU15 imports from other non-EU trade partners so that we can assume constant transport modes when we conduct our analysis and interpret our findings.

[12] Djankov et al. (2010) document that administrative regulations can substantially delay processing times and impose significant barriers to international trade. The new customs regulations between the EU and the UK, following Brexit, are a recent example of increased bilateral trade administration costs that are (at least temporarily) time-intensive.

3 Empirical analysis

3.1 Data

We use product-level information on bilateral trade in manufacturing goods between ESE exporters and EU15 destination markets. The data comes from the CEPII BACI database, where flows are disaggregated at the 6-digit HS (Harmonized System) level and reported in terms of their *free-on-board* (f.o.b.) value, as well as their quantity (in kilograms). Since we compile our sample using two editions of the BACI data, we harmonize HS6 product codes employing correspondence tables from the United Nations Statistics Division (UNSD). Our sample of exporting economies is comprised of 16 ESE countries. On the importer side, we distinguish 14 destination markets that constitute the EU15 (Belgium and Luxembourg appear as a single destination in the data). Overall, our sample spans the period from 1997 to 2007.

We also rely on firm-level customs data for Bulgaria's exports of manufacturing goods to the EU15. Firm-level information allows us to explore further dimensions of the impact of Chinese competition that cannot be observed using product-level trade data. The data comes from the Exporter Dynamics Database (EDD), compiled by the World Bank (Fernandes et al., 2016), and spans the period 2001-2006.[13] As in our product-level data set, we observe bilateral export values and quantities at the HS 6-digit product level. An important difference is that the product-level data does not report shipments with a value below 1,000 USD, whereas the Bulgarian firm-level data includes such smaller amounts.

In Table 1, Panel A, we present some features of our product-level trade data. Exports into the EU15 account for a stable 55 percent of ESE countries' total manufacturing export revenues and an average country roughly reports 7,500 to 10,400 shipments per year. However, variation across exporters is substantial: the least active ESE exporter (Albania) reports 1,046-1,382 shipments per year, while the most active one (Czech Republic) counts 18,366-22,993 annual shipments. The geographic diffusion of exports is limited: the average ESE exporter ships its average product to, at most, half of the EU15 destination markets (5-7 out of 14). Panel B shows corresponding statistics for the sample of Bulgarian exporting firms, of which we observe 8,916 units on average per year. For the vast majority of firms, EU15 markets are the main, if not the only, export destination. However, comparing mean and median numbers for the EU15 share in revenues we note that some firms are substantially more diversified. Similar heterogeneity can be observed in the remaining categories. The average Bulgarian exporter reports between 34 and 39 shipments per year in which it sells between 33 and 38 different products. Concerning the intensive firm-product margin, we note that the average product is exported to only 1-2 destinations. Overall, our firm-level sample

[13]Customs data at the firm-product-destination level is confidentially available from the EDD for a limited group of countries.

Table 1: Descriptive statistics of product- and firm-level trade data

Panel A: ESE exporting countries, 1997-2007						
Observation in sample	First year (1997)			Last year (2007)		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
EU15 share in total exports (%)	56.7	56.6	14.1	55.3	55.4	11.6
Total # of shipments to EU15	7,467	5,988	5,621	10,369	8,074	5,621
# HS6 products shipped	1,923	2,019	894	2,134	2,195	772
# HS6 per destination	856	847	479	1,012	974	510
# Destinations per HS6	5.3	5.4	1.9	6.7	7.0	2.2
Panel B: Bulgarian firms, 2001-2006						
Observation in sample	First year (2001)			Last year (2006)		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
EU15 share in total exports (%)	81.19	99.70	30.63	78.62	98.28	31.72
Total # of shipments to EU15	34.32	18	46.69	39.86	21	58.00
# HS6 products shipped	33.12	18	43.70	38.32	21	54.26
# HS6 per destination	18.33	10	22.31	20.58	10	29.23
# Destinations per HS6	1.56	1	1.35	1.73	1	1.72

Note: Panel A reports statistics for product-level trade data, based on the final estimation sample covering 16 exporting countries, 14 destinations, and 3,903 HS6 manufacturing products. Number of observations: 1,628,298; cross-sections (exporter-importer-HS6): 258,569; average years per cross-section: 6.3. Panel B reports statistics for Bulgarian firm-level trade data. Number of observations: 268,822; cross-sections (firm-importer-HS6): 162,554; average years per cross-section: 1.65.

displays a majority of extremely specialized exporters and a relatively small number of highly diversified exporters.

3.2 Empirical baseline specifications

For our product-level data, we set up a linear panel regression model of the following form:

$$\ln Y_{ijkt} = \alpha + \beta China_{jkt} + \gamma \ln M_{jkt} + \mu_{ijk} + \mu_{ijt} + \nu_{ijkt}. \qquad (6)$$

The dependent variable, $\ln Y_{ijkt}$, measures, alternatively, the (log) value and the (log) quantity of shipments from ESE country i to EU15 importer j, for HS 6-digit product, k, in year t. On the right hand side we include our main variable of interest, $China_{jkt}$, which measures China's expansion into the EU15 by its import market share in the respective product-destination in year t.[14]

In order to account for potential confounding factors, we control for the evolution of import demand at the destination-product level, $\ln M_{jkt}$, as well as for aggregate demand and supply shifters using two sets of fixed effects. Importer-exporter-time fixed effects, μ_{ijt}, control for aggregate time-varying demand and supply shifters (such as business cycle dynamics, bilateral agreements and trade costs, or other country-pair specific factors). Exporter-importer-product fixed effects, μ_{ijk}, capture time-invariant, product-specific demand and supply shifters (such as preferences, relative supply capacities, or persistent non-political trade barriers between two trading partners) as well as differences in the accounting of traded quantities across products. The last term on the right-hand side of Equation (6), ν_{ijkt}, denotes an independent and identically distributed (i.i.d.) error term.

For our firm-level sample we adopt the analogous baseline specification:

$$\ln Y_{fjkt} = \alpha + \beta China_{jkt} + \gamma \ln M_{jkt} + \delta \mathbf{X}_{ft} + \mu_f + \mu_{jk} + \mu_{jt} + \nu_{fjkt}. \qquad (1')$$

The key difference with respect to the product-level specification is that the exporting country's subscript i becomes redundant, so that fixed effects μ_{jk} and μ_{jt} remain destination-product and destination-time specific. The new firm-level dimension f is observed in the dependent variables, export value and quantity, so that we augment our previous model with a set of firm fixed effects, μ_f, and time-varying firm-level controls, $\mathbf{X}_{ft}$.[15] Since in both our specifications the main coefficient of interest is β, we consider the dimensions of its associated variable and therefore adjust standard errors for clustering at the destination-product level (Moulton, 1990).

3.3 Measurement and identification

This subsection briefly explains our baseline identification strategy. Since it has become standard in the literature on Chinese competition, we relegate the discussion of potential challenges and critical assumptions to Appendix sections A.1-A.3.

In line with previous studies, we measure the intensity of Chinese competition by its import market penetration rate: $China_{jkt} = M^{CN}_{jkt}/M_{jkt}$.[16] This poses challenges to identification, as

[14] As discussed in subsection 2.2, Chinese competition affects ESE exports via the destination-product specific price index, which we assume to decrease as China's market share expands.

[15] As shown in Table 1, Bulgarian exports appear to be rather polarized as typically firms export their goods to only one destination. Interacting firm fixed effects with an additional dimension would result in a substantial loss of both variation and actual observations in our data. Firm-level control variables will be explained in detail below and capture broadly firms' overall exporting experience as well as their size. Our firm-level specification is similar to those used in related studies using firm- or plant-level data (e.g. Utar and Torres Ruiz, 2013).

[16] Overall market penetration is deemed to be more appropriate mainly in studies on the domestic responses to increasing import competition (e.g. Bernard et al., 2006; Autor et al., 2013, 2014; Dauth et al., 2014; Bugamelli et al.,

OLS estimates inform about correlations but not about causation. It is possible that (i) causality runs from ESE exports to China's market shares; or that (ii) there exists no causal relationship at all. The latter case includes the possibility of spurious correlation, which, depending on the actual source of the observed correlation, can have different implications on the direction of the bias in the OLS coefficient.

Since the seminal study by Autor et al. (2013), the empirical literature on Chinese competition has been fairly consistent in addressing these concerns. In a nutshell, the "standard approach" uses Chinese exports to n as an instrument for exports to j, where n is similar but not equal to j. The validity of this instrument is justified by the assumption that if China's market share rises simultaneously in two similar, yet different, destinations, this can no longer reflect an idiosyncratic preference shift in j, but captures a change in China's supply capacity. We follow this reasoning in our baseline specification and select a group of high-income countries to reflect n: Australia, Canada, New Zealand, Norway, and Switzerland. By focusing on relatively small high-income markets, with distance from China comparable to our EU15 destinations, we attempt to rule out that regional production networks or preference shifts in large individual destinations impact our results (e.g. Mau, 2017).[17]

In the context of our study, observing China's product-market expansion in destinations n is not enough, because it does not inform us about the extent to which it materializes across the different EU15 destinations. We therefore employ an augmented version of this instrument by assigning destination-specific weights to the import market penetration rates observed in n:

$$China^{IV}_{jkt} \equiv (China_{kt} \times w_j) = \underbrace{\left(\frac{\sum_n M^{CN}_{nkt}}{\sum_n M_{nkt}}\right)}_{\substack{\text{product-year} \\ \text{variation}}} \times \underbrace{w_j}_{\substack{\text{destination} \\ \text{variation}}}. \tag{7}$$

To measure w_j, we exploit information on Hong Kong re-exports for the years 1999-2001 and compute j's fraction in its total re-exports to the EU15. We motivate this approach by noting that, prior to its WTO entry, China exported many of its goods via Hong Kong, which entailed additional surcharges (Feenstra and Hanson, 2004). We hypothesize that improved market access provisions after WTO entry may have enabled Chinese exporters to avoid these surcharges and

2015). The unavailability of product-level data on domestic production prevents us from computing this measure at the HS6-product level. Indeed, studies employing this measure typically rely on aggregate sector-level data. Since we attempt to evaluate competition effects between countries exporting to the same *third* market, we are confident that import market shares are an appropriate measure for the purposes of our analysis.

[17]Note that our approach does not exactly replicate the approach of Autor et al. (2013), given the different focus of our paper. We adopt the idea of using observations in n as an instrument for observatons in j, but abstain from using pre-sample observations to obtain weights for a more aggregate measure of exposure to Chinese competition. Accordingly, the recent critique by Goldsmith-Pinkham et al. (2019), which focuses on potential issues with the aggregation and the weights used, does not apply to our context.

instead ship goods directly to the final destination. Such an adjustment would imply that Chinese exports expanded relatively faster in destinations where Hong Kong re-exports were larger in 1999-2001.[18] Our main instrument for China's expansion thus represents an interaction of the time-varying, product-specific import market penetration in other destinations, $China_{kt}$, with the relative probability of destination j to be entered by Chinese exports, w_j. By adding w_j we generate a novel dimension of variation in competition intensity, which complements the conventional identification via product-level changes in supply capacity used in other studies. This enables us to fully exploit the information in our data and to address potential concerns regarding the "standard approach" in robustness checks that have typically not been feasible in previous studies.

4 Results

4.1 Displacement of exports through Chinese competition

In this subsection we report findings for displacement effects of ESE exports due to Chinese competition. To infer effects on the scale of trade activity, we focus mainly on estimated adjustments in exported quantities and report adjustments in export revenues for comparison.

4.1.1 Baseline results

Table 2 conveys a clear message regarding the relationship between China's expansion into EU15 destination-product markets and ESE countries' exports. The first column displays our OLS results and suggests a negative relationship. Using the average expansion of China observed in our sample, i.e. 5.47 percentage points, this implies a reduction in ESE export quantity by $5.47 \times 1.024 \approx 5.6$ percent between 1997 and 2007. A similar effect is found for export revenues in column (5), where we observe a 6.8 reduction in the same period. Columns (2) and (6) report results for our IV specification. The estimated coefficients are larger in absolute terms and suggest reductions in quantity and revenue by 10.3 and 12.8 percent, respectively. [19] In the lower panel of Table 2, we report the coefficients of interest obtained in the first stage of the IV estimation. In column (2), the coefficient shows the expected sign and test statistics support the predictive power of the

[18]Evidence in support of our suggested mechanism is provided in Figure A1, showing that Hong Kong's share in China's total transport services imports dropped persistently after 2002. Hong Kong has been a GATT/WTO member since 1986 and maintained this status after formally becoming part of China in July 1997, making transshipment of Chinese exports attractive. After WTO entry, the relative benefits of Hong Kong entrepôt trade declined. Figure A2 presents the distribution of our destination-specific weight w_j.

[19]These numbers are comparable to the displacement effect Utar and Torres Ruiz (2013) calculate for Mexican maquiladora plants selling to the US during the period 1990-2006. Their preferred specification implies a reduction by about 18 percent during their sample period, in which China's market share increased by about 7 percentage points. Assuming the same expansion in our sample, we would obtain a reduction in ESE exports by 16 percent.

Table 2: China's impact on export volumes and value shipped by ESE exporters to the EU15

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	log export quantity				log export revenue			
Sample:	ESE countries Product-level (1997-2007)		Bulgaria Firm-level (2001-2006)		ESE countries Product-level (1997-2007)		Bulgaria Firm-level (2001-2006)	
Estimator:	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
OLS and second stage results								
China: s^{CN}_{jkt}	-1.024**	-1.879**	-0.414**	-2.167**	-1.222**	-2.343**	-0.355**	-1.219*
	(0.040)	(0.178)	(0.107)	(0.599)	(0.036)	(0.158)	(0.111)	(0.596)
Import demand: $\ln M_{jkt}$	0.511**	0.516**	0.185**	0.215**	0.569**	0.576**	0.213**	0.228**
	(0.007)	(0.007)	(0.021)	(0.024)	(0.006)	(0.006)	(0.023)	(0.025)
Years exporting$_{ft}$			0.379**	0.387**			0.328**	0.332**
			(0.050)	(0.050)			(0.052)	(0.052)
N. Destinations served$_{ft}$			0.073**	0.071**			0.069**	0.068**
			(0.022)	(0.022)			(0.023)	(0.023)
Product range$_{ft}$			-0.256**	-0.255**			-0.259**	-0.259**
			(0.017)	(0.017)			(0.018)	(0.018)
Fixed effects:	ijk, ijt	ijk, ijt	jk, jt, f	jk, jt, f	ijk, ijt	ijk, ijt	jk, jt, f	jk, jt, f
First stage results (dep.var.: s^{CN}_{jkt})								
$s^{CN}_{nkt} \times w_j$		1.830**		1.361**		1.830**		1.361**
		(0.054)		(0.108)		(0.054)		(0.108)
Observations	1,628,298	1,628,298	268,822	268,822	1,628,298	1,628,298	268,822	268,822
N. Clusters	44,669	44,669	15,738	15,738	44,669	44,669	15,738	15,738
Kleibergen-Paap (F-stat)		1,163.9		158.5		1,163.9		158.5

Note: Table reports estimated log-point adjustments in quantities and values shipped by Eastern and Southeast European exporters to EU15 markets, due to increasing Chinese market shares. Control variables and fixed effects structure differ across samples, as indicated in the table and explained in Section 3.2. Standard errors in parentheses have been adjusted for clustering at the product-destination level. Statistical significance: $^a = p < 0.1$, $^* = p < 0.05$, $^{**} = p < 0.01$.

instrument.

Columns (3), (4) and (7), (8) of Table 2 report findings for Bulgarian firm-level export quantity and revenue in EU15 destinations. OLS and 2SLS specifications include a set of time-varying firm-level controls. We control for firm's exporting experience, which we measure by the number of years a firm exports a given HS 6-digit product. We also include two additional controls to capture firm size via its diversification (i.e., by counting the maximum number of HS6 products it exports to a specific destination and by counting the maximum number of destinations it serves with a specific HS6 product). Both OLS and 2SLS estimates suggest a negative relationship between Chinese market penetration and Bulgarian export quantities and revenues in EU15 destination markets. Estimates reported in columns (4) and (8) imply that a standard deviation increase in China's market share in the EU15 leads to a 4.51 (2.54) percent lower export quantity (revenue) for Bulgarian exporters. Estimates reported in the lower panel of column (4) show that the instrumental variable is not weak, while the Kleibegen-Paap F-statistic reassures on the validity of our identification.

Overall, effects on Bulgarian exporters are slightly smaller in magnitude and comparable in significance to product-level estimates for the sample of ESE countries. Noticeably, one finding that consistently emerges is that OLS coefficients tend to underestimate the true displacement effect of Chinese competition. This suggests that simultaneity bias challenges appropriate identification. Consequently, OLS estimates should be interpreted as a lower bound of the actual displacement effect of China on ESE exports.

4.1.2 Robustness checks

Alternative specifications. Our baseline findings show consistent results for the displacement of ESE countries' exports by Chinese competition. While we opted for a single specification in our baseline estimation, alternative clustering dimensions, aggregation, and especially alternative fixed effect structures may impact our findings. The latter are particularly interesting, because they enable us to control for general unobserved product-level dynamics (such as technological progress and offshorability) that may have caused Chinese exports to expand and ESE exports to decline. In Table A1, we present results for these robustness and specification tests and find that displacement effects appear even larger once we include product-year or exporter-product-year fixed effects. Alternative clustering structures and assessing effects on the aggregate EU15 market, without having to rely on weights derived from Hong Kong re-exports, do not impact our baseline findings. Altogether, we find IV estimates ranging between -1.879 and -3.316 across the different specifications.

Alternative Instruments. Next to alternative specifications, our findings might be sensitive to the way we measure Chinese competition. We therefore employ two alternative identification strategies, in which we exploit trade policy changes after China's WTO entry in December 2001.

One such policy change was China's transition to permanent normal trade relations (PNTR) with the US, which entailed a lower threat of sudden tariff increases and an expansion of Chinese exports (Pierce and Schott, 2016; Handley and Limão, 2017; Feng et al., 2017).[20] Mau (2017) shows that the transition to US PNTR also triggered an acceleration of China's exports to the EU15

[20] Uncertainty arose from the fact that MFN rates were granted only for one year and were subject to review and approval by the US Congress before being renewed. While the US never actually applied these higher rates on Chinese products, a potential negative decision would have entailed Chinese exporters facing a 28 percentage point increase in applied tariffs on average. At some instances during the 1990s the voting margins in favor of maintaining MFN rates for another year were very small. Upon China's WTO entry, in December 2001, this annual review process was abolished.

and other large high-income destinations.[21] Following these studies, we measure the product-specific pre-WTO tariff threat faced by Chinese exporters as the difference between US Column-2 and MFN tariff rates ($Col2_k - MFN_k$) and interact it with a post-WTO-entry dummy (WTO_t^{CN}). We apply the same destination-specific weight w_j as before.

Columns (1) and (5) of Table A2 report second-stage estimation results for this instrument, which lend support to a negative impact of China's expansion on ESE exports. Estimates for our Bulgarian firm-level sample also confirm a displacement effect, albeit coefficient size and statistical significance are somewhat less robust. We attribute this partly to the short sample period, which prevents us from including a sufficient amount of pre-WTO entry observations.

As a second policy change, we exploit the removal of European quotas in the textiles and clothing industries (HS Chapters 50-63). Quotas were originally imposed on Chinese exports under the Multifibre-Arrangement (MFA) in the 1970s. During our sample period, a first round of quota removals became effective for China upon its WTO entry and a second round followed in 2005.[22] To evaluate the impact of these removals, we compute for each liberalization round the product-specific quota *fill* rate (or utilization rate) reported during the three years preceding a specific quota removal. We assume that fill rates indicate how binding a quota actually was, so that higher rates should entail a relatively stronger expansion after the removal. We interact fill rates ($fill_k$) with a dummy variable that indicates the quota-free period ($remove_{kt}$) and with the destination-specific weights (w_j) we have used also for the other instruments. The sample employed for this robustness check focuses only on the relevant textile and clothing industries comprised in HS chapters 50-63.

Our results are reported in Table A2 columns (2) and (4), for export quantities, and columns (6) and (8), for revenues. Again, we find our baseline findings supported by negative and statistically significant coefficients, an exception being again Bulgarian firm-level exports. Next to the short sample period, the quantitatively smaller displacement effects could also originate from a relatively higher competitiveness of Bulgarian firms in the textiles and clothing industries.

4.2 Differential effects in time-sensitive sectors

Having established a negative impact of Chinese competition on ESE exports, we turn to evaluating whether time-sensitive industries have been relatively less affected. To test this, we interact our main variable of interest with a time-invariant HS2 sector-specific indicator of time sensitivity.

[21] Although this event was politically exclusive to US-China trade relations (the EU installed PNTR towards China already in the 1980s), such a "spillover-effect" is in line with theoretical models where firms face significant fixed costs of exporting that are not specific to a particular destination.

[22] Utar (2014, 2018) presents a detailed description of the nature and sequence of these events. See Brambilla et al. (2010) for an analysis of US import quotas on Chinese textile and clothing products. The original data set, specifying quota products, allowed quantities and quota utilization rates was retrieved from the *Système Intégré de Gestion de Licenses* (SIGL).

We adopt the strict binary indicator in our baseline specifications (see Section 2). Since we are primarily interested in the real displacement effects of Chinese competition and seek to avoid confounding effects captured driven by price changes, this subsection concentrates on outcomes for export quantities.

4.2.1 Baseline results

Table 3 presents our core findings for differential displacement effects in time-sensitive industries. Coefficients reported in columns (1) to (4) are obtained from our product-level data one ESE countries' exports. Estimates reported in columns (5) to (8) reflect our Bulgarian firm-level exports. Results from our baseline specifications, shown in columns (1)-(2) and (5)-(6), suggest a significantly smaller displacement effect in time-sensitive sectors. Their implied size is substantial. While column (1) suggests about 75 lower displacement, the remaining specifications suggest that exports in time-sensitive sectors have been virtually unaffected by Chinese competition.

We include additional interaction terms to test whether our baseline findings are driven by confounding product- or sector-level characteristics. As a first and obvious suspect we include a binary indicator variable for intermediate inputs. Such goods may be traded within just-in-time supply chains that are typically regionally concentrated (e.g. Pisch, 2020). We identify intermediate inputs based on the Broad Economic Categories (BEC rev.4) nomenclature. Next to this, time-sensitivity could be correlated with more intensive contracting, for example, if such products have to meet criteria that make production more complex. We use the contract-intensity measure from Nunn (2007) and include it as a binary indicator variable that takes a value equal to one for goods with above-median contracting intensity.[23] Finally, we control for skill-intensity, which could be correlated if timely delivery requires higher management and ICT operation skills, for example. We measure skill-intensity using data from Amiti and Freund (2010) and include it as a binary variable that flags above-median skill-intensive products in our sample.[24]

Our results in columns (3)-(4) and (7)-(8) suggest that the impact of Chinese competition on ESE exports differs across several product and sector specific dimensions. Indeed, the differential effects for time-sensitive industries is corrected downwards and now indicates 43-64 percent lower displacement in three out of four specifications. The interaction coefficients for our additional product characteristics also indicate consistently smaller displacement effects among ESE

[23] The original data from Nunn (2007) reports contract intensity at the 5-digit NAICS level. We use correspondence tables from Pierce and Schott (2009) to map this measure to HS 6-digit products.

[24] Their measure of skill-intensity reflects the share non-production workers in total employment for Indonesian manufacturing industries in 1992. Amiti and Freund (2010) argue that relative factor use in Indonesia's manufacturing sector is a good proxy of relative factor use in China and find that China's export growth during the early 2000s was driven by less skill-intensive products. Skill intensity has revealed as a key dimension for differential exposure in several other studies evaluating the impact of Chinese competition (e.g. Autor et al., 2013; Utar and Torres Ruiz, 2013; Utar, 2014, 2018; Bugamelli et al., 2015).

Table 3: Differential effects in time-sensitive industries

Dep. var.: log export quantity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample:	ESE countries (Product level, 1997-2007)				Bulgaria (Firm level, 2001-2006)			
Specification:	Baseline		Augmented		Baseline		Augmented	
Estimator:	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
China: s^{CN}_{jkt}	-1.581**	-3.374**	-2.172**	-4.828**	-0.732**	-2.723**	-0.408	-3.289*
	(0.049)	(0.194)	(0.124)	(0.416)	(0.137)	(0.624)	(0.308)	(1.333)
× time-sensitive, strict def.	1.176**	3.425**	0.977**	3.083**	0.804**	2.579**	0.571*	1.423^a
(binary, 1 = above median)	(0.075)	(0.225)	(0.083)	(0.267)	(0.200)	(0.626)	(0.231)	(0.845)
× intermediate inputs			0.648**	1.546**			-0.013	2.628*
(binary, 1 = yes)			(0.114)	(0.327)			(0.293)	(1.050)
× contract intensity			0.519**	1.478**			-0.385	0.781
(binary, 1 = above median)			(0.116)	(0.355)			(0.291)	(0.980)
× skill intensity			0.516**	1.224**			0.360	1.799^a
(binary, 1 = above median)			(0.105)	(0.334)			(0.299)	(1.060)
Control for import demand:	✓	✓	✓	✓	✓	✓	✓	✓
Firm-level controls included:					✓	✓	✓	✓
Fixed effects:	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f
Observations	1,628,298	1,628,298	1,628,298	1,628,298	268,822	268,822	268,822	268,822
N. Clusters	44,669	44,669	44,669	44,669	15,738	15,738	15,738	15,738
Kleibergen-Paap (F-stat)		582.0		72.3		68.7		10.1

Note: Table reports estimated log-point adjustments in quantities shipped by Eastern and Southeast European exporters to EU15 markets, due to increasing Chinese market shares, as well as differential adjustments for selected industry attributes. A control variable for import demand product-destination markets is included in all specification. Moreover, firm-level specifications include control variables for firms' years of exporting (as observed in the sample) and the number of destinations and products they export in a given year. Fixed effects structures differ across samples, as indicated in the table and explained in Section 3.2. Standard errors in parentheses have been adjusted for clustering at the product-destination level. Statistical significance: $^a = p < 0.1$, $^* = p < 0.05$, $^{**} = p < 0.01$.

exporters. In Appendix Table A3 we include each of our control characteristics separately into the model and find that the downward correction for time-sensitivity was driven primarily by intermediate inputs. Table A3 further reports that products' scope for vertical (quality) differentiation (e.g. Khandelwal, 2010) or their so-called "stickiness" in trade relations (Martin et al., 2021) are not the main driving force behind our findings for time-sensitivity reported in this section.

Altogether, our evidence suggests that ESE exports in time-sensitive industries have been relatively resilient to Chinese competition during the early 2000s. In line with our theoretical reasoning in subsection 2.2, this might indicate the existence of a local comparative advantage that arises from differential preferences for earlier delivery across sectors and the negative correlation between geographic proximity and delivery times. Time-sensitivity seems to denote a separate channel for the determination of trade patterns that coexists with other product attributes.

4.2.2 Robustness and plausibility checks

This subsection presents results for additional specifications that assess the robustness of our findings to alternative measures of time-sensitivity. Moreover, we conduct a number of additional tests to explore the validity and plausibility of our proposed reasoning on time sensitivity and the role of geographic proximity.

Alternative measures of time-sensitivity. Given the different ways to classify industries as being time-sensitive, and having relied on only one of them so far, Table 4 presents results for the alternative measures. Panel A reports estimates from our product-level ESE exporters sample, while Panel B reports the Bulgarian firm-level results.

Across panels, coefficients displayed in columns (1) and (2) confirm our general finding that intensifying Chinese competition reduced export volumes to the EU by ESE countries and Bulgarian firms, while these effects appear to be smaller in time sensitive sectors. The magnitude of these differential effects are comparable to our baseline results. The OLS estimate in column (1) of Panel A suggests an about 55 percent smaller displacement effect, while the corresponding IV estimator suggests an almost complete compensation. Firm-level results in Panel B report similar findings.

In the remaining columns of the Table, we use a continuous measure of time-sensitivity, which relies directly on the point estimate we obtained when using the data and methodology from Hummels and Schaur (2013). However, we distinguish again between a broad and a strict measure, where the latter sets coefficient estimates to zero when statistical significance did not pass the 10 percent threshold. While the reported size of the interaction coefficients cannot be easily interpreted in this case, we observe that also these measures suggest a significantly milder effect of Chinese competition on exports in time-sensitive industries. We conclude from this analysis that our findings are statistically fairly robust, even if estimated magnitudes can vary substantially across our samples and specifications.

Table 4: Alternative measures of time-sensitivity

	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)
Panel A: ESE countries (Product-level, 1997-2007) – Dep. var.: log export quantity						
Time-sensitivity measure:	Binary (above median)		Continuous (normalized: SD=1)			
Time-sensitivity definition:	Broad		Strict		Broad	
Estimator:	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
China	-1.266**	-2.508**	-0.935**	-1.598**	-0.862**	-1.386**
	(0.049)	(0.183)	(0.041)	(0.178)	(0.048)	(0.205)
× time-sensitive	0.698**	2.169**	0.601**	1.702**	0.627**	1.787**
	(0.079)	(0.240)	(0.046)	(0.138)	(0.096)	(0.341)
Control for import demand:	✓	✓	✓	✓	✓	✓
Fixed effects:	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt
Observations	1,628,298	1,628,298	1,628,298	1,628,298	1,628,298	1,628,298
N. clusters	44,669	44,669	44,669	44,669	44,669	44,669
Kleibergen-Paap (F-stat)		554.0		609.0		595.1
	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)
Panel B: Bulgaria (Firm-level, 2001-2006) – Dep. var.: log export quantity						
Time-sensitivity measure:	Binary (above median)		Continuous (normalized: SD=1)			
Time-sensitivity definition:	Broad		Strict		Broad	
Estimator:	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
China's market share	-0.630**	-2.550**	-0.300**	-1.311*	-0.136	-0.987
	(0.127)	(0.606)	(0.109)	(0.652)	(0.131)	(0.872)
× time-sensitive	0.678**	2.364**	0.442**	1.533**	0.887**	2.780*
	(0.208)	(0.639)	(0.126)	(0.418)	(0.266)	(1.418)
Control for import demand:	✓	✓	✓	✓	✓	✓
Firm-level controls included:	✓	✓	✓	✓	✓	✓
Fixed effects:	jk, jt ,f	jk, jt ,f	jk, jt ,f	jk, jt ,f	jk, jt ,f	jk, jt ,f
Observations	268,822	268,822	268,822	268,822	268,822	268,822
N. clusters	15,738	15,738	15,738	15,738	15,738	15,738
Kleibergen-Paap (F-stat)		60.3		68.5		67.5

Note: Table shows estimates of log-point adjustments in the quantity of shipments from Eastern and Southeast European exporters to the EU15, due to increasing Chinese market shares these markets, and differential adjustments in time-sensitive industries according to alternative definitions and measurements. Standard errors reported in parentheses are clustered at the product-destination level. Statistical significance: $^a = p < 0.1$, $^* = p < 0.05$, $^{**} = p < 0.01$.

Placebo regressions and intra-European distances. We investigate two additional hypotheses that could support our reasoning on the role of geographic proximity in establishing a competitive advantage in time-sensitive industries. We first estimate the response of other low-wage Asian (LWA) countries' exports to the EU15. While these countries also compete with China (e.g. Eichengreen et al., 2007; Greenaway et al., 2008), they should not be endowed with a geographic proximity advantage in EU15 markets. We test this by conducting a placebo regression that is identical to our baseline, but focuses on exports by LWA countries.[25] The second test is to check whether relatively smaller displacement effects in time-sensitive industries materialize mainly in the geographically more proximate EU15 destination markets, from the ESE exporting countries' perspective. We test this by employing a binary ij-specific variable that indicates whether the bilateral distance between a country pair ranges above the median distance for any ij-pair in our sample.[26] Table 5 presents our results.

Table 5: Differential adjustments to competition in time-sensitive industries, plausibility checks

Dep. var.: log export quantity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Plausibility check:	Placebo: low-wage Asian exporters				Non-linearities: ESE distance to destination			
Specification:	Baseline		Augmented		Subsample $\leq 1,500$	Subsample $> 1,500$	Triple-interaction	
Estimator:	OLS	2SLS	OLS	2SLS	OLS	OLS	OLS	2SLS
China's market share	-0.775**	-0.660**	-1.076**	-0.828*	-1.880**	-1.045**	-1.879**	-4.318**
	(0.049)	(0.212)	(0.107)	(0.374)	(0.063)	(0.067)	(0.063)	(0.249)
× time-sensitive	0.365**	0.225	0.166*	-0.051	1.426**	0.746**	1.426**	4.109**
	(0.073)	(0.207)	(0.082)	(0.250)	(0.093)	(0.108)	(0.093)	(0.281)
× intermediate inputs			0.443**	0.675*				
			(0.096)	(0.286)				
× contract intensity			0.240*	0.174				
			(0.099)	(0.289)				
× skill intensity			0.609**	0.810*				
			(0.116)	(0.388)				
× distant_{ij}							0.832**	2.694**
							(0.087)	(0.343)
× time-sens. × distant_{ij}							-0.680**	-1.882**
							(0.134)	(0.391)
Control for import demand:	✓	✓	✓	✓	✓	✓	✓	✓
Fixed effects:	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt
Observations	767,418	767,418	767,418	767,418	1,100,535	527,763	1,628,298	1,628,298
N. clusters	38,703	38,703	38,703	38,703	35,630	34,525	44,669	44,669
Kleibergen-Paap (F-stat)		431.5		86.5				296.2

Note: Table shows estimated log-point adjustments in the quantity of shipments to the EU15, due to increasing Chinese market shares. Columns (1)-(4) estimate adjustments in shipments by low-wage Asian exporters. Columns (5)-(8) consider shipments by East and Southeast European exporters. The variable distant_{ij} takes a value equal to one for observed bilateral (population-weighted) distances of more than 1,500 kilometers between the ESE exporter and the EU15 destination, as reported in the CEPII Gravity Dataset. Standard errors reported in parentheses are clustered at the product-destination level. Statistical significance: $^a = p < 0.1$, $^* = p < 0.05$, $^{**} = p < 0.01$.

[25]The sample Asian exporters used for our placebo regression consists of Bangladesh, Cambodia, India, Indonesia, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam.

[26]We use bilateral population-weighted distances from the CEPII gravity database and define distant trade relations at a 1,500 kilometer threshold, which roughly reflects the distance between the median country pair in our sample. According to this threshold, each ESE exporter i has both distant and non-distant EU15 partners j. Bulgaria, Romania and Turkey mainly trade on distance (i.e. about 66, 53, and 91 percent of their observed shipments). On the importer side, Ireland, Portugal, and Spain are always classified as distant destinations, while the UK follows with about 65 percent of its observations reflecting distant trade.

Columns (1)-(4) suggest that LWA exporters reveal only weak signs of differential exposure to Chinese competition in time-sensitive industries. Although OLS estimates in columns (1) and (3) do suggest a smaller displacement effect, the 15-47 percent difference is quantitatively much smaller than the one found for ESE exporters. Moreover, our IV specifications do not support any significantly different adjustments of LWA exports to Chinese competition in these sectors. Since differential effects for other industry characteristics we include in columns (3) and (4) are robust, we conclude that an advantage in time-sensitive industries is less likely to be evident among LWA exporters. This lends support to our conjecture that exporters residing geographically more proximate to their reference market are more likely to be internationally competitive in time-sensitive industries.

Columns (5)-(8) report results for our second hypothesis, which we test first by splitting our sample in two and, subsequently, by employing a triple-interaction term into our model. Columns (5) and (6) report OLS results for sub-samples of geographically proximate and distant country pairs, respectively. Displacement effects appear to be generally smaller for distant trade relations, while time-sensitive sectors reveal about 50 percent lower displacement. Considering the sub-sample of relatively proximate country pairs, displacement effects are about 70 lower in time-sensitive industries. Columns (7) and (8) confirms these results, as we can infer from the three-way interaction coefficient at the bottom of the table. Its negative sign suggests that the competitive advantage over China in time-sensitive sectors materializes primarily among the relatively short-distance trade relations of ESE exporters with the EU15. Hence, our general theoretical conjectures are supported also by this result.

5 Further results

In addition to our main findings, we exploit further information in our data to investigate additional dimensions in exporters' adjustments to Chinese competition. We first focus on the effects on export unit values to obtain a more complete picture of the impact of Chinese competition on ESE export performance. Finally, we discuss patterns and potential determinants of heterogeneity across ESE countries and Bulgarian firms.

5.1 Unit value adjustments

We measure unit values by dividing reported export revenues with export quantities to obtain an indicators of average export prices. Higher prices might indicate adjustments in product quality that may arise from a changing firm composition, if measured at the product level, or from actual quality upgrading, if measured at the firm-level (Schott, 2004; Feenstra and Romalis, 2014).

Columns (1)-(4) of Table 6 display results for product-level ESE exporters, while columns (5)-(8) report findings obtained from our Bulgarian firm-level sample. Comparing the general impact of Chinese competition on export unit values across our samples, we observe that average ESE exports sell at lower average prices, while Bulgarian exporters suggest the opposite adjustment. Given their similar adjustments in terms of export quantities reported earlier, we conclude that observed differential impacts of Chinese competition across exporters might be entirely driven by different unit-value responses. This points at a potentially diverse scope for adjustment to Chinese competition, where some exporters might be forced to lower their prices, while others see scope for upgrading their goods and serving pricier market segments.[27]

Table 6: Export unit value adjustments

Dep. var.: log export UV	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample:	ESE countries (Product level, 1997-2007)				Bulgaria (Firm level, 2001-2006)			
Specification:	Baseline		Time-sensitive		Baseline		Time-sensitive	
Estimator:	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
China: s_{jkt}^{CN}	-0.198**	-0.463**	-0.188**	-0.426**	0.059	0.948**	0.194**	1.345**
	(0.018)	(0.075)	(0.023)	(0.083)	(0.052)	(0.290)	(0.057)	(0.284)
× time-sensitive			-0.021	-0.086			-0.341**	-1.843**
			(0.034)	(0.094)			(0.103)	(0.326)
Control for import demand:	✓	✓	✓	✓	✓	✓	✓	✓
Firm-level controls included:					✓	✓	✓	✓
Fixed effects:	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f
Observations	1,628,298	1,628,298	1,628,298	1,628,298	268,822	268,822	268,822	268,822
N. Clusters	44,669	44,669	44,669	44,669	15,738	15,738	15,738	15,738
Kleibergen-Paap (F-stat)		1163.9		582.0		158.5		68.7

Note: Table reports estimated log-point adjustments in the unit values of shipments by Eastern and Southeast European exporters to EU15 markets, due to increasing Chinese market shares, as well as differential adjustments in time-sensitive industries. A control variable for import demand product-destination markets is included in all specification. Moreover, firm-level specifications include control variables for firms' years of exporting (as observed in the sample) and the number of destinations and products they export in a give year. Fixed effects structures differ across samples, as indicated in the table and explained in Section 3.2. Standard errors in parentheses have been adjusted for clustering at the product-destination level. Statistical significance: $^a = p < 0.1$, $^* = p < 0.05$, $^{**} = p < 0.01$.

Turning to the differential responses in time-sensitive industries, our findings are again inconsistent between our samples. ESE exporter unit values do not reveal any differential adjustments, suggesting that our reported resilience to international competition materializes entirely via quantity adjustments. Time-sensitive exports reveal the comparable reductions in average prices in both

[27] Indeed, one explanation for our findings could be that Bulgaria benefited from relatively high FDI inflows during our period of investigation, which facilitated quality upgrading of firms' exports thanks to positive forward spillovers (Ciani and Imbruno, 2017). Bajgar and Javorcik (2020) show a positive relationship between the quality of products exported by Romanian firms and the presence of multinational enterprises in input-supplying industries.

industries. Results in column (7) and (8), however, suggest that unit-value increases among Bulgarian exporters are systematically smaller in time-sensitive industries, which could suggest that such firms lack incentives to upgrade their products.

5.2 Heterogeneous effects across exporters

After having assessed the role of timely delivery in international competition, we shift our focus towards heterogeneous effects across ESE exporters. Moreover, relying on information from our firm-level data, we also report findings on differential effects of Chinese competition across exporting firms.

Effects across exporting countries. In Appendix C, we present an extensive analysis of heterogeneous effects across ESE countries in our sample. Overall, we conclude that our baseline results for export quantity adjustments are fairly representative, despite some differences for individual countries (see Figures C1-C3).

As shown in Table C1, the eight Eastern European countries (EEC) from our sample that joined the EU in 2004 reveal systematically larger reductions in exports than the remaining Southeast European (SEE) economies. Part of this difference can be attributed to an influential outlier in the comparison group: Turkish exports appear to be quite resilient to Chinese competition according to our analysis (see Table C1, Panel B). Several other features seem to determine the differential experience of ESE exporters with Chinese competition. Countries integrating earlier into the European Union tend to be generally more affected by Chinese competition. Moreover, we observe that exporters with lower average price levels and higher inflows of FDI (in percent of GDP) are relatively less affected. High FDI inflows and low price levels could, for instance, explain why Czech Republic's exports are less adversely affected by Chinese those of its neighbors, Poland and Slovakia (Figure C4).

Effects across firms. In Table C2, we focus on heterogeneous effects across firms, which we investigate by interacting Chinese expansion with different firm-level characteristics. Column (1) reports 2SLS results obtained when interacting China's market share with a firm-level indicator which proxies its relative size based on total export revenues in the first year we observe it in our data. Firms residing in the top 25^{th} percentile of the revenue distribution are considered as being large. Estimates show that these firms are significantly less affected by Chinese competition, which suggests that large firm are either sufficiently productive or more capable in diversifying their export strategies to avoid major displacements of their exports.

In column (2), the interaction variable is a binary time-invariant indicator for firms that sold any of their goods to more than one destination, upon the first observation. Estimates now suggest a large and significant displacement effect for the majority of geographically less diversified firms (recall that the median firm in our sample exports the average product to only one destination), while multi-destination exporters are less affected. On the contrary, results in column (3) suggest that multi-product exporters (i.e. firms selling more than one HS6 product to a single destination) are not differently affected by Chinese competition in EU15 markets.

6 Conclusion

We analyzed the impact of increased Chinese competition in EU15 markets on the export performance of 16 Eastern and Southeast European countries in the early 2000s. Our identification strategy exploits the exogenous intensification of Chinese competition within narrow destination-product markets, which we derive from the evolution of Chinese exports in comparable high-income markets and from trade linkages existing before China's accession to the WTO. We find that export quantities and revenues of ESE countries decline in response to China's expansion and confirm this result also on an auxiliary database of Bulgarian firms.

Our core finding is that reductions in export quantities are substantially smaller in industries for which timely delivery matters. This points at the existence of a competitive advantage in time-sensitive industries that ESE exporters derive from their geographic contiguity and shorter delivery times to the EU15. We build intuition for this interpretation using a simple theoretical framework where firms' or countries' ability to ensure timely delivery reveals as an important determinant of their competitiveness. Indeed, we find that specialization in time-sensitive industries can shelter ESE countries from external competition in their export markets, and show that these results are not driven by trade in intermediate inputs or by the skill-intensity of their exports. Further support for our arguments and interpretation is provided by empirical findings that indicate a critical role of geographic proximity to the destination market to exploit the advantage in time-sensitive industries.

We also provide new evidence explaining differential effects across exporters by showing that China's impact varies depending on initial exporter conditions, such as average price levels or FDI inflows at the beginning of the sample period. Moreover, our firm-level analysis suggests that larger and multi-destination exporters are systematically less affected by Chinese competition. While these findings suggests that specific exporting countries and firms in our sample may have been differently affected by Chinese competition during the early 2000s, our general conclusions are warranted by the fact that the majority of exporters reveal comparable adjustments.

From a policy perspective, our findings suggest that specializing in time-sensitive sectors and providing a functional and well-connected transport infrastructure can shield exporters from external competition. Investments in infrastructure may be viewed as a complementary strategy to investments in training and education, which foster specialization in skill-intensive activities. Trade integration between contiguous markets can make trade flows more stable and resilient to external shocks. Conversely, exporters located far away from their destination markets face substantial entry barriers to particular market segments. In this respect, prolonged delivery times to (and distance from) large high-income markets may impose limits to export diversification, especially for small economies which do not benefit from other sources of comparative advantage.

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Appendix

A Identification and robustness

A.1 Reverse causality and spurious correlation

In the context of our study, the role of reverse causality can be illustrated with a simple gravity model. Consider a simplified characterization of market shares following Eaton and Kortum (2002): $\pi_{jm} = \frac{(c_m \tau_{jm})^{-\theta}}{\sum_h (c_h \tau_{jh})^{-\theta}}$, where π_{jm} denotes exporter m's fraction in j's total consumption, c_m are unit production costs in country m and $\tau_{jm} \geq 1$ denotes bilateral trade barriers. For m being China, market shares change if the numerator (supply conditions in China) or the denominator (supply conditions in the rest of the world, including China and all ESE exporters i) change. China's market share depends on its supply capacities *relative* to all other countries, while any causal effect attributable to China requires that changes stem from its *absolute* supply capacities. For instance, reverse causality would occur if ESE exporters' internal structural adjustments allow China to expand in markets previously occupied by these exporters. Although this would not reject our hypothesis that Chinese and ESE product varieties are substitutes, the underlying causal force would come from the ESE economies and not from China. Similarly, preference shifts towards Chinese varieties could increase its market share at the expense of ESE exports, while both absolute and relative supply capacities are unchanged. In this case, a negative coefficient for $China_{jkt}$ would originate from spurious correlation, and in both cases, our estimate of β would be inflated and suggest greater than actual displacement of ESE exports due to Chinese competition.

We note that it is also possible that our OLS coefficient exerts attenuation bias. During the period we observe, the majority of countries in our sample integrated with EU15 markets. Either through attaining EU membership candidate status or becoming full members. Besides an almost complete removal of tariff barriers, this entailed also inflows of foreign investment from EU15 countries. Noting that, from the viewpoint of our importing economies, most ESE countries and China had a comparative advantage in labor- and low-skill intensive production, trade liberalization and investments could have spurred growth and productivity in sectors where China expanded, as well. Indeed, there could even be complementarity in sourcing from China and ESE if trade patterns are driven by general trends in offshoring labor-intensive production activities. As a result, we would observe that our OLS coefficient understates actual displacement effects, due to a simultaneity bias where ESE and Chinese exports grow at the expense of economically more advanced exporters outside our sample. We back up our OLS results by employing an instrumental variables approach to extract variation in China's expansion that can be attributed exclusively to changes in its own supply capacities.

A.2 Bartik IV and caveats to identification

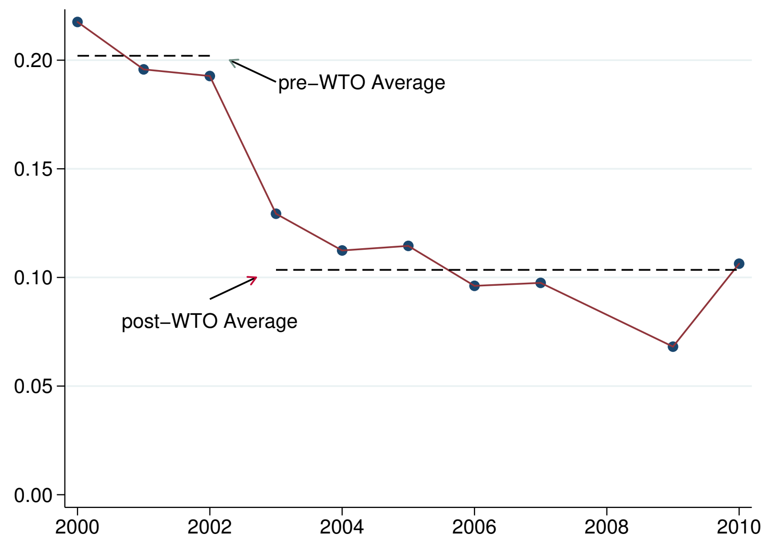
Despite its wide use in the empirical literature, the product-level dimension of our instrument leaves the actual causal source of China's expansion unobserved. According to Autor et al. (2013), it is still possible that demand shocks for imports from low-wage countries (including China and ESE) are correlated across EU15 and other high-income economies. In this case, both our OLS and instrumental variable coefficient would understate the true effect of Chinese competition. However, since our descriptive statistics suggest that the ESE countries mainly export to EU15 destinations, while another large fraction accounts for trade among ESE countries, we argue that simultaneity bias is less likely to play a major role for our instrumental variable.

Another concern could be that China's expansion into high-income markets not only resulted from its own economic reforms and trade liberalizations, but instead resulted from independent, yet complementary, technological change. The late 1990s and early 2000s witnessed major advancements in information and communication technologies (ICTs), which facilitated international outsourcing and offshore production. In this case, China's expansion would not be exogenous from the viewpoint of a country that contributed to these technological advancements. While this could pose an important threat for identification of import competition in the EU15, we suppose that for our group of exporters Chinese competition is less likely to be a home-made phenomenon. In our robustness checks we implicitly control for this possibility by adding additional fixed effects into our empirical model. As a more general approach to addressing these concerns, we also employ an alternative identification strategy which exploits China's WTO entry as a quasi-natural experiment to generate variation in exposure to Chinese competition at the HS 6-digit product level.

A.3 Hong Kong re-exports weight

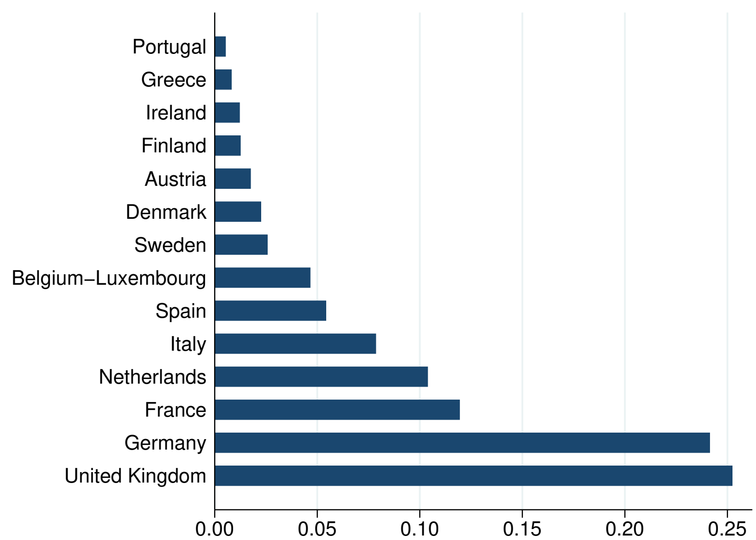
Figure A1 shows how Chinese imports of Hong Kong transportation services decline after 2002. The reduction suggests that lower trade barriers allowed China to rely less on shipments via Hong Kong ports and instead to export directly to its final destination markets. A2 displays to which EU15 destinations Hong Kong re-exports were mostly shipped during the years before China's WTO entry. Countries where Hong Kong re-exports concentrated are expected to experience relatively stronger expansions of Chinese exports after its WTO entry.

Figure A1: Chinese imports of transportation services from Hong Kong, share of total



Note: Authors' calculations based on data from World Bank Trade in Services Database (https://data.worldbank.org/data-catalog/trade-in-services). Data starts in 2000, information for 2008 missing.

Figure A2: Distribution of Hong Kong re-exports across EU15 destinations, 1999-2001



Note: Authors' calculations based on data from UN Comtrade. Shares indicate fractions of total Hong Kong re-exports to EU15 destinations.

A.4 Robustness of general displacement effects

We submit our baseline results from Table 2 to a number of robustness checks, which are summarized in Table A1.

Table A1: Robustness of China's impact on ESE exports, product-level estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: log export quantity										
	Clustering and aggregation				Additional fixed effects and controls					
	Cluster HS6		Aggregate EU15 market		HS6-year FE		Additional control		Exporter-HS6-year FE	
Estimator:	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
China (s^{CN}_{jkt})	-1.024**	-1.879**	-1.255**	-1.538**	-0.592**	-3.061**	-0.592**	-3.072**	-0.587**	-3.316**
	(0.063)	(0.268)	(0.126)	(0.302)	(0.038)	(0.651)	(0.038)	(0.651)	(0.041)	(0.690)
Import demand	0.511**	0.516**	0.552**	0.553**	0.411**	0.422**	0.411**	0.422**	0.428**	0.442**
	(0.011)	(0.011)	(0.019)	(0.019)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)	(0.009)
Applied tariff							-1.922**	-1.912**		
							(0.164)	(0.164)		
Observations	1,628,298	1,628,298	394,071	394,071	1,626,480	1,626,480	1,626,480	1,626,480	1,516,895	1,516,895
N. Clusters	3,903	3,903	3,921	3,921	44,344	44,344	44,344	44,344	42,795	42,795
Kleibergen-Paap (F-stat)		444.9		411.0		191.0		191.1		178.2
Clustering dimension	HS6	HS6	HS6	HS6	HS6-dest.	HS6-dest.	HS6-dest.	HS6-dest.	HS6-dest.	HS6-dest.
Exporter-importer-year FE	✓	✓			✓	✓	✓	✓	✓	✓
Exporter-importer-HS6 FE	✓	✓			✓	✓	✓	✓	✓	✓
Exporter-year FE			✓	✓						
Exporter-HS6 FE			✓	✓						
HS6-year FE					✓	✓	✓	✓		
Exporter-HS6-year FE									✓	✓

Note: Table reports estimated log-point adjustments in the quantity shipped by Eastern and Southeast European exporters to the EU15, due to increasing Chinese market shares. Standard errors in parentheses adjusted for clustering in different dimensions, as indicated in the bottom panel of the table. Statistical significance: ^{a} $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

First, we adjust standard errors for clustering at the HS6-product level. As expected, columns (1) and (2) show that fewer clusters increase the standard error of our main coefficient, but it remains highly statistically significant. In columns (3) and (4), we aggregate variables over all destination markets and therefore treat the EU15 as a single destination. Although standard errors are again somewhat larger, both OLS and IV estimates confirm magnitudes and significance of the previously estimated effects. In the following, we include additional fixed effects and control variables. We first include an additional set of product-year fixed effects to control for omitted variable bias stemming from a correlation of China's expansion with general product-level dynamics. While our OLS coefficient for China in column (5) becomes indeed smaller in absolute terms, the corresponding IV coefficient reported in column (6) is essentially unchanged. The same finding reveals in columns (7) and (8) where we include the applied EU tariff on ESE countries' products as an additional control variable. In the final two columns, we allow for the possibility that our main variable of interest is correlated with exporter-specific product portfolio dynamics and include exporter-HS6-year effects. Note that this specification implicitly controls for ESE countries' imports from China, which might affect their exporting behavior either through competition in the domestic market or through imports of intermediate inputs and other changes in their production functions. Despite removing substantial variation in our data by such a specification, we find again that our OLS estimate is lower compared to the baseline, but that our IV coefficients suggest even larger displacement effects.

In Table A2 we report evidence obtained using alternative instruments in our specifications using the sample of ESE product-level exports and for those using data from Bulgarian exporting firms. We rely here on instruments based on exogenous policy changes which help us to identify the impact of Chinese competition. One such policy change was China's transition to permanent normal trade relations (PNTR) with the US, which entailed a lower threat of sudden tariff increases and an expansion of Chinese exports (Pierce and Schott, 2016; Handley and Limão, 2017; Feng et al., 2017). Results for our outcome variables, export quantity and revenue, obtained using this alternative instrument are reported in columns (1), (3), (5), and (7). As a second policy change, we exploit the removal of European quotas in the textiles and clothing industries (HS Chapters 50-63). Quotas were originally imposed on Chinese exports under the Multifibre-Arrangement (MFA) in the 1970s. During our sample period, a first round of quota removals became effective for China upon its WTO entry and a second round followed in 2005. To evaluate the impact of these removals, we compute for each liberalization round the product-specific quota *fill* rate (or utilization rate) reported during the three years preceding a specific quota removal. We assume that fill rates indicate how binding a quota actually was, so that higher rates should entail a relatively stronger expansion after the removal. We interact fill rates ($fill_k$) with a dummy variable that indicates the quota-free period ($remove_{kt}$) and with the destination-specific weights (w_j) we have used also for the other instruments. Estimates obtained using this alternative instrument are reported in columns (2), (4), (6), and (8) of this Table. Regressions on export quantity, column (1) and (2), and export revenue, column (5) and (6), of ESE product-level exports strongly confirm results displayed in Table 2. Estimates for the sample of Bulgarian exporting firms provide less clear-cut yet still consistent results.

Table A2: China's impact on export quantity and revenue, 2SLS results for alternative instruments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	*log export quantity*				*log export revenue*			
Sample:	ESE countries Product-level (1997-2007)		Bulgaria Firm-level (2001-2006)		ESE countries Product-level (1997-2007)		Bulgaria Firm-level (2001-2006)	
Instrument:	US-PNTR	MFA/ATC	US-PNTR	MFA/ATC	US-PNTR	MFA/ATC	US-PNTR	MFA/ATC
2SLS results								
China: s^{CN}_{jkt}	-1.059*	-2.911**	-7.335**	-0.799	-2.807**	-2.648**	-1.684	-1.455^{a}
	(0.457)	(0.339)	(2.645)	(0.833)	(0.398)	(0.314)	(2.968)	(0.859)
Control for import demand:	✓	✓	✓	✓	✓	✓	✓	✓
Firm-level controls included:					✓	✓	✓	✓
Fixed effects:	ijk, ijt	ijk, ijt	jk, jt, f	jk, jt, f	ijk, ijt	ijk, ijt	jk, jt, f	jk, jt, f
First stage results (dep.var.: s^{CN}_{jkt})								
PNTR$^{CN}_{kt} \times w_j$	0.399**		0.185**		0.399**		0.185**	
	(0.022)		(0.032)		(0.022)		(0.032)	
Quota-removal$^{CN}_{kt} \times w_j$		0.438**		0.320**		0.438**		0.320**
		(0.030)		(0.040)		(0.030)		(0.040)
Observations	1,628,298	399,507	268,822	113,359	1,628,298	399,507	268,822	113,359
N. Clusters	44,669	9,866	15,738	4,463	44,669	9,866	15,738	4,463
Kleibergen-Paap (F-stat)	337.6	213.4	32.087	63.426	337.6	213.4	32.087	63.426

Note: Table reports estimated log-point adjustments in quantities and values shipped by Eastern and Southeast European exporters to EU15 markets, due to increasing Chinese market shares, using alternative instrumental variables. The US-PNTR instrument is equal to zero before the year 2002 and equal to the pre-PNTR tariff threat China faced in the US prior to its WTO entry thereafter (Pierce and Schott, 2016; Handley and Limão, 2017; Mau, 2017). The MFA/ATC quota instrument is used only in a subsample of our data, which represents industries that belong the textiles and clothing sectors (i.e. HS2 Chapters 50-63). It measures product-level utilization rates of the import quotas the EU imposed on Chinese goods prior to their gradual removals in 2002 and 2005 (Utar, 2014, 2018; Mau, 2017). The variable is equal to zero in years prior to the removal of a quota for good k and equal to its previous utilization rate thereafter. Control variables and fixed effects structure differ across samples, as indicated in the table and explained in Section 3.2. Standard errors in parentheses have been adjusted for clustering at the product-destination level. Statistical significance: $^{a} = p < 0.1$, $^{*} = p < 0.05$, $^{**} = p < 0.01$.

A.5 Robustness of time-sensitivity results

Tables in this subsection present results for alternative specifications that support a differential (smaller) displacement effect of Chinese competition in time-sensitive industries. Table 4 uses the binary configuration of our measure of time sensitivity as well the continuous measures of time-sensitivity (stict and broad). Table A3 reports results for time-sensitivity after controlling separately for the potentially confounding factors discussed in the main text. In both tables, Panel A displays estimates obtained relying on product-level data on ESE exports for the period 1997-2007, while Panel B displays coefficients obtain relying on firm-level data on Bulgarian exports for the period 2001-2006. The dependent variable employed is all specifications reported below is the logarithm of export quantity. Estimates largely confirm evidence described in section 4.

Table A3: Time-sensitivity estimates and potentially confounding industry characteristics

	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)	(7a)	(8a)	(9a)	(10a)
Panel A: ESE countries (Product level, 1997-2007) – Dep. var.: log export quantity										
Potential confounder:	intermediate inputs BEC (rev.4)		contract intensity Nunn (2007)		skill intensity Amiti and Freund (2010)		ladder length Khandelwal (2010)		relationship stickiness Martin et al. (2021)	
Estimator:	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
China's market share	-1.655**	-3.388**	-1.694**	-4.214**	-1.618**	-3.392**	-1.496**	-3.533**	-1.618**	-3.482**
	(0.052)	(0.193)	(0.088)	(0.420)	(0.049)	(0.193)	(0.063)	(0.260)	(0.051)	(0.197)
× time-sensitive	1.047**	3.160**	1.206**	3.616**	1.050**	3.134	1.096**	3.449**	1.045**	3.114**
	(0.079)	(0.242)	(0.079)	(0.243)	(0.079)	(0.238)	(0.078)	(0.246)	(0.083)	(0.260)
× intermediate inputs	0.419**	1.015**								
	(0.085)	(0.324)								
× contract intensity			0.132	0.877*						
			(0.087)	(0.347)						
× skill intensity					0.557**	1.370**				
					(0.104)	(0.331)				
× ladder length							-0.128^{a}	0.425^{a}		
							(0.077)	(0.239)		
× stickiness									0.301**	0.640*
									(0.091)	(0.276)
Control for import demand:	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fixed effects:	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt	ijk, ijt
Observations	1,628,298	1,628,298	1,628,298	1,628,298	1,628,298	1,628,298	1,317,956	1,317,956	1,579,225	1,579,225
N. clusters	44,669	44,669	44,669	44,669	44,669	44,669	35,916	35,916	43,106	43,106
Kleibergen-Paap (F-stat)		145.0		144.0		315.3		358.2		381.8
	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)	(7b)	(8b)	(9b)	(10b)
Panel B: Bulgaria (Firm level, 2001-2006) – Dep. var.: log export quantity										
Potential confounder:	intermediate inputs BEC (rev.4)		contract intensity Nunn (2007)		skill intensity Amiti and Freund (2010)		ladder length Khandelwal (2010)		relationship stickiness Martin et al. (2021)	
Estimator:	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
China's market share	-0.761**	-2.559**	-0.435^{a}	-2.346	-0.740**	-2.676**	-0.711**	-3.163**	-0.700**	-2.609**
	(0.143)	(0.645)	(0.228)	(1.445)	(0.137)	(0.627)	(0.172)	(0.897)	(0.139)	(0.635)
× time-sensitive	0.706**	1.765*	0.663**	2.472**	0.736**	2.302**	0.897**	2.698**	0.781**	2.124**
	(0.215)	(0.732)	(0.216)	(0.687)	(0.212)	(0.667)	(0.216)	(0.816)	(0.222)	(0.644)
× intermediate inputs	0.216	2.051^{a}								
	(0.227)	(1.123)								
× contract intensity			-0.344	-0.353						
			(0.224)	(1.084)						
× skill intensity					0.300	1.425				
					(0.298)	(1.003)				
× ladder length							0.084	0.897		
							(0.212)	(0.695)		
× stickiness									0.005	1.935*
									(0.253)	(0.811)
Control for import demand:	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Firm-level controls included:	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fixed effects:	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f	jk, jt, f
Observations	268,822	268,822	268,822	268,822	268,822	268,822	227,851	227,851	261,829	261,829
N. clusters	15,738	15,738	15,738	15,738	15,738	15,738	12,843	12,843	15,264	15,264
Kleibergen-Paap (F-stat)		20.8		20.3		60.6		39.9		49.8

Note: Table shows estimates of log-point adjustments in the quantity of shipments from Eastern and Southeast European exporters to the EU15, due to increasing Chinese market shares these markets, and differential adjustments in time-sensitive industries after controlling for selected potentially confounding industry characteristics. Time-sensitivity is measured as a binary variable that represents above-median estimates of industries' time sensitivity according to the our strict definition. Standard errors reported in parentheses are clustered at the product-destination level. Statistical significance: $^{a} = p < 0.1$, $^{*} = p < 0.05$, $^{**} = p < 0.01$.

B Estimating time-sensitivity

To measure differential time-sensitivity across product categories, Hummels and Schaur (2013) exploit detailed information on shipping mode in US trade data and estimate sector-specific markups firms are willing to pay to import a good via air freight instead of sea shipment. This markup informs about the value of fast delivery that is attributed to a particular good. Products for which the value of time is higher are considered as being relatively more time-sensitive.[28] We argue that such goods should also reveal higher resilience towards Chinese competition in ESE exports, given their geographic proximity to EU15 destinations. To test this hypothesis, we use the data from Hummels and Schaur (2013) to replicate their methodology and to obtain a cross-sectional measure of time-sensitivity at the 2-digit HS sector level.

Model. Hummels and Schaur (2013) assume a simple demand function in which consumers purchase goods depending on its price, its quality, and the time it takes for delivery.

$$q_i^z = E\left(\frac{p_i^{z*}}{v_i^z \exp(-\tau \cdot days_i^m)}\right)^{-\sigma} \tag{B.1}$$

Given expenditure E, price p_i^z and quality v_i^z offered by a firm z located in exporting country i affect demand for its variety q_i^z. Besides this, the number of days it takes to ship a good from i to the destination market negatively enters the demand function with an elasticity parameter τ. Shipping times depend on the mode of transport m, which can be either ocean cargo o or airfreight a. Since this model considers import demand by the US, there is no destination-specific subscript and the demand system is initially assumed to be the same across products.

On the supply side, firms v face fixed costs F of exporting and also charge differently, depending on the mode of transport. Shipping charges g_i^m depend on the location of the exporter and the transport mode, where for any i airfreight is more expensive than ocean cargo: $g_i^a > g_i^o$. With shipping charges being proportional to the quantity of a shipment (not its value), profits of the firm result as follows:

$$\pi(z)_i^m = \frac{(z + g_i^m)}{\sigma - 1} E\left(\frac{(z + g_i^m)/\theta}{v_i^z \exp(-\tau \cdot days_i^m)}\right)^{-\sigma} - F \tag{B.2}$$

Defining mode-specific ad-valorem shipping costs from exporter i as $f_i^m = (1 + g_i^m / p_i^m)$, and assuming that airfreight generally takes only one day to reach the destination, Hummels and Schaur

[28] Hornok (2012) provides evidence that the European integration process has boosted trade in such time-sensitive products disproportionately, as border waiting times and other trade barriers were dismantled.

(2013) derive the following relative export revenue equation for a firm z shipping via air:[29]

$$\ln \frac{r(z)_i^a}{r(z)_i^o} = \sigma\tau\left(days_i^o - 1\right) + (1-\sigma)\ln\left(\frac{p_i^a}{p_i^o}\right) - \sigma\ln\left(\frac{f_i^a}{f_i^o}\right) + \sigma\ln\left(\frac{v_i^a}{v_i^o}\right) \tag{B.3}$$

To take this specification to more aggregated data (i.e. product-level trade data), firm-level revenues are multiplied by the number of z_i^m-type firms, N_i^m:

$$\ln \frac{R_i^a}{R_i^o} = \sigma\tau\left(days_i^o - 1\right) + (1-\sigma)\ln\left(\frac{p_i^a}{p_i^o}\right) - \sigma\ln\left(\frac{f_i^a}{f_i^o}\right) + \sigma\ln\left(\frac{v_i^a}{v_o^z}\right) + \ln\left(\frac{N_i^a}{N_i^o}\right) \tag{B.4}$$

Estimation. To estimate this equation, Hummels and Schaur (2013) exploit detailed US import data for the period 1991-2005, where they observe the exporting country i, 6-digit HS products k, arriving at coast $c = \{east, west\}$, by mode m, at time t. The observable variables used for the estimation in our paper are the quantity of a shipment (in kilograms), the total value of a shipment (in US dollars), and shipping charges (in US dollars), so that we estimate the following regression equation:

$$\ln \frac{X_{ikct}^a}{X_{ikct}^o} = \sigma\tau\left(days_{ic}^o - 1\right) + (1-\sigma)\ln\left(\frac{uv_{ikct}^a}{uv_{ikct}^o}\right) - \sigma\ln\left(\frac{f_{ikct}^a}{f_{ikct}^o}\right) + \varepsilon_{ikct}, \tag{B.5}$$

where uv_{ikct}^m denotes unit value of the shipment, to proxy prices, and $\varepsilon_{ikct} = \sigma\ln\left(\frac{v_i^a}{v_o^z}\right) + \ln\left(\frac{N_i^a}{N_i^o}\right) + \mu_{ikct}$ denotes the error term. We estimate this model separately for each HS2 sector, including exporter-product fixed effects. Our estimates of time-sensitivity are then computed by dividing the estimated $\hat{\sigma\tau}$ from the transit time variable in the equation by $\hat{\sigma}$ obtained from the relative freight-charges. Similar to Hummels and Schaur (2013), we obtain different estimates across HS2 chapters, where statistically significant estimates at the 10 percent level are strictly positive.[30]

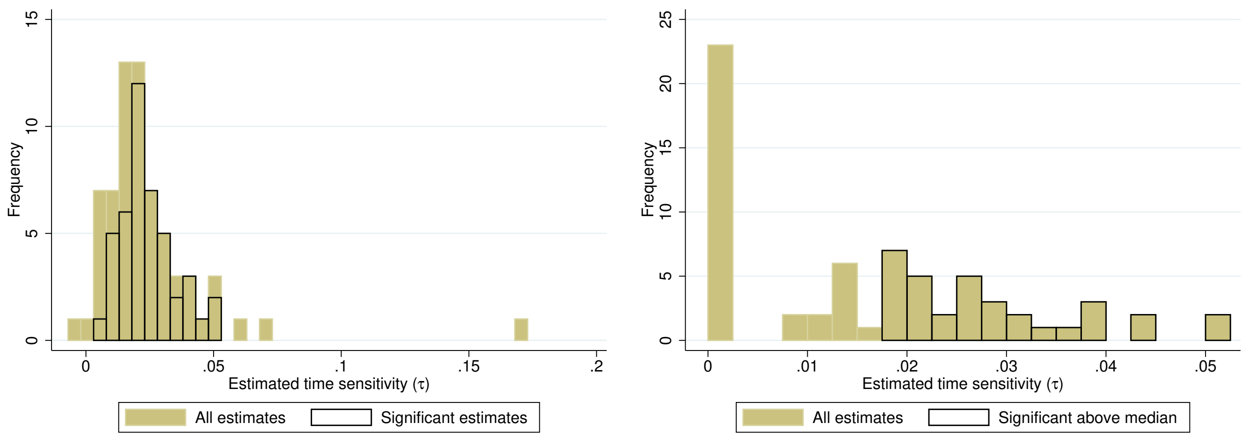
In Figure B1 we present our estimates. In Panel (a), we display the distribution of time-sensitivity estimates and highlight those observations that report statistically significant coefficients at the 10 percent level. They are strictly positive and range between 0 and 0.05. In Panel (b) we set all insignificant estimates equal to zero, following the definition of our strict definition of time-sensitivity, and highlight the observations that range above median as we use the binary indicator for our regressions. The results in Panel (a) broadly resemble the pattern documented by Hummels and Schaur (2013, Fig.A3), who estimate individual coefficients for 5-digit end-use categories. Figure B2 shows that time-sensitive sectors also reveal a lower price elasticity of demand.

[29] Details of this derivation are shown in the online appendix, section A2.2, of their article.

[30] The data and code for running these regressions are provided in the supplementary materials to their original publication (`https://www.aeaweb.org/articles?id=10.1257/aer.103.7.2935`). Hummels and Schaur (2013, Fig. A3) estimate coefficients for individual 5-digit end-use categories.

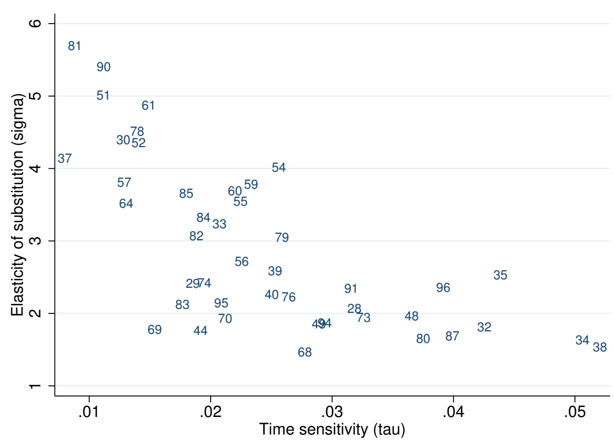
Figure B1: Distribution of time sensitivity across HS2 sectors

(a) Broad (b) Strict



Note: Estimated time sensitivity using data and methodology from Hummels and Schaur (2013). Panel (a) baseline results (broad measure); panel (b) adjusted results (strict measure), after setting insignificant estimates equal zero. Sample restricted to manufacturing sectors, i.e. HS Chapters 28-96.

Figure B2: Correlation between time-sensitivity and the elasticity of substitution



Note: Estimated time sensitivity and substitution elasticity using data and methodology from Hummels and Schaur (2013). Sample restricted to manufacturing sectors, i.e. HS Chapters 28-96, with statistical significance of 10 percent or higher.

Table B1: Ranking of sectors with respect to time-sensitivity, strict measure

Rank	HS Section	Section name	HS2 Chapter	Chapter description
1	VI	Chemicals and allied industries	34	Soap, Organic surface-active agents; Washing, lubricating, polishing or scouring preparations; Artificial or prepared waxes, Candles and similar articles, Modelling pastes, Dental waxes and dental preparations with a basis of plaster
2	VI	Chemicals and allied industries	38	Chemical products n.e.c.
3	VI	Chemicals and allied industries	35	Albuminoidal substances; Modified starches; Glues; Enzymes
4	VI	Chemicals and allied industries	32	Tanning or dyeing extracts; Tannins and their derivatives; Dyes, pigments and other colouring matter; Paints, varnishes; Putty, other mastics; Inks
5	XVII	Vehicles, Aircraft, Vessels	87	Vehicles; Other than railway or tramway rolling stock, and parts and accessories thereof
6	XX	Miscellaneous manufactured articles	96	Miscellaneous manufactured articles
7	X	Pulp of wood or of other cellulosic material	48	Paper and paperboard; articles of paper pulp, of paper or of paperboard
8	XV	Base metals and articles of base metal	80	Tin
9	XV	Base metals and articles of base metal	73	Iron or steel
10	VI	Chemicals and allied industries	28	Inorganic chemicals
11	VII	Plastics	39	Plastics and articles thereof
12	XVIII	Optical, photographic, measuring, and medical instruments	91	Clocks and watches and parts thereof
13	XX	Miscellaneous manufactured articles	94	Furniture; bedding, mattresses, mattress supports
14	X	Pulp of wood or of other cellulosic material	49	Printed books, newspapers, and products of the printing industry
15	XIII	Articles of stone, plaster, cement and similar	68	Articles of stone, plaster, cement, asbestos
16	XV	Base metals and articles of base metal	76	Aluminium and articles thereof
17	XI	Textiles and textile products	54	Man-made filaments
18	XV	Base metals and articles of base metal	79	Zinc and articles thereof
19	VII	Plastics	40	Rubber
20	XI	Textiles and textile products	59	Textiles fabrics
21	XI	Textiles and textile products	56	Wadding, felt and nonwovens; special yarns
22	XI	Textiles and textile products	55	Man-made staple fibres
23	XI	Textiles and textile products	60	Knitted or crocheted fabrics
24	XIII	Articles of stone, plaster, cement and similar	70	Glass and glassware
25	XX	Miscellaneous manufactured articles	95	Toys, games and sports requisites
26	VI	Chemicals and allied industries	33	Essential oils and resinoids
27	XVI	Machinery and mechanical appliances	84	Nuclear reactors and boilers
28	IX	Wood and articles of wood	44	Wood and articles of wood; wood charcoal
29	XV	Base metals and articles of base metal	74	Copper and articles thereof
30	XV	Base metals and articles of base metal	82	Tools, implements, cutlery, spoons and forks, of base metal
31	XV	Chemicals and allied industries	29	Organic chemicals
32	XVI	Machinery and mechanical appliances	85	Electrical machinery and equipment and parts
33	XV	Base metals and articles of base metal	83	Miscellaneous articles of base metal

Note: Authors' compilation. Section and chapter descriptions based on information from *Foreign Trade Online* (https://www.foreign-trade.com/reference/hscode.htm).

Table B2: Continued: ranking of sectors with respect to time-sensitivity, strict measure

Rank	HS Section	Section name	HS2 Chapter	Chapter description
34	XIII	Articles of stone, plaster, cement and similar	69	Ceramic products
35	XI	Textiles and textile products	61	Articles of apparel and clothing accessories, knitted or crocheted
36	XV	Base metals and articles of base metal	78	Lead and articles thereof
37	XI	Textiles and textile products	52	Cotton
38	XII	Footwear, headgear, umbrellas	64	Footwear, gaiters and the like
39	XI	Textiles and textile products	57	Carpets and other textile floor coverings
40	XV	Chemicals and allied industries	30	Pharmaceutical products
41	XVIII	Optical, photographic, measuring, and medical instruments	90	Optical, photographic, cinematographic, measuring apparatus
42	XI	Textiles	51	Wool, fine or coarse animal hair
43	XV	Base metals and articles of base metal	81	Other base metals
44	VI	Chemicals and allied industries	37	Photographic or cinematographic goods
45	XV	Base metals and articles of base metal	72	Iron and steel
46	XV	Base metals and articles of base metal	75	Nickel and articles thereof
47	XI	Textiles and textile products	58	Special woven fabrics
48	VI	Chemicals and allied industries	36	Explosives; Pyrotechnic products; Matches; Pyrophoric alloys; Certain combustible preparations
49	XI	Textiles and textile products	63	Other made up textile articles
50	XIX	Arms and ammunitions	93	Arms and ammunition
51	VIII	Hides and Skins, Leather, Furskins	43	Furskins and artificial fur
52	VIII	Hides and Skins, Leather, Furskins	45	Cork and articles of cork
53	VIII	Hides and Skins, Leather, Furskins	46	Manufactures of straw
54	XI	Textiles	50	Silk
55	VIII	Hides and Skins, Leather, Furskins	42	Articles of leather
56	XII	Footwear, headgear, umbrellas	67	Prepared feathers and down
57	XI	Textiles and textile products	62	Articles of apparel and clothing accessories, not knitted
58	VI	Chemicals and allied industries	31	Fertilisers
59	XI	Textiles and textile products	53	Other vegetable textile fibres
60	XII	Footwear, headgear, umbrellas	65	Headgear and parts thereof
61	XVIII	Optical, photographic, measuring, and medical instruments	92	Musical instruments
62	VIII	Hides and Skins, Leather, Furskins	41	Raw hides and skins (other than furskins) and leather
63	XVII	Vehicles, Aircraft, Vessels	89	Ships, boats and floating structures
64	X	Wood and wood products	47	Pulp of wood or other fibrous cellulosic material; Recovered (waste and scrap) paper or paperboard
65	XVII	Vehicles, Aircraft, Vessels	86	Railway or tramway locomotives
66	XVII	Vehicles, Aircraft, Vessels	88	Aircraft, spacecraft, and parts thereof
67	XII	Footwear, headgear, umbrellas	66	Umbrellas, sun umbrellas, walking-sticks
68	XIV	Pearls, Precious stones and metals	71	Natural, cultured pearls; Precious, semi-precious stones; Precious metals; Metals clad with precious metal, and articles thereof; Imitation jewellery; Coin

Note: Authors' compilation. Section and chapter descriptions based on information from *Foreign Trade Online* (https://www.foreign-trade.com/reference/hscode.htm).

C Heterogeneous effects across exporters

C.1 Differential effects across countries

Our sample encompasses exporting countries at different stages of economic development. As a consequence we might expect differential responses to Chinese competition across these countries. More precisely, assuming that Chinese exports partly expand due to lower relative prices, the level of economic development and the average price level of exports across ESE countries could play a role in determining their exposure to Chinese competition.

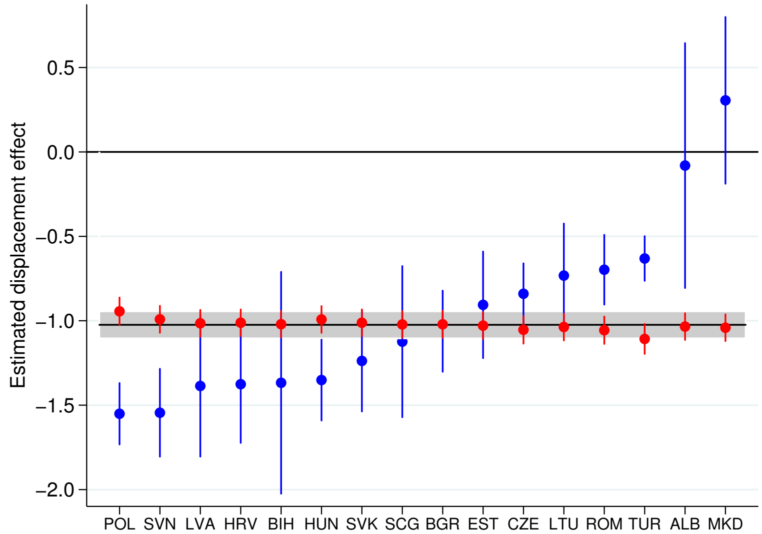
Exporter and country-pair specific coefficients. We first check whether our product-level results are driven by individual exporting countries. To evaluate this, we add an additional term into our specification which interacts our main variable of interest with an exporter-specific dummy variable:

$$\ln Y_{ijkt} = \alpha + \beta s^{CN}_{jkt} + \beta_i (s^{CN}_{jkt} \times \mathbf{D}_i) + \gamma \ln M_{jkt} + \mu_{ijk} + \mu_{ijt} + \nu_{ijkt}, \tag{C.1}$$

The estimate of β_i will inform about the *differential* effect of Chinese export market competition on country i, relative to other ESE exporters. Furthermore, $(\hat{\beta} + \hat{\beta}_i)$ will inform us about the overall magnitude of the displacement of i's exports. We summarize OLS estimates of Equation (C.1) graphically in Figure C1. The vertical axis denotes the magnitude of the point estimate for Chinese competition and the solid horizontal line, surrounded by the shaded area, denotes the displacement effect and 95-percent confidence interval we obtained from our baseline specification in Table 2, column (1). Red dots and vertical lines denote the estimated base-effect, $\hat{\beta}$, obtained from Equation (C.1). The blue dots and vertical lines denote the respective effect estimated for the individual exporter, $(\hat{\beta} + \hat{\beta}_i)$.

Comparing the base effects reported in Figure C1, we find that no single exporting country in our sample drives our baseline result. If this were the case, we would have seen that red dots and confidence intervals do not overlap with the grey area. Only for two exporters (Poland and Turkey), point estimates reside just outside this area. Turning to the exporter-specific coefficients, indicated by the blue points, we find that some exporters do reveal differential responses. At one end of this spectrum, this concerns countries with significantly stronger displacement effects, such as Poland and Slovenia. At the other extreme, several Southeast European economies are significantly less affected. Albania and Northern Macedonia, with point estimates just below zero, appear to be entirely unaffected by Chinese competition. For the rest of our exporters we observe point estimates ranging between -0.75 and -1.5. Like in our firm-level estimation Bulgaria's experience is statistically indistinguishable from the estimated average for the full sample.

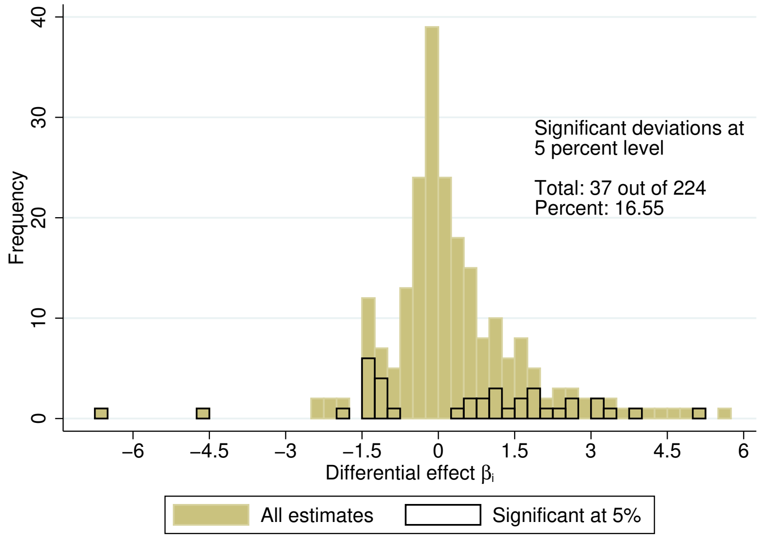
Figure C1: Exporter specific displacement effects versus baseline



Note: Author's calculations. Shaded area with solid line: baseline result from Eq. (6). From Eq. (C.1): red – base-effect ($\hat{\beta}$); blue – individual effect ($\hat{\beta} + \hat{\beta}_i$); vertical lines – 95-percent confidence intervals.

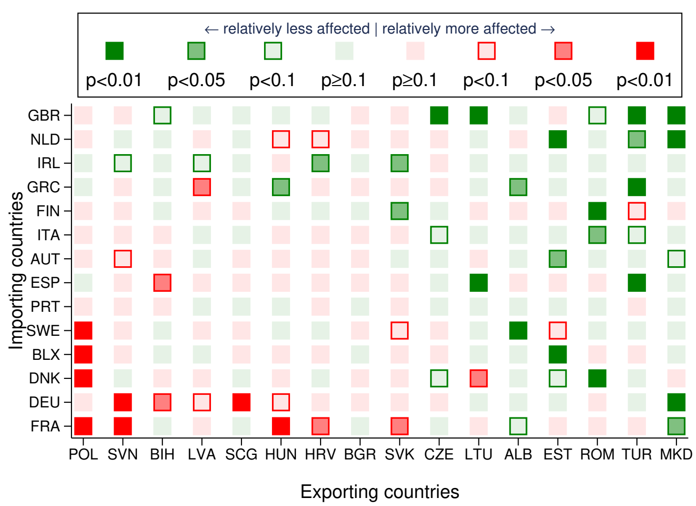
Exploring these dimensions further, we estimate separate coefficients for each exporter-importer pair ij. With 14 importers and 16 exporters, we ran 224 regressions to obtain indication for differential effects in all possible combinations. The overall distribution of estimated interaction coefficients, $\hat{\beta}_{ij}$, is displayed in Figure C2. For about five out of six country pairs, we find no statistically significant difference from the baseline effect. The remaining pairs indicate either larger or smaller displacement, with interaction coefficients ranging widely between $\hat{\beta}_{ij} = [-6, 6]$. Looking at individual ij-pairs in Figure C3, we observe that the least responsive exporters reveal significant deviations in about a third of the EU15 destinations. On the importer side, we find frequent cases of systematically smaller displacement in the United Kingdom and the Netherlands, while displacement tends to be more pronounced in Germany and France. We cannot infer any obvious systematic relation to importing country characteristics.

Figure C2: Country-pair specific displacement effects; distribution of interaction coefficients



Note: Author's calculations based on 224 regressions for individual country-pair effects of Chinese competition on ESE exports. Histogram shows frequency of $\hat{\beta}_{ij}$ magnitudes. Lined bars denote frequency of significant deviations from base-effect at 5 percent level.

Figure C3: Differential effects of Chinese competition for individual country pairs



Note: Author's calculations based on repeated estimates of baseline product-level OLS specification with respective country-pair interaction. Positive coefficients (suggesting weaker responses) are colored in green, whereas negative coefficients (suggesting stronger responses) are colored in red. The intensity of the colors indicates different levels of statistical significance (see legend).

EEC vs SEE and exporter characteristics. To identify potential drivers of differential competition effects across exporters, we interact our main variable of interest with alternative country-specific characteristics (Table C1).[31] In Panel A, we present OLS results for alternative exporter specific interaction terms with our main variable of interest. We begin with a simple dummy variable for the eight Eastern European countries (EEC), which became full EU members in 2004. This country group appears to face systematically larger displacement effects due to Chinese competition. In column (2) we use another measure that captures exporters' relative stage in the EU integration process, measuring the fraction of HS6 product lines exported to the EU15 free of tariffs at the beginning of our sample period (1997-1999). We find again a negative and significant interaction coefficient. In column (3)-(4) we confirm our previous conjecture that countries at higher stages of economic development and with higher price levels are differently affected by Chinese competition. We also check whether ESE exporters receiving higher inflows of FDI (measured in percent of GDP) reveal different effects. This does not seem to be generally the case, even though inclusion of all interactions terms suggest slight offsetting effects. In Figure C4, we show differences and commonalities between EEC and SEE exporters in terms of the country characteristics we take into consideration.

In Panel B of Table C1, we revisit these results with a restricted sample that excludes Turkey, the country with the most meaningful deviations from our pooled baseline results. Columns (1) and (2) show that the differential effect for early integrating economies is indeed smaller once we exclude Turkey from the sample. Coefficients for interactions in columns (3) and (4) also reveal some changes. More interestingly, however, column (5) suggests that higher FDI inflows into the exporting countries are associated with significantly *smaller* displacement effects. This relationship remains robust and suggests that FDI inflows may have contributed to higher competitiveness of ESE exporters *vis-à-vis* China. In our full specifications, reported in columns (6) and (7), we confirm our previous findings that higher prices undermine competitiveness while higher stages of economic development do not indicate a statistically distinct effect anymore. The last column further suggests that EEC countries are no longer systematically more affected, once we control for other exporter characteristics. Early trade integration, as measured by the fraction of tariff free product lines remains significant. We might interpret this as indicative for an EU integration process that contributed to economic restructuring which was then associated with larger displacement by Chinese exports.

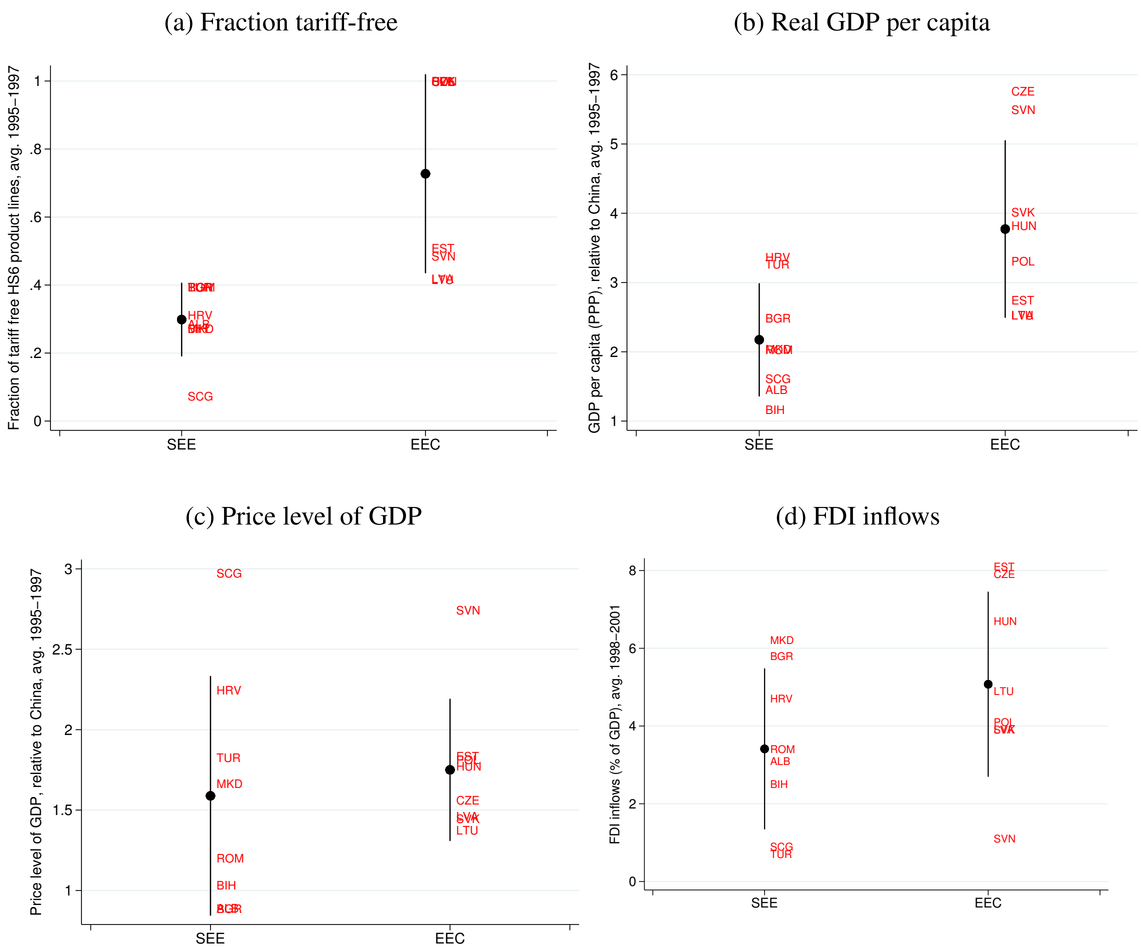
[31] We divide ESE exporters into two groups, Eastern European (EEC) and Southeast European (SEE) countries. EEC are: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia. SEE refers to Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Northern Macedonia, Romania, Serbia-Montenegro, and Turkey.

Table C1: Differential impact of China across ESE exporters, product-level data, 1997-2007

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. var.: log export revenue	Individual interactions					Combined	
Panel A: Full sample - 16 ESE exporters							
China (s_{jkt}^{CN})	-0.773**	-0.651**	-0.680**	-0.795**	-1.023**	-0.610**	-0.735**
	(0.051)	(0.078)	(0.120)	(0.069)	(0.040)	(0.125)	(0.132)
× EEC$_i$	-0.435**						-0.401**
	(0.066)						(0.121)
× Free HS6$_i$		-0.581**				-0.853**	-0.468*
		(0.112)				(0.162)	(0.201)
× (log) GDPpc$_i$			-0.288**			0.335*	0.330*
			(0.095)			(0.136)	(0.136)
× (log) Price-level$_i$				-0.472**		-0.553**	-0.315^a
				(0.117)		(0.151)	(0.168)
× FDI inflow$_i$					-0.030	0.028	0.083^a
					(0.029)	(0.039)	(0.043)
Observations	1,628,298	1,628,298	1,628,298	1,628,298	1,628,298	1,628,298	1,628,298
N. Clusters	44,669	44,669	44,669	44,669	44,669	44,669	44,669
Panel B: Restricted sample - 15 ESE exporters (excl. Turkey)							
China (s_{jkt}^{CN})	-0.871**	-0.815**	-0.770**	-0.816**	-1.152**	-0.579**	-0.603**
	(0.071)	(0.094)	(0.121)	(0.070)	(0.048)	(0.125)	(0.135))
× EEC$_i$	-0.334**						-0.073
	(0.080)						(0.142)
× Free HS6$_i$		-0.419**				-0.641**	-0.582**
		(0.122)				(0.166)	(0.203)
× (log) GDPpc$_i$			-0.280**			0.017	0.032
			(0.095)			(0.145)	(0.148)
× (log) Price-level$_i$				-0.627**		-0.372*	-0.338*
				(0.121)		(0.153)	(0.169)
× FDI inflow$_i$					0.138**	0.203**	0.204**
					(0.040)	(0.049)	(0.049)
Observations	1,409,858	1,409,858	1,409,858	1,409,858	1,409,858	1,409,858	1,409,858
N. Clusters	42,913	42,913	42,913	42,913	42,913	42,913	42,913

Note: Results reflect OLS estimates. Standard errors in parentheses clustered at product-destination level. Statistical significance: ^{a} $p < 0.1$, * $p < 0.05$, ** $p < 0.01$. All specifications include exporter-importer-product FE, exporter-importer-year FE and log import demand as controls. EEC$_i$ is a dummy variable for 8 ESE exporters becoming EU members in 2004; Free$_i$ measures trade integration with the EU15 by the fraction of observed tariff-free HS6 product lines exported (average 1997-1999); GDPpc$_i$ denotes real GDP per capita relative to China (output-based measure, in chained PPPs, as reported in PWT 9.0; average 1995-1997). Price-level$_i$ denotes price levels of output relative to China (as reported in PWT 9.0; average 1995-1997); FDI inflow$_i$ in percent of GDP, normalized to mean zero and standard deviation of one (original from WDI database, average 1998-2001).

Figure C4: Eastern vs Southeast European exporters



Note: Tariff information based on data from World Integrated Trade Solutions (WITS). Data for real GDP and price level of GDP from Penn World Tables 9.0. FDI inflow figures based on data from the World Development Indicators database.

C.2 Differential effects across firms

Multi-product and multi-destination firms. The theoretical and empirical literature gives mixed suggestions for a differential impact of Chinese competition on larger firms. While multi-product or multi-destination firms might be assumed to be bigger and more productive, thus less affected, the opposite effect is also possible. In particular, Holmes and Stevens (2014) document patterns suggesting that larger firms are more exposed to Chinese competition and, hence are more affected. The reason is that larger firms have more standardized production processes and focus more on large-scale consumption varieties than smaller firms that are flexible to customize their production. While such patterns have been documented for US data, it is questionable whether this would be confirmed as well for Bulgaria. We first assess whether introducing a different proxy for firm size changes our findings. We build a variable for large firms which defines a firm as large if it reports revenues above the 75^th percentile in the distribution of firm-level export revenue in the first year in which it starts exporting. This variable is constant for the following years in which the firm is present in our database. 2SLS estimates reported in Table C2, show that large firms are significantly less affected by Chinese competition. We then analyze the differential impact of Chinese competition across firm types by classifying multi-product firms as those selling more than one HS 6-digit product in the same year to any EU15 destination. Likewise, we define multi-destination firms as those exporting the same HS 6-digit product to at least two destination countries in a given year. In both cases, we use the first observation available for a firm so that its status as a multi-product or multi-destination firm is time-invariant. Evidence shows that multi-destination firms are less harmed by Chinese competition in the various destination markets. On the contrary, IV estimates on multi-product firms show that Chinese competition does not differently affect the export performance of these firms.

Table C2: Heterogeneous effects on Bulgarian, large, multi-destination and multi-product firms

	(1) Large Firms	(2) Multi-destination	(3) Multi-product
Estimator:	2SLS	2SLS	2SLS
Dep. var.: log export quantity			
China (s^{CN}_{jkt})	-3.234**	-10.042**	-2.073*
	(0.646)	(1.550)	(0.969)
China × Large Firm	1.631**		
	(0.269)		
China × Multi-destination		4.100**	
		(0.681)	
China × Multi-product			-0.060
			(0.734)
Control for import demand:	✓	✓	✓
Firm-level controls included:	✓	✓	✓
Fixed effects:	jk, jt ,f	jk, jt ,f	jk, jt ,f
First stage results			
$s^{CN}_{nkt} \times w_j$	1.377**	30.803**	1.181**
	(0.108)	(4.038)	(0.125)
$s^{CN}_{nkt} \times w_j \times$ Large	2.398**		
	(0.109)		
$s^{CN}_{nkt} \times w_j \times$ Multi-destination		2.058**	
		(0.090)	
$s^{CN}_{nkt} \times w_j \times$ Multi-product			3.312**
			(0.224)
Observations	268,822	268,822	268,822
N. Clusters	15,738	15,738	15,738
Kleibergen-Paap (F-stat)	79.187	34.236	79.235

Note: Standard errors reported in parentheses are clustered at the product-destination level. Statistical significance: $^a = p < 0.1$, $^* = p < 0.05$, $^{**} = p < 0.01$. All specifications include destination-product, destination-year, and firm fixed effects. For those specifications including two instrumental variables we report first stage estimates only for the instrumented variable of interest.

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