Multiproduct Mergers and the Product Mix in Domestic and Foreign Markets*

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Abstract

This paper investigates the effects of mergers on the product mix of multiproduct firms. Thus, we open the black box of post-merger efficiency improvements to reveal a new margin of adjustment along the product dimension. We analyze horizontal mergers in a theoretical model where oligopolistic firms employ a flexible manufacturing technology and allocate assets between differentiated varieties. After a merger, acquirers drop products from their consolidated domestic product portfolio and reallocate assets towards core varieties. We further demonstrate that such merger-induced efficiency gains imply greater activity in foreign markets. Using detailed Danish register data, we document novel facts regarding mergers and multiproduct firms and find empirical evidence strongly supporting the model's predictions. Our results show that the number of domestic products of the post-merger acquirer falls relative to the sum of the pre-merger acquirer and target, that skewness of domestic sales rises towards core products, and that export activity increases.

JEL codes: F10; F12; F14; G34; L25
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1 Introduction

A striking feature in the data reveals that economic activity is highly concentrated in a small number of large firms that produce multiple products for the domestic and export markets. For the U.S., Bernard et al. (2010) document that around 40% of firms are multiproduct firms (henceforth MPFs) accounting for 90% of total sales. Likewise, in the export market, Bernard et al. (2009) show for U.S. trade that 30% of firms sell more than five products abroad and they contribute to 95% of all export value.[1] Moreover, a significant portion of the aggregate changes in product variety and industry-level productivity are accounted for by the investments of large firms (e.g., Bernard et al., 2010; Broda and Weinstein, 2010; Doraszelski and Jaumandreu, 2013). In order to understand such patterns in the data, a series of theoretical studies have emphasized the importance of within-firm adjustments in response to external shocks. For example, globalization and trade liberalization affect firms' product variety and investments in cost reduction technologies (e.g., Dhingra, 2013). Firm-level productivity also improves as firms skew their sales towards better performing core competencies (see Eckel and Neary, 2010; Mayer et al., 2014). Empirically, these reallocations have been shown to explain a substantial share of the fluctuations in overall product variety and aggregate productivity (see Mayer et al., 2021).

In view of the fact that the within-firm adjustments of MPFs matter even at the aggregate level, we investigate both theoretically and empirically the effects of a different type of shock at the micro level, namely, mergers and acquisitions (M&A).[2] Merger deals often involve large MPFs, which suggests that at the firm level, changes in the level of available resources and their reassignment have the potential to significantly influence the product portfolio. For instance, cost reductions brought about by consolidation through mergers may increase product variety (Berry and Waldfogel, 2001). Importantly, large MPFs have strategic market power under imperfect competition and internalize the impact of their product variety on existing products (e.g., Parenti, 2018). Because of this within-firm cannibalization effect, mergers between firms in the same industry also have the potential to reduce product variety. In addition, mergers change the degree of competition at the industry level, which lead to further adjustments of the product portfolio. In this paper, we focus on the impact of domestic horizontal mergers between MPFs and study the scale and scope decisions of the merged entity, i.e., the post-merger acquirer firm. Our analysis opens the black box of post-acquisition efficiency improvements along the entire product portfolio and examines the resulting consequences on the product mix of the firm. Furthermore, we demonstrate that the merger-induced reallocation of resources across varieties has important implications for the firm's participation and performance in export markets.

Given the omnipresence of MPFs, it is surprising that multiproduct mergers are not well re-

[1] Similar patterns are observed, for example, in Brazil, France, Chile, and India (see Arkolakis et al. (2021), Fontagné et al. (2018), Alvarez et al. (2013), and Goldberg et al. (2010), respectively).

[2] In this paper, we do not distinguish between "'mergers" and "acquisitions." The former term is often used to describe a transaction that combines two firms of relatively equal size, and the latter for the case when a larger firm buys a smaller firm. However, as we show below, acquirer and target firms have similar characteristics in terms of their product range, which is the focus of our paper.

flected in the literature. This is true for the theoretical literature on horizontal mergers, which mainly focuses on single-product firms.[3] This is even more true for the empirical literature, where systematic evidence on the impact of a merger on the scale and scope of MPFs in domestic and foreign markets is missing. Existing evidence is very much limited to case studies and specific industries for either the domestic market (see Berry and Waldfogel (2001) and Sweeting (2010) for the radio sector) or the export market (see Ohashi and Toyama (2017) for the Korean automobile industry). Atalay et al. (2020) documents within-firm adjustments using a sample of 61 mergers compiled by combining the SDC Platinum M&A database with the Nielsen Retail Scanner database, restricting their analysis to sales in U.S. grocery and drug stores.[4] Hence, "much more (empirical) work is needed in merger-induced synergies and on understanding [...] product repositioning" (Nocke, 2021, p.23). This paper fills these gaps in the literature with three contributions: first, we provide novel facts on domestic mergers between MPFs; second, we develop a theoretical framework to study the effects of horizontal mergers on the product mix in domestic and export markets; and third, we empirically examine the within-firm adjustments of acquirer firms after a merger and show that such reallocation decisions have significant impact on their export performance. By making use of detailed Danish register-based data for a large panel of firms across many industries over a 20-year period, this paper is the first to systematically investigate the adjustments within MPFs following a merger along the full product range for both the domestic and foreign markets.

We begin our analysis by documenting novel facts on mergers using Danish firm and product-level data from 1996 to 2015. While existing empirical work is limited to specific industries, the rich register-based data allows us to investigate mergers across all industries. Focusing on horizontal mergers within 4-digit private industries, we identify more than 4500 domestic merger events and document the following three facts. First, a large fraction of pre-merger acquirers and targets are MPFs in both the domestic and export markets. Second, acquirers and targets compete in the product space partially, with some overlap between their product portfolios prior to a horizontal merger. Third, products from the combined product portfolio of the acquirer and target are dropped after the merger, especially those from the target.

Motivated by these facts, we present a theoretical model to study horizontal mergers of MPFs in an oligopolistic market with differentiated goods. Specifically, we introduce the idea of Perry and Porter (1985) that mergers increase the level of available assets into the multiproduct framework of Eckel and Neary (2010). Firms are characterized by a core competence as well as a flexible manufacturing technology. They allocate a fixed amount of assets or "productive capacity" (see Perry and Porter, 1985) across heterogeneous varieties to reduce their marginal costs. From a resource-based view of the firm, these assets may also be interpreted as a type of firm capability, captured by their organizational capital or intangible managerial inputs (Wernerfelt, 1984; Nocke and Yeaple, 2014). In a setting with flexible manufacturing, core varieties receive more assets as they

[3]An exception to the assumption of single-product firms is Nocke and Schutz (2018b). Moreover, MPFs are well established in the literature on merger simulation (e.g., Mazzeo et al., 2018; Garrido, 2020; Johnson and Rhodes, 2021) and the upward-pricing pressure of mergers (see Farrell and Shapiro (2010), among others).

[4]Another paper studying supermarkets is Argentesi et al. (2016). They find that mergers do not affect prices but lead to a reduction in variety for stores.

are sold at a larger scale. By combining Perry and Porter (1985) with Eckel and Neary (2010), we jointly examine the two forces that have been emphasized in the analysis of mergers since Williamson (1968), namely, synergy gains and the reduction in industry competition. In our setting, synergy gains arise as the new firm obtains the combined productive capacity of both merger partners (Perry and Porter, 1985), and can exploit complementarities among their capabilities and intangible assets.[5] We simply call this the *asset effect* in the merged entity. Meanwhile, the reduction in industry competition is referred to as the *anti-competitive effect*. Our work investigates how these forces promote within-firm adjustments at the product margin, and in particular, our theory generates testable predictions with regards to their impact on firms' product mix at home and abroad.

In a first step, we focus on the impact of a merger on the acquirer firm's product scope in the domestic market. Here, two opposing forces are at work. On the one hand, additional assets are used to reduce the marginal costs of all varieties, thereby raising the firm's entire output. This in turn increases cannibalization among varieties, which induces the firm to drop the least efficient varieties from its product portfolio. On the other hand, a reduction in industry competition raises the incentive of the firm to add more products. Therefore, while the overall impact of a merger on total firm output is positive, the effect on product scope is ambiguous for the acquirer and depends on the degree of product differentiation. Nonetheless, we show that the product range of the merged entity is smaller than the sum of products of the two firms (acquirer and target) before the merger.[6] Our second testable prediction refers to the acquirer's core competency. Due to the underlying flexible manufacturing technology, the increase in output is largest for the core variety following a merger event as most of the additional assets are allocated towards it. This has important implications for the post-merger acquirer's participation in foreign markets. Because firms tend to lead with their core product into foreign markets, this gives rise to two additional predictions that we take to the data. Following a merger, the acquirer increases the number of export destinations and also the export scope per destination.

In a final step, we use our rich register-based data from Denmark to test the theoretical predictions. Our data allows us to study product-level adjustments within firms in both domestic and export destination markets. For information on domestic sales at the product level, we rely on the production survey *VARS*, i.e., the Danish version of PRODCOM. For data on exports, we match the firm identifiers to the customs data, from which we can compute the product scope in foreign markets. We make use of an event-study design and compare various domestic and export market outcomes in the post-merger period against the pre-merger period. In particular, we define a 3-year post-merger period to estimate the dynamic effects of a merger on an acquirer and a 4-year pre-merger period (including the merger year) to detect any pre-trends leading up to the event. We

[5] The effects of a merger reduce to the classical trade-off between potential efficiency gains and market power (see Farrell and Shapiro, 1990). Relying on data from *Consumer Reports* magazine, recent empirical work by Sheen (2014) shows that on average, prices fall after mergers. This suggests that mergers induce efficiency gains after the target is consolidated by the acquirer.

[6] The ambiguous impact on the number of products within MPFs in oligopolistic markets due to a change in competition is also highlighted recently in Fan and Yang (2020). They note that whether competition leads to too few or too many products sold on the market is an empirical question.

make use of the two-way fixed effects (TWFE) estimator, which includes both firm and time fixed effects. With the inclusion of firm fixed effects, the estimation captures the within-firm adjustments of the acquirer after its consolidation with the target firm.

The empirical findings strongly support our model's predictions. Specifically, we show that after a merger, the acquirer sells more domestic and foreign products. Importantly, we find that the number of products of the post-merger acquirer falls relative to the sum of the pre-merger acquirer and target.[7] We also show that following a merger, the acquirer exports to more destination markets. Moreover, sales of the core products in both the domestic and foreign markets rise, which leads to a concentration of sales as measured by an increase in the Theil index. Thus, the results are consistent with the idea of merger-induced within-firm adjustments in the domestic product portfolio as well as a stronger focus on core varieties, which ultimately promote greater activity in markets abroad.

We further demonstrate that our results are robust to alternative estimation strategies based on recent advances in the methodological literature on event studies, as well as a propensity score reweighting estimator that controls for the the potential non-random selection of acquirers based on time-varying observable characteristics (Guadalupe et al., 2012). In addition, we show that acquirers sell more products to more destinations even when they purchase non-exporting target firms. This suggests that the increase in export activity is not a mechanical outcome from adding the target's product lines, but rather, there is an underlying driving force from adjustments of the product portfolio that allows acquirers to become more competitive in international markets.

Our paper is related to several strands of the literature. To model MPFs, we extend recent theoretical developments in international economics that stress the role of demand (i.e., cannibalization) and supply linkages (i.e., flexible manufacturing). These linkages are specific to settings with MPFs and constrain the expansion of scope at the firm level (e.g., Eckel and Neary, 2010; Qiu and Zhou, 2013; Dhingra, 2013; Mayer et al., 2014; Flach and Irlacher, 2018; Arkolakis et al., 2021). Our focus on mergers as well as our empirical analysis provide a clear distinction to these papers. As in Nocke and Yeaple (2014), because assets (i.e., organization capital) are fixed for a given firm, firms face a trade-off between managing a large portfolio of products and producing at low marginal cost. However, unlike our model, Nocke and Yeaple (2014) consider symmetric varieties in a setting without mergers and their framework does not feature a cannibalization effect due to the assumption of monopolistic competition. Notably, our theory also differs from Neary (2007), who examines the impact of trade liberalization on cross-border mergers of single-product firms. By contrast, our model highlights domestic mergers between MPFs as a channel to affect their export performance.

Our work also speaks to the literature that investigates how changes in ownership structure affect firm performance. For example, following a foreign takeover, productivity gains may result from product and process innovations, investment in new machinery, as well as within-firm adjustments in worker composition by skill and the provision of worker training (e.g., Guadalupe et al., 2012;

[7] Stiebale and Vencappa (2018) instead show that the number of products of the *target* generally increases after being acquired. Due to limitations of the Danish register data, we are unable to continue observing the target firm after it has been purchased.

Arnold and Javorcik, 2009; Koch and Smolka, 2019). Meanwhile, complementary evidence for domestic M&A's reveals substantial productivity gains due to a restructuring of establishments within the firm boundaries, improved sorting and matching of establishments and workers, and the reassignment of key employees (e.g., Maksimovic et al., 2011; Siegel and Simons, 2010; Smeets et al., 2016). We contribute to this area of research by exploring a different type of within-firm adjustment, namely, reallocations of resources across products within MPFs. An increase in the skewness of sales is well studied in the empirical literature on trade-induced reallocations (e.g. Baldwin and Gu, 2009; Bernard et al., 2011; Iacovone and Javorcik, 2010; Mayer et al., 2014). Our results show that the sales share distribution across the product portfolio becomes more concentrated after a merger event, thereby providing a new mechanism for how changes in ownership structure affect firm performance. To demonstrate the relevance of these product reallocations, we show that following a merger deal, the acquirer exports more products and to more destination markets. Hence, adjustments of the product portfolio allow acquirers to become more competitive in international markets.

Our work also refers to an extensive strand of literature on mergers in industrial organization (e.g., see Gandhi et al. (2008), Asker and Nocke (2021), and Nocke (2021) for recent surveys). Besides the fact that we focus on MPFs as opposed to single-product firms, our paper is the first to provide systematic empirical evidence on adjustments along the product line in domestic and foreign markets. From a theoretical point of view, our intention differs from classic questions on mergers in industrial organization such as merger assessment from an antitrust perspective or the profitability of mergers. Our starting point is that merger events are observed in the data. Therefore, the purpose of our theoretical and empirical analyses is not to address questions related to whether or not mergers are welfare-enhancing or evaluating whether or not they should be approved. Instead, we take the perspective that a merger has been accepted in order to analyze and understand the adjustments that take place within the merged entity following this event. This distinguishes our work from theoretical contributions of multiproduct mergers in industrial organization such as Nocke and Schutz (2018a) and Johnson and Rhodes (2021). Furthermore, by studying the within-firm adjustments of the product mix, our paper complements recent contributions that examine the impact of mergers on innovation and growth (e.g., Cunningham et al., 2021; Fons-Rosen et al., 2021).

The remainder of this paper proceeds as follows. In Section 2, we describe our data and present novel facts on multiproduct mergers that motivate our model and empirical analysis. In Section 3, we present our theory and derive testable predictions. Section 4 conducts the empirical analysis and Section 5 concludes.

2 Data and stylized facts

2.1 Data

We employ register data from Statistics Denmark for our empirical analysis. Domestic mergers along with the acquirer and target firms involved are identified following the methodology in Smeets et al. (2016). First, the establishment register *IDAS* contains a unique establishment identifier that can be followed over time as it remains fixed even with changes in ownership. *IDAS* also provides the establishment's firm identifier in both the current and following year, allowing changes to be tracked. We classify a change in the firm identifier to that of an existing firm as a change of ownership and hence, a merger.[8] The acquirer firm is given by the firm identifier which is used after the merger, while the target firm is given by the identifier which is observed prior to the merger but subsequently disappears post-merger.

Since we are interested in how the acquirer adjusts its product portfolio after a merger, we restrict the sample of merger deals to those in which the acquirer gains full ownership of the target firm. This means that they also have control and management over the latter's product lines. Therefore, we exclude all partial mergers from the analysis. As an example of a partial merger, an acquirer may purchase a fraction of a target's establishments, and the target remains in the market as an independent firm after the deal (i.e., with its original firm identifier). Alternatively, the target may sell its establishments to multiple acquirers. Because data on products (described below) is available at the firm level and not the establishment level, under either scenario, we would not be able to clearly distinguish the product lines that the acquirer obtains from the target. Moreover, following Smeets et al. (2016), we also exclude joint mergers, where two or more firms merge to form a new firm (i.e., with an identifier that previously did not exist). In this situation, it would not be possible to differentiate the acquirer and target firms.

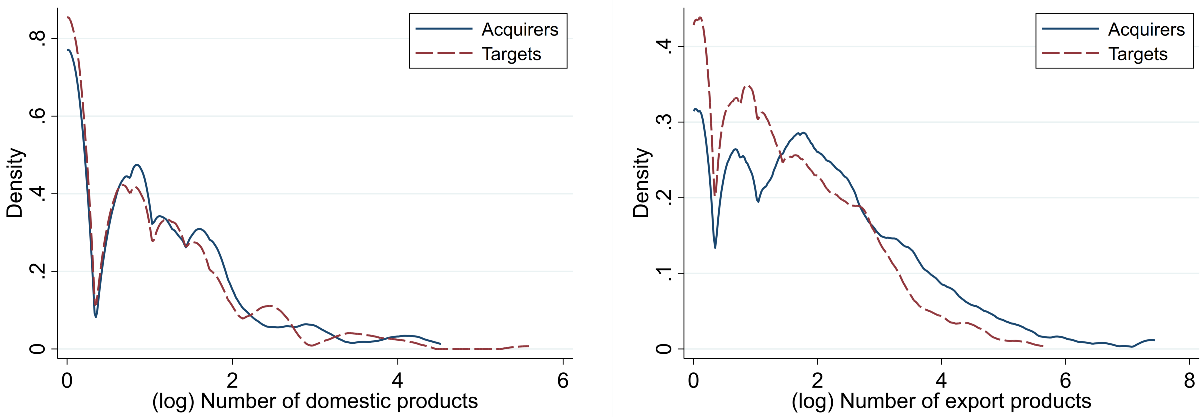
General information on firms, including their industry codes, are obtained from the firm-level register *FIRM*. The first four digits of the Danish industry codes (DB) in 2007 correspond to the NACE Rev. 2 industry codes, and around 10% can be further split into subcategories at the 6-digit level. We limit our sample to firms in private industries (i.e., excluding utility services, public administration and defense, education, health services, culture and entertainment services). In this paper, we focus on horizontal mergers, which we define as merger deals within the same 4-digit industry. Based on this definition, roughly 55% of the mergers identified over our sample period are considered horizontal mergers.[9] After these data cleaning procedures, we arrive at a list of 4,580 horizontal mergers for the 20-year period between 1996 and 2015.

Furthermore, two additional registers provide information on firms' sales of domestic and export products. They are matched to our firm-level data using firm identifiers. Specifically, *UHDI* gives us data on firms' exported products and their destination countries at the Combined Nomenclature (CN) 8-digit product level starting from 1993. *VARS*, the Danish version of PRODCOM, is available effectively from 1996 and provides information on firms' combined sales domestically and abroad at the CN 10-digit product level. We aggregate *VARS* up to the 8-digit level to be consistent with the trade data. By subtracting exports in *UHDI* from total sales in *VARS*, we compute domestic sales at the product level.[10] While trade data is available across all industries and is not

[8] As in Smeets et al. (2016), we exclude spurious changes to non-existing firm identifiers, for example, when headquarters move to a different location.

[9] For comparison, when using a broader definition at the 2-digit level, 66.9% of the mergers are classified as horizontal.

[10] The starting point of the CN 8-digit codes is the 6-digit codes from the Harmonized System (HS) nomenclature.



(a) (b)

Figure 1: This figure plots the kernel densities of the (log) average number of products in the pre-merger period for acquirers and targets in (a) the domestic market; and (b) the export market.

limited by firm size, the production survey only covers firms with 10 or more employees in the raw material extraction and manufacturing industries. Nevertheless, for this subset of firms, we have very detailed information at the product level that also allows us to test our hypotheses for changes in the domestic market product portfolio after a merger.

As an example of what an industry is and what products are sold, consider the manufacturing sector "Manufacture of wearing apparel", which has the 2-digit DB code of 14. Within this category, there are five 4-digit codes. One of these is 1413, which represents the industry of "Manufacture of other outwear." In the data, firms in this industry sell many products, including the category with the 4-digit CN code of 6104, "Women's or girls' suits, ensembles, jackets, blazers, dresses, skirts, divided skirts, trousers, bib and brace overalls, breeches and shorts (other than swimwear), knitted or crocheted." One of the subcategories is "Jackets and blazers", which contains four 8-digit codes: (i) 61043100, of wool or fine animal hair; (ii) 61043200, of cotton; (iii) 61043300, of synthetic fibers; and (iv) 61043900, of other textile materials. These 8-digit codes define the products that we examine in the firms' product portfolios.

2.2 Stylized facts

By linking the various Danish registers, we have a very rich dataset that allows us to document novel stylized facts about the domestic and foreign product portfolios of acquirer and target firms that are involved in domestic mergers. Because firms' product composition may fluctuate and experience

As noted by Gampfer and Geishecker (2019), for a small fraction of product-year observations in the Danish data, exports are larger than total sales, resulting in negative domestic sales. This is because the sources of information for the two datasets differ, and in particular, export values may include sales of traded goods whereas total sales in *VARS* exclude goods for resales. For the baseline specification in our econometric analysis, we drop all products with negative domestic sales. We also conduct a series of robustness checks to verify our findings are not affected by this issue.

changes from year to year (e.g., due to lumpiness, idiosyncratic shocks, etc.), we define a pre-merger period for the four years before and including the merger year, and a post-merger period three years after the merger year.[11] Given our methodology of identifying mergers, we have full information on a target firm before the merger event, but as mentioned, its firm identifier disappears after the merger. This means that implicitly, the target operates only in the pre-merger period. By contrast, a distinction is made between the pre-merger acquirer and post-merger acquirer. Having combined the different data registers, we first present three novel stylized facts on domestic mergers.

Fact 1 *A large fraction of acquirers and targets are MPFs at home and abroad.*

For the domestic market, we document this fact conditional on the manufacturing firms appearing in the *VARS* database. Admittedly, this is a select sample of firms. However, single-product firms exist and there is variation across acquirers and targets. With this caveat in mind, we compute the average number of CN 8-digit products in the pre-merger period. We find that among acquirers 66.3% are MPFs in the domestic market, while almost a quarter (23.7%) sell five or more domestic products.[12] These statistics are similar for targets at 62.4% and 20.1%, respectively. Figure 1(a) plots the kernel densities for the number of domestic products sold by acquirers and targets, and we find that the two distributions are also similar.[13]

For the export market, the data comprises the universe of firms, including non-exporters. Around 25.0% (14.4%) of all acquirers (targets) sell multiple products abroad. However, conditional on exporting, the share of multiproduct exporters is much higher at 86.6% (82.1%) for acquirers (targets), and around 55.2% (41.3%) of acquirers (targets) export five or more products. Distributions of the number of export products are plotted in Figure 1(b). We can also examine the intersection of the *VARS* and export datasets. Now, conditional on appearing in *VARS* (but not conditional on exporting), the share of acquirers and targets as multiproduct exporters is also very large at 77.0% and 58.7%, respectively. These statistics clearly demonstrate that MPFs are very prevalent in the merger market, both on the buyer and seller side, i.e., as acquirers and targets.

Fact 2 *Acquirers and targets compete partially in the product space.*

We define horizontal mergers within a 4-digit industry, and we consider the firms' portfolio of products across the pre or post-merger period.[14] Indeed, we observe that many acquirer and target

[11] Fluctuations, i.e., product churning within firms, are well documented in the literature (see, for example, Iacovone and Javorcik (2010)).

[12] This is equivalent to defining a MPF as selling more than one product in any year during pre-merger period. In the empirical analysis of Section 4, we also employ an alternative, more restrictive definition that an MPF must sell multiple products in all years of the sample.

[13] For reasons of data confidentiality, we cannot plot the exact distribution (i.e., histogram) of the number of products. Note that the kernel density estimates give an approximation for the shapes of the distributions, and the actual values of the densities plotted are not comparable to the statistics provided in the main text.

[14] We harmonize the CN 8-digit product codes over time by relying on the concordance table of Van Beveren et al. (2012). Then, for each firm, we count the number of unique domestic and export 8-digit products sold over 4-year pre-merger period. An overlapping product between the acquirer and target is sold by both firms at any time over the pre-merger period.

firms sell the same 8-digit products, and therefore, compete in the product space. However, their product portfolios only overlap partially. We find that 56.8% (63.1%) of the acquirer's (target's) domestic products before the merger are produced by both firms. In terms of value, they represent a larger 68.8% and 70.7% for acquirers and targets, respectively. Thus, the competing products tend to be, on average, of greater value to both firms. The patterns are similar in the export market, though with smaller magnitudes. 27.6% (42.0%) of the acquirer's (target's) products overlap with their counterpart in the merger deal, accounting for 52.7% (64.0%) of the total export sales. If we consider the combined product portfolios of the pre-merger acquirer and target and count the number (value) of unique products between them, then there is an overlap of 42.3% (66.0%) in the domestic market and 15.6% (52.6%) in the export market.

Fact 3 *Products from the combined product portfolio of the acquirer and target are dropped after the merger, especially those from the target.*

From Fact 2, it is clear that along with control and ownership of the target's production facilities, the acquirer also obtains new product lines. The merged entity may also introduce new product lines, but here, we focus on and describe the adjustments of the product portfolios of the pre-merger acquirer and target. In particular, the acquirer must decide whether or not to continue producing its own products, as well as whether to add the target's products to its existing product portfolio or discard them. The data reveals a stark contrast between the overlapping and non-overlapping products. In the domestic (export) market, the acquirer continues to sell 93.0% (83.1%) of overlapping products. For non-overlapping domestic (export) products that the acquirer originally sold, the survival rates are lower at 73.5% (34.5%). Attrition is even higher for the target's non-overlapping products. The post-merger acquirer continues to sell only 27.4% and 25.6% of such products in domestic and foreign markets, respectively. Churning clearly exists, especially for sales in foreign markets. Although it would be interesting to investigate the sales evolution of the overlapping products separately for the acquirer's own product lines compared with the target's, we unfortunately cannot distinguish the two after the merger takes place. In other words, we do not have information at a finer level, such as the acquirer and target's individual brands. Nonetheless, Facts 2 and 3 together imply that there are important changes to the product portfolio resulting from the reorganization of the post-merger acquirer. At the extensive margin, products are dropped and added that affect the total number of products. This also suggests that the product mix may be affected as the distribution of sales across products changes.

3 The model

In this section, we present a novel framework to analyze horizontal mergers between MPFs. To do so, we build on the model of Eckel and Neary (2010) and combine it with the merger analysis from Perry and Porter (1985). The main goals of this section are to formalize the implications of merger-induced within-firm adjustments along the acquirer's product portfolio and to provide testable predictions to guide our empirical analysis in the subsequent section.

3.1 Consumers

We start with a closed economy, consisting of L consumers who derive utility by consuming q_0 units of a homogeneous good and $q(i)$ units of differentiated goods according to the utility function:

$$U = q_0 + aQ - \frac{1}{2}b\left[(1-e)\int_{i\in\Omega} q(i)^2 di + eQ^2\right], \tag{1}$$

where a and b are non-negative preference parameters, $e \in (0,1)$ is an inverse measure of product differentiation, and $Q = \int_{i\in\Omega} q(i)di$ denotes total consumption over all varieties indexed by $i \in \Omega$. Consumers maximize utility subject to the budget constraint $q_0 + \int_{i\in\Omega} p(i)q(i)di = I$, where $p(i)$ is the price of variety i and I is individual income.[15] The homogeneous good serves as the numéraire, implying $p_0 = 1$. It is produced under perfect competition and each unit produced requires one unit of labor.[16] Utility maximization yields the following inverse market demand function with a non-constant price elasticity:

$$p(i) = a - b'\left[(1-e)y(i) + e\int_{i\in\Omega} y(i)di\right], \tag{2}$$

where $b' \equiv b/L$ is an inverse measure of market size and $y(i)$ denotes market demand for variety i by all consumers $Lq(i)$.

3.2 Technology and profit maximization

In the pre-merger scenario, we follow Eckel and Neary (2010) and consider a setting of Cournot competition among m symmetric firms. The production technology of each firm is characterized by a core competence $i = 0$, defined as the most efficient variety in the portfolio, along with a flexible manufacturing technology. The latter feature implies that firms can add additional varieties to their portfolio. However, adaptation costs are incurred with each addition, which raise the marginal cost of production for that variety. As a departure from Eckel and Neary (2010), we build on the idea of Perry and Porter (1985) to extend the model by allowing firms to invest into their production process. Specifically, we assume that each firm owns a fixed amount of K units of assets that are optimally allocated across the endogenous set of varieties δ. As in Perry and Porter (1985) and Nocke and Yeaple (2014), these assets cannot be bought "off the shelf", and may be interpreted as the firm's productive capacity or their organizational capital. The marginal costs of producing a particular variety are reduced by allocating more assets towards it. To formalize this idea, denote the amount of variety-specific assets by $k(i)$ and assume the following cost function:

$$c(i) = c + \frac{c_1}{\beta}i^\beta - 2\eta\sqrt{k(i)}, \tag{3}$$

[15] Throughout our analysis, we assume $q_0 > 0$ to ensure positive consumption levels of the differentiated good.

[16] The quasi-linear preferences in Eq. (1) imply that all income effects are absorbed by the numéraire good. Thus, we take a partial equilibrium perspective and do not consider general equilibrium adjustments on wages, which are fixed at $w = 1$.

with $c, c_1, \beta, \eta > 0$. Given this cost function, a firm allocates assets across varieties in its portfolio subject to the capital constraint $K = \int_0^\delta k(i)di$. Total profits of a firm are given by:

$$\Pi = \int_0^\delta [p(i) - c(i)]y(i)di - F, \tag{4}$$

where F denote fixed cost of production that are paid to operate one firm. In the following, we characterize the profit maximization problem of a firm that takes into account the market clearing condition $y(i) = x(i)$. An MPF simultaneously chooses the optimal output of each variety (i.e., scale $x(i)$), the optimal number of products (i.e., scope δ), as well as the optimal allocation of assets per variety (i.e., $k(i)$).

Optimal scale and scope: Maximizing profits in Eq. (4) with respect to scale implies the following first-order condition:

$$\frac{\partial \Pi}{\partial x(i)} = p(i) - c(i) - b'(1-e)x(i) - b'e \int_0^\delta \frac{\partial Y}{\partial x(i)} x(i)di = 0, \tag{5}$$

where $Y \equiv \int_{i \in \Omega} x(i)di = m \int_0^\delta x(i)di$ denotes industry-wide output of all m producers. By using the inverse demand function in Eq. (2) and using $X = \int_0^\delta x(i)di$ for total firm scale, we can solve for optimal output per variety i as follows:

$$x(i) = \frac{a - c(i) - b'e\,(X + Y)}{2b'(1-e)}. \tag{6}$$

Eq. (6) displays two important features of the model. First, output of the core variety $i = 0$ is the highest because it has the lowest costs. Second, in addition to the standard Cournot competition effect (captured by Y), there is a negative impact of total firm scale X on individual scale – the cannibalization effect – which is more pronounced when products are closer substitutes (higher values of e). To derive the first-order condition for scope, the firm maximizes profits Π with respect to δ subject to the constraint on assets K. Solving this problem implies that the output of the marginal variety δ is equal to zero, i.e., $x(\delta) = 0$ (see Eckel and Neary, 2010).[17]

Optimal allocation of assets: Maximizing profits in Eq. (4) with respect to optimal assets for variety i subject to the constraint $K = \int_0^\delta k(i)di$ and integrating the respective expression gives:

$$k(i) = \frac{K\tilde{\beta}(\delta^\beta - i^\beta)^2}{2\delta^{2\beta+1}}, \tag{7}$$

where $\tilde{\beta} \equiv (1/\beta + 1)(1/\beta + 2)$. Inspection of Eq. (7) reveals that the firm allocates the largest share of its assets towards the core variety $i = 0$ while assets assigned to the marginal variety $i = \delta$ are

[17] Formally, the function that is solved is given by: $L = \int_0^\delta [p(i) - c(i)]\, x(i)\, di - F - \lambda \left(\int_0^\delta k(i)di - K \right)$, where λ is the Lagrange multiplier.

zero. Furthermore, it follows immediately from computing the partial derivative with respect to total assets K (i.e., for a given product range δ) that the core product also receives the greatest portion of any additional assets gained from a rise in K. Combining the information above on optimal scale, scope, and assets, we can rewrite optimal scale as:[18]

$$x(i) = \frac{(c_1/\beta)(\delta^\beta - i^\beta) + 2\eta\sqrt{k(i)}}{2b'(1-e)}. \tag{8}$$

Therefore, the output schedule can be described as a downward-sloping locus starting with the highest output for the core variety.

3.3 Pre-merger symmetric industry equilibrium

Given the solutions to the firm's maximization problem above, we now proceed to solve the industry equilibrium. Substituting Eq. (7) into (8) and integrating across all varieties gives total firm scale as a function of scope:

$$X(\delta) = \frac{c_1\delta^{\beta+1} + \eta\beta\sqrt{2K\delta\tilde{\beta}}}{2b'(1-e)(\beta+1)}. \tag{9}$$

To derive a second equation linking X and δ, we make use of Eq. (6), by considering $x(\delta) = k(\delta) = 0$ and the symmetry condition $Y = mX$, to derive:

$$\delta(X) = \left(\frac{\beta\,(a - c - b'e(1+m)X)}{c_1}\right)^{1/\beta}. \tag{10}$$

Eqs. (9) and (10) characterize the symmetric industry equilibrium. Figure 2 graphically illustrates the equilibrium (for $\beta = 1$), where we illustrate both equations in the right panel to determine optimal total scale X^* and scope δ^*.[19] The panel on the left-hand side displays optimal scale per variety from Eq. (8), showing that the largest output is concentrated on the core variety $i = 0$ and a zero output for the marginal variety $i = \delta$.

3.4 The consequences of a merger on firm-level variables

Using this framework, we now analyze the impact of a merger between two firms out of the pool of m symmetric firms. As stated before, the focus of our work is not to explain why mergers arise. Instead, we are interested in the impact of a merger on MPFs' product-mix. Thus, we keep the model as simple as possible here and make sure that the incentive for one merger exists. To this

[18] To derive Eq. (8), we combine information from the first-order conditions for scale and scope. As the first-order condition for scope implies that $x(\delta) = 0$, we obtain: $c(\delta) = a - b'e(X+Y)$. Substituting the latter expression into Eq. (6), we derive $x(i) = [c(\delta) - c(i)]/[2b'(1-e)]$. Lastly, using $k(\delta) = 0$ from Eq. (7) and substituting the cost functions, we derive the expression from the main text.

[19] We derive $dlnX/dln\delta = \left[(\beta+1)\delta^{\beta+1}c_1 + (\eta\beta/2)\sqrt{2K\delta\tilde{\beta}}\right]/[2b'(1-e)(\beta+1)] > 0$ to prove that total scale rises in scope. To show that scope is a decreasing function of total scale we compute: $dln\delta/dlnX = -[b'e(1+m)X]/[c_1\delta^\beta] < 0$.

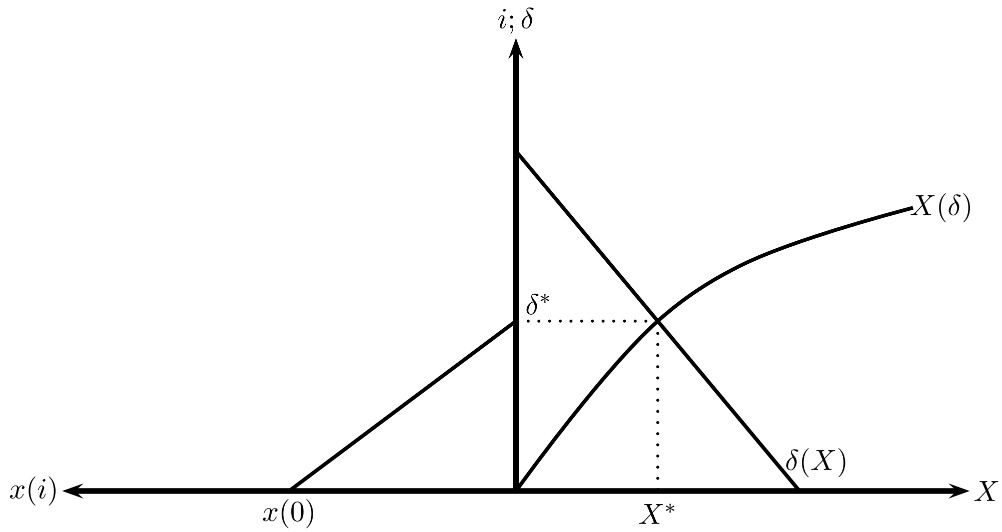


Figure 2: Symmetric industry equilibrium

end, we assume that each firm incurs a fixed cost of production F. The role of this fixed cost is simply to guarantee that the combined profits after a merger are higher than the sum of the individual profits before the merger, as the merged entity only has to pay the fixed cost once.[20] To distinguish between the new merged entity and the remaining $m-2$ old firms, we introduce index $j \in \{I, O\}$, with I (inside) and O (outside) denoting the former and latter group of firms, respectively (see Salant et al., 1983). Our setting then allows us to formally discuss the impact of a merger by examining two forces. Specifically, the effect of a merger can be decomposed into synergy gains due to an *asset effect* and a reduction in industry competition, the *anti-competitive effect*. While the first arises only within the merged entity, the second affects all firms equally. In the interest of space and readability, we confine ourselves to graphical analysis and an intuitive discussion in the main text as much as possible and support this discussion with detailed analytical derivations in Theoretical Appendix A.

3.4.1 Asset effect of a merger

We illustrate the increase in assets for the merged entity $j = I$ in Figure 3 by rotating the $X(\delta)$-curve clockwise. Intuitively, as the new firm now has access to the assets of both merger partners, it can reduce all costs to attract more consumers, which increases its overall output. The increase in total firm scale affects the scope of the firm negatively. The reason behind this effect is the stronger cannibalization induced by an increase in X_I. In the special case where products are perfectly differentiated, i.e., $e = 0$, the role of cannibalization vanishes.[21]

The fact that the merged entity increases total scale while dropping marginal products implies

[20] By choosing an appropriate level of the fixed cost, we can achieve an equilibrium in which one merged insider firm exists, and the remaining symmetric outsider firms do not have incentives to conduct another merger. Intuitively, the degree of competition is reduced after one merger, and this raises outsiders' profits and therefore lowers their incentives to merge.

[21] The full mathematical derivations, also for outsiders, can be found in Theoretical Appendix A.1.1.

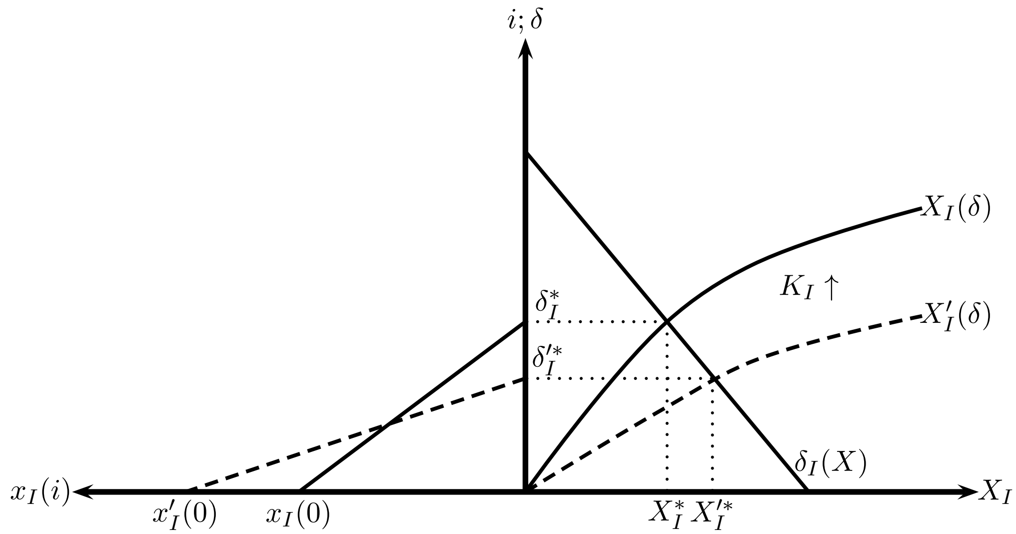


Figure 3: Impact of an increase in assets on the scale and scope of firm I

that the firm focuses more on its core varieties. This can be seen in the left panel of Figure 3, where the outputs of varieties close to the core variety increase while outputs of marginal varieties fall. Using the terminology of Eckel and Neary (2010), an increase in assets makes the firm "leaner and meaner." These efficiency gains are triggered by allocating the new assets towards the best performing products.

3.4.2 Anti-competitive effect of a merger

Besides increasing the assets of firm I, a merger between two firms also changes the degree of competition in the industry. Specifically, industry competition declines as there is a one less firm in the market. Graphically, a reduction in m rotates the $\delta(X)$ line counterclockwise as depicted in Figure 4, which increases total scale. In contrast to firm I's response from an increase in assets, the number of products rises here. This is because the reduction in the number of competitors outweighs the stronger cannibalization effect arising from an increase in total firm output.[22]

3.4.3 Combined effects of a merger event

Combining the insights from the previous subsections, we conclude that a merger event in our setting unambiguously increases total firm scale X_I. Both an increase in K_I and a reduction in m induces an output expansion for the merged MPF. This implies that with respect to total scale, the asset effect and the anti-competitive effect work in the same direction.

With respect to the response in optimal scope, the prediction of our model is less clear-cut as the asset effect and the anti-competitive effect operate in opposite directions. On the one hand, intensified cannibalization through an increase in X_I induces the firm to reduce scope. On the other hand, lower competition through a reduced number of firms in the industry encourages the merged

[22]We present analytical results in Theoretical Appendix A.1.2.

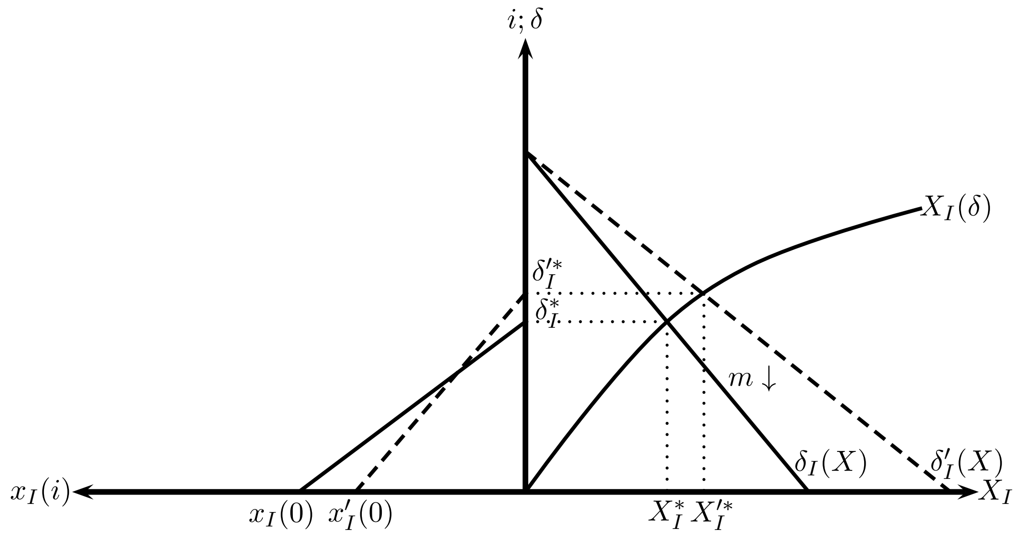


Figure 4: Impact of a reduction in competitors on the scale and scope of firm I

firm to increase optimal scope δ_I. In Theoretical Appendix A.2, we provide a simulation exercise of our model in order to further investigate the ambiguous effects on optimal scope in our setting. There, we also show how changes in product scope depend on the interplay between the strengths of the asset effect (determined by η) and the cannibalization effect (determined by e).

3.5 Implications and testable predictions

Having analyzed the impact of a merger in our theoretical framework, we now discuss the main implications and derive predictions that can be confronted with data in the subsequent empirical analysis.

3.5.1 Product portfolio

The first prediction that we take to the data is with respect to the response of the optimal scope. Our analysis above indicated that the result is theoretically ambiguous. Hence, it is an empirical question as to whether the asset effect or the anti-competitive effect dominates. To shed further light on this ambiguity, we use Eq. (10) to compare the product range in an ex-ante scenario (δ_{ea}) to the product range of the merged entity in an ex-post equilibrium (δ_I). These are, respectively:

$$\delta_{ea} = \left(\frac{\beta\left(a - c - b'e\left(1+m\right)X_{ea}\right)}{c_1}\right)^{1/\beta} \text{ and } \delta_I = \left(\frac{\beta\left(a - c - b'e\left(X_I + Y_{ep}\right)\right)}{c_1}\right)^{1/\beta}. \qquad (11)$$

The result of an increased scope in the ex-post equilibrium (i.e., $\delta_I > \delta_{ea}$) requires the following condition: $Y_{ea} - Y_{ep} > (X_I - X_{ea})$, where $Y_{ea} = mX_{ea}$ and $Y_{ep} = X_I + (m-2)\,X_O$. This implies that the ex-post product range is larger when the reduction in industry output is larger than the increase in total scale of the merged entity. Intuitively, this implies that the intensified cannibalization effect is more than offset by a reduction in overall output in the industry. As the strength of the cannibalization effect is determined by the parameter e in the model, we can expect differential results depending on high versus low levels of product differentiation, as confirmed by the simulation exercise in Theoretical Appendix A.2. To see this, note that a change in total firm scale X_I enters Eq. (11) twice: first, through a change in industry output captured by the term $-b'eY_{ep}$, and second, through the cannibalization effect $-b'eX_I$. The strengths of both effects depends on the degree of product differentiation where lower levels of e imply that products are less substitutable and cannibalization is less intense.

By contrast, the theory makes an unambiguous prediction when comparing the product range of the merged entity (i.e., post-merger acquirer) to the combined product range of the pre-merger and target. Due to the presence of the cannibalization effect, the product range of the merged firm I will be smaller, i.e., $\delta_I < 2\delta_{ea}$. Hence, the same amount of assets leads to fewer products when concentrated in one instead of two firms. Taking stock, we summarize this first set of predictions on the product scope.

Testable Prediction 1 *i) While the effect of a merger event on optimal scope is ambiguous in general, we expect that the scope is more likely to rise in case of a higher degree of product differentiation. ii) The product range of the merged entity is smaller than the sum of products of the two firms before the merger.*

3.5.2 Focus on core competency

Following a merger, the amount of assets held by the acquirer increases, and these additional resources must be allocated across the product lines. The allocation of the combined stock of assets affects production costs $c(i)$. This in turn has consequences for the competitiveness of individual varieties in the domestic market and, as we will discuss in the next subsection, in export destinations. Totally differentiating Eq. (7) gives:

$$dk(i) = \frac{1}{2\delta_I^{2\beta+1}}\tilde{\beta}\left(\delta_I^{\beta} - i^{\beta}\right)^2 dK_I + \frac{1}{\delta_I^{\beta+2}}\left(\beta K_I \tilde{\beta}\left(\delta_I^{\beta} - i^{\beta}\right) - (2\beta+1)\delta_I^{\beta+1}\right) d\delta_I. \tag{12}$$

The first part represents the direct effect of an increase in assets following a merger. Evaluating the equation at $i = 0$ shows that this effect is most pronounced for the core variety. The second part represents the effect which arises through a change in product scope following a merger. Due to the two opposing forces in our setting, it is a priori unclear whether optimal scope rises or falls after a merger event. However, conditional on changes in product scope, we expect the largest drop in production costs and hence, the largest increase in per variety scale $x(i)$, for the core variety $i = 0$.

Testable Prediction 2 *Conditional on changes in product scope, the output increase is largest for the core variety following a merger event.*

3.5.3 Internationalization strategies

As a final implication of our model, we study the effects of domestic mergers on the success of acquirers in international markets. To do so, we consider a potential set $\mathbb{N}$ of export destinations.

Each destination $n \in \mathbb{N}$ is characterized by country-specific trade costs t^n and is similar in all other aspects to the economy that has been analyzed thus far. To focus on the main ideas, we abstract from characterizing a full $\mathbb{N}$-country trade equilibrium. Instead, we analyze a scenario where firm I decides whether or not to export to various foreign destinations. In this setting, the production costs of variety i are given by $c(i) + t^n$. In destination n, firm I competes with m^n incumbent firms, which have the advantage of not having to pay the country-specific trade costs t^n. As formally derived in Theoretical Appendix A.3, optimal scope δ_I^n of firm I in country n reads:

$$\delta_I^n = \left(\frac{a - c - t^n + 2\eta\sqrt{K_I\tilde{\beta}/2\delta_I} - b'e(X_I^n + Y^n)}{c_1/\beta + 2\eta\sqrt{K_I\tilde{\beta}/2\delta_I^{2\beta+1}}} \right)^{\frac{1}{\beta}}. \tag{13}$$

Clearly, due to the presence of trade costs, the firm only exports a subset of products (which can be of zero mass) to the foreign destination: i.e., $\delta_I^n < \delta_I$. As an important distinction to the total scope produced in the home country δ_I (see Eq. (10)), optimal export scope depends directly on K_I. The reason is that assets for the marginal export variety are non-zero, i.e., $k(\delta_I^n) > 0$, whereas $k(\delta_I) = 0$.[23] Setting $\delta_I^n = 0$ (which also implies $X_I^n = 0$) gives the critical value of trade costs above which there are no exports to that specific destination:

$$t^n_{critical} = a - c + 2\eta\sqrt{\frac{K_I\tilde{\beta}}{2\delta_I}} - b'eY^n. \tag{14}$$

As we are interested in the effects of a domestic merger on the optimal export scope of firm I to country n, we focus on the asset effect of mergers as the main driver of our results and leave the number of firms in market n unaffected.[24]

In Figure 5, we illustrate the asset effect of mergers on export behavior graphically and a formal analysis to our results can be found in Theoretical Appendix A.3. Figure 5 presents graphically the first-order conditions for scope in the home country as well as in two potential export destinations n_1 and n_2. Country n_2 is characterized by a higher level of trade costs. Optimal (export) scope is determined by the intersection of the cost-schedule and each horizontal line. In the case of symmetric markets, the presence of trade costs implies that domestic scope is strictly larger than export scope. In particular, for the given pre-merger scenario, export scope to country n_2 is zero.

[23]Notably, this arises due to the specific way we introduce assets in our framework, which differs from models that consider endogenous sunk costs as part of an investment decision (see, for example Eckel et al., 2015; Flach and Irlacher, 2018). In those settings, exporting would reinforce investments into exported varieties.

[24]Analogous to our analysis of the domestic market, if the target firm was exporting to country n before, then there would also be an anti-competitive effect in the destination market. We argue that this effect can be downplayed in the foreign market. In particular, for a small country like Denmark, a merger between two domestic Danish companies is unlikely to have a large influence on the degree of competition in the foreign market. Thus, we argue that this effect is only of second-order importance in the export destinations. We find in the data that target firms are less likely to export compared to acquirers, and also export less than them, further corroborating our claim. Hence, we leave the number of firms in market n unaffected following a domestic merger. In the empirical analysis below, we demonstrate that similar results are obtained when we restrict the sample to acquisitions of non-exporting targets.

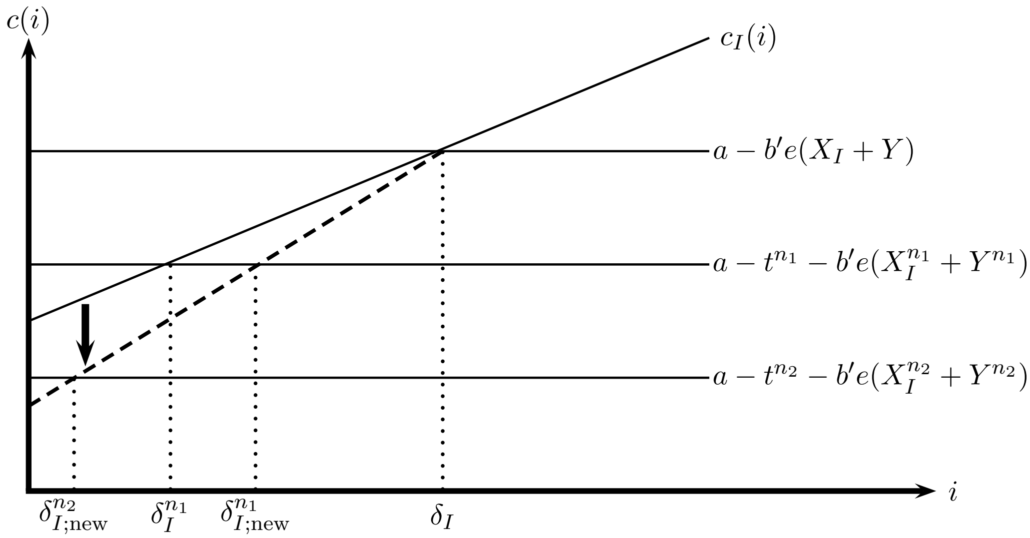


Figure 5: Effect of an increase in assets on the export scope of firm I

The impact of the asset effect is demonstrated by the counterclockwise rotation of the cost curve for exports (dashed line).[25] Through this analysis, we derive two predictions that can be confronted with the data. First, the firm expands to new export markets in the aftermath of a domestic merger (see $\delta^{n_2}_{I;new} > 0$). Second, following a domestic merger event, the export scope rises in destinations where the firms was already active in (see the increase from $\delta^{n_1}_{I}$ to $\delta^{n_1}_{I;new}$).

Testable Prediction 3 *Following a merger event, firms increase i) the number of export destinations and ii) the export scope per destination.*

4 Empirical analysis

4.1 Empirical strategy

In this section, we employ the Danish register data described in Section 2 to provide empirical support for the testable predictions of our theoretical model. Using a common empirical framework, we investigate changes in different outcomes of the acquirer firm following a merger event. Hence, we estimate our regressions at the firm level. One approach to evaluate the impact of a merger on the acquirer firm is the difference-in-differences (DiD) setup:

$$\text{outcome}_{it} = \alpha_i + \beta_t + \mu \mathbf{1}\left[t - \text{MergerYr}_i \in g\right] + \epsilon_{it}, \tag{15}$$

The dependent variable $outcome_{it}$ is the outcome of acquirer firm i at time t, and $\mathbf{1}\left[t - \text{MergerYr}_i \in g\right]$ is an indicator variable which equals 1 if t belongs in the post-merger period g of acquirer i following the merger year, denoted by $MergerYr_i$, and zero otherwise. This specification includes both unit (i.e., firm) and time fixed effects to control for unobserved heterogeneity and is referred to as the two-way fixed effects (TWFE) estimator.

[25] Figure 5 is drawn for the case in which domestic scope is unchanged by the merger. See the formal discussion in Theoretical Appendix A.3 for more details.

Eq. (15) estimates the average impact of the merger event over the post-merger period. Our main empirical strategy instead relies on an event-study design, which expands on the DiD setup to allow the effect of the merger to vary over time non-parametrically with lead and lag terms.[26] Thus, we estimate the following specification:

$$\begin{aligned} \text{outcome}_{it} = \alpha_i + \beta_t + \gamma_{<-3}\mathbf{1}\left[t - \text{MergerYr}_i < -3\right] + \sum_{\tau=-3,\,\neq 0}^{+3} \mu_\tau \mathbf{1}\left[t - \text{MergerYr}_i = \tau\right] \\ + \gamma_{>+3}\mathbf{1}\left[t - \text{MergerYr}_i > +3\right] + \varepsilon_{it}. \end{aligned} \tag{16}$$

The length of the event window in our event study is seven years, with the pre-merger period defined as the four years before and including the merger year, and correspondingly, the post-merger period is composed of the three years after the merger event. For each of the three years τ before and after the merger, we define the relative year indicator variable $\mathbf{1}\left[t - \text{MergerYr}_i = \tau\right]$. Distant relative years are binned, both before the pre-merger and after the post-merger period. In other words, years $\tau < -3$ ($\tau > +3$) are grouped with the dummy variable $\mathbf{1}\left[t - \text{MergerYr}_i < -3\right]$ ($\mathbf{1}\left[t - \text{MergerYr}_i > +3\right]$). For this specification, we include in the sample as a control group the firms that never experience any merger event, i.e., neither as an acquirer nor a target. Note that the regression pools all merger events in our sample, so the control group consists of firms from all industries. This implies that the control group consists not only of "outside" firms in the same industry that did not participate in mergers, but the vast majority are actually operating in completely different industries.[27] Following conventional practice, we take the merger year ($\tau = 0$) to be the omitted base category. The coefficients of interest are μ_τ, and we compare them over time to study the impact of the merger event. In contrast to the "static" specification in Eq. (15), this regression allows us to discern whether there are any pre-trends from the estimates of τ_{-3} to τ_{-1}, as well as to examine the persistence of the effects post-merger.

Eq. (16) is estimated using ordinary least squares (OLS). Importantly, the specification is again a TWFE regression model with both firm and time fixed effects. Firm fixed effects α_i allow for different baseline outcomes across acquirers. Hence, we are controlling for firm-level unobserved heterogeneity to study the within-firm adjustments of the acquirer. Note that industry fixed effects as well as all one-time changes in the firm associated with the merger are absorbed by the firm fixed effects. In addition, time fixed effects β_t in Eq. (16) capture time-varying shocks across firms as well as trends in the outcome variables.

[26]Eq. (15) is the so-called "static" specification that captures a single treatment effect which is time invariant, while Eq. (16) is the "dynamic" specification used to conduct an event study (e.g., Sun and Abraham, 2021).

[27]We also show that our results are robust to the sample of only acquirers. In this case, binning the distant relative years is necessary to avoid the problem of multi-collinearity, which arises because $\sum_{\tau=-3}^{+3} \mathbf{1}\left[t - \text{MergerYr}_i = \tau\right]$ is exactly 1 and there is a linear relationship between the two-way fixed effects and the relative period indicators (Borusyak et al., 2021; Sun and Abraham, 2021).

4.2 Outcome variables and estimation sample

Motivated by Testable Prediction 1, we empirically examine the change in the number of products in the domestic market, $Prod^D$. We take logarithms of the outcome variables, which implies that the coefficients μ_τ can be interpreted approximately as percentage changes of the outcomes relative to the merger year. Moreover, we compare the sum of the pre-merger acquirer and target's domestic products against the post-merger acquirer, $Prod^{D,AT}$. For Testable Prediction 2, we employ two approaches. First, we study changes in the skewness of sales over products, $Skew^D$. As in Mayer et al. (2014), Flach et al. (2021), and Mayer et al. (2021), "skewness" here is used as an index of inequality for the distribution of product sales, as opposed to its statistical definition as a measure of asymmetry. We follow their approach and also utilize the Theil index as our measure for the concentration of export market shares of different products.[28] Second, we investigate how the merger impacts sales across the entire range of products, from the top performing product to the median and minimum in terms of total sales. These are denoted as $Sales^{D,max}$, $Sales^{D,med}$, and $Sales^{D,min}$, respectively. Finally, for Testable Prediction 3, we turn our attention to the export market. Specifically, the outcomes of interest are the number of destination markets, Mkt^X, and the average number of products per destination, $AveProd^X$, conditional on the pre-merger acquirer being active in those markets.

Due to data constraints, there is a minimum size threshold of 10 or more employees for regressions relying on the domestic sales data computed from *VARS*. For regressions related to export outcomes, we impose a minimum size threshold of 5, which lowers the number of deals analyzed by around one-fifth.[29] While the vast majority of acquirers purchase a single target in a given year, we allow for the possibility of a merger event with multiple mergers in a single year. In this case, at least one of the target firms must operate in the same 4-digit industry as the acquirer. In our model, we presented the analysis with one-to-one matches for simplicity, but the results generally extend to the case in which the acquirer purchases multiple target firms and consolidates all of their assets. In Section 4.5 below, we further demonstrate the robustness of our findings by excluding acquirers with multiple mergers in a given year from the sample. We also note that even if cross-industry merger deals are dropped from a particular merger event with multiple targets, the merger event would still exist because there remains a horizontal merger in that given year. Thus, this restriction would only affect the regressions in which the outcome variable is the sum of the pre-merger acquirer and target's products. Lastly, to keep a clean sample, we exclude all acquirers with multiple horizontal merger events, as well as all mergers that occur within seven years of another deal by the same acquirer. Because an acquirer's product portfolio may be affected by mergers both within and across industries, this step ensures that the post-merger period is not contaminated by any other

[28] We also find qualitatively similar results with the Atkinson index, an alternative entropy index to the Theil measure. These results are available upon request. Compared to these entropy indices, the Herfindahl-Hirschman index (HHI) generally puts much more weight on large values and may be less responsive to changes across the distribution.

[29] We use the individual-level data registers *IDAN* and *BEF* to compute the number of employees between the age of 18 and 65.

Table 1: Summary Statistics

	Panel A: Domestic market outcomes	
	Mean	Std dev.
1. (log) Number of products, $Prod^D$	0.638	0.773
2. (log) Number of products between acquirer and target, $Prod^{D,AT}$	0.658	0.783
3. Skewness of sales across products, $Skew^D$	0.255	0.373
4. (log) Sales of product at maximum of sales distribution, $Sales^{D,max}$	16.72	1.463
5. (log) Sales of product at median of sales distribution, $Sales^{D,med}$	16.01	1.809
6. (log) Sales of product at minimum of sales distribution, $Sales^{D,min}$	14.84	2.917

	Panel B: Export market outcomes	
	Mean	Std dev.
1. (log) Number of destination markets, Mkt^X	1.458	1.211
2. (log) Average number of products per market, $AveProd^X$	0.851	0.822
3. (log) Number of products, $Prod^X$	1.755	1.275
4. (log) Number of product-market pairs, $ProdMkt^X$	2.291	1.649

Notes: Authors' calculations using the Danish register data. N = 21,843 for the domestic market outcomes and 67,274 for the export market outcomes. Skewness is measured by the Theil index. The sales distribution in Panel A rows 4-6 refers to the distribution across products.

pre-merger activities, even if they are taking place in another industry.

The sample used to analyze domestic outcomes contains 139 merger deals from the manufacturing sector. While *VARS* does include firms in the raw material extraction industries, we do not observe any mergers in these industries, and their firms are omitted from the analysis. Meanwhile, the sample for examining export outcomes is larger with 492 mergers. Around one-third of acquirers are exporters, which is substantially higher than the share across all firms (0.14). However, this means that the majority of acquirers have no exports either in the pre or post-merger period. Because there is no change in any of the export outcome variables for this set of deals, we drop them from the analysis. Although the number of deals in our samples for the domestic and export market regressions are substantially smaller than the raw total, they still represent the largest set of mergers from the universe of deals available that allow us to obtain clean results.[30] Table 1 presents summary statistics for our outcome variables.

4.3 Baseline results

We present our main results graphically, and report the full set of coefficient estimates in the corresponding regression tables in Empirical Appendix B. In these figures, we focus on the event window (i.e., the three years before and after the merger), but the coefficients of the distant years (i.e., $>+3$ and <-3) are included in the appendix tables. Standard errors are clustered at the level of NACE Rev. 2 2-digit industries, and 90% confidence intervals are displayed in the graphs.[31]

[30] We have verified that very similar patterns to the three stylized facts presented in Section 2 are obtained with this smaller but cleaner sample used for the regression analysis.

[31] Baseline results corresponding to Figure 6 for domestic market outcomes and Figure 7 for export market outcomes are presented in Panel A of Appendix Tables B.1 and B.3, respectively. Panel B of Appendix Tables B.1 and B.3 show the estimates when the sample includes only the acquirers.

4.3.1 Domestic market outcomes

First, Figure 6 shows the results for domestic market outcomes. In Figure 6(a), we find that the acquirer's product scope, as measured by the number of products ($Prod^D$), increases following a merger event. The estimated coefficients in the three years of the post-merger period are all positive and statistically significant. By contrast, the coefficients in the pre-merger period are small and statistically indistinguishable from zero, which suggests that there are no pre-trends leading up to the merger. Theoretically, the firm-level asset effect from increased cannibalization and the industry-level anti-competitive effect from a reduction in the number of firms affect the acquirer's product scope in opposite directions. Empirically, we find that on average, the latter force is stronger and the number of domestic products in the three years after the merger rises by around 7% relative to the merger year. According to Testable Prediction 1(i), this would suggest that there is a high degree of product differentiation within the firms' product portfolio, such that the cannibalization force does not dominate. We examine this issue further in Section 4.7 below.

From Figure 6(b), we also find that the number of products of the post-merger acquirer is significantly smaller than the sum of products between the pre-merger acquirer and target ($Prod^{D,AT}$). Thus, we confirm Stylized Fact 3 with econometric analysis, and importantly, the evidence presented strongly supports Testable Prediction 1(ii). To measure $Prod^{D,AT}$, we count the number of unique products between the acquirer and target before the merger. Our results indicate that the acquirer cuts down the number of product lines on average by around 30% after the merger. From Stylized Fact 3, we know that the target's products have a very high likelihood of being eliminated. Thus, by dropping products, the acquirer can reallocate the consolidated resources towards other product lines to improve their efficiency. We turn to this idea next by examining the sales composition of the domestic market product portfolio.

Figure 6(c) presents the change in skewness of sales across products ($Skew^D$). Skewness is measured by the Theil index, $\delta^{-1}\sum_i (r_i/\bar{r})\ln(r_i/\bar{r})$, where δ is the number of products, r_i is the sales of product i, and $\bar{r}$ is the mean sales across products. We find that, on average, domestic sales of the acquirer become more concentrated after the merger, which is consistent with Testable Prediction 2. Note that in our regression, we are effectively controlling for the one-time change in the number of products due to the merger (i.e., $d\delta_I$ in Eq. (12)) with firm fixed effects. For the sample of acquirers, Appendix Table B.2 demonstrates our results hold even after controlling for the time-varying change in the number of products relative to the merger year (i.e., $Prod^D_{i,t} - Prod^D_{i,MergerYr}$). Moreover, Figure 6(d) further supports Testable Prediction 2 by showing that the increase in sales systematically declines as one moves away from the core product. In particular, we find the largest effect on the best-performing product ($Sales^{D,max}$), defined as the product with the maximum sales in the sales distribution across products for a given year. Sales of the product at the median of the distribution ($Sales^{D,med}$) also grow, but the changes are smaller and not statistically significant in the first two years post-merger. Lastly, there is no change of the sales of the worst-performing product ($Sales^{D,min}$) before and after the merger year. Overall, the evidence indeed suggests that

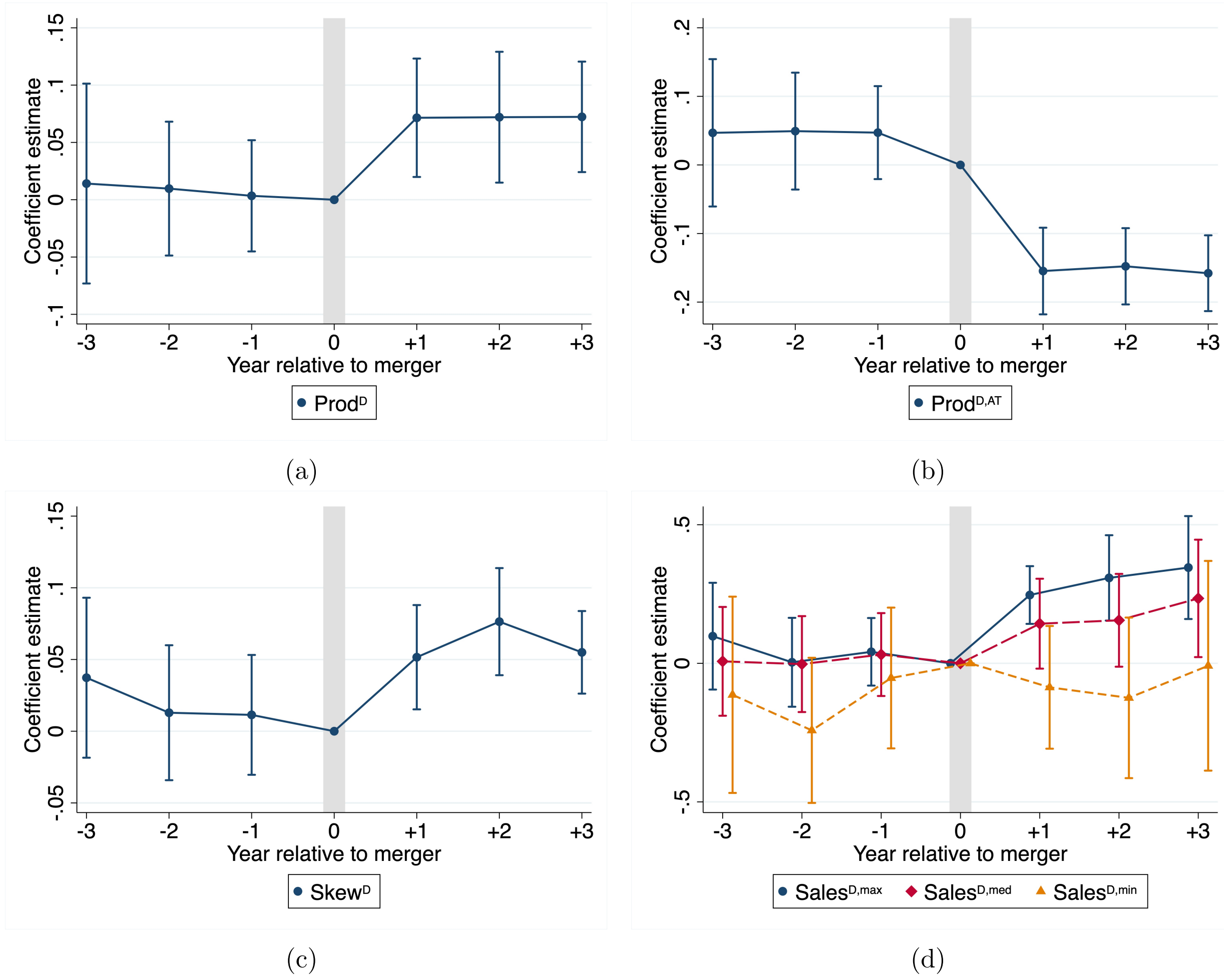


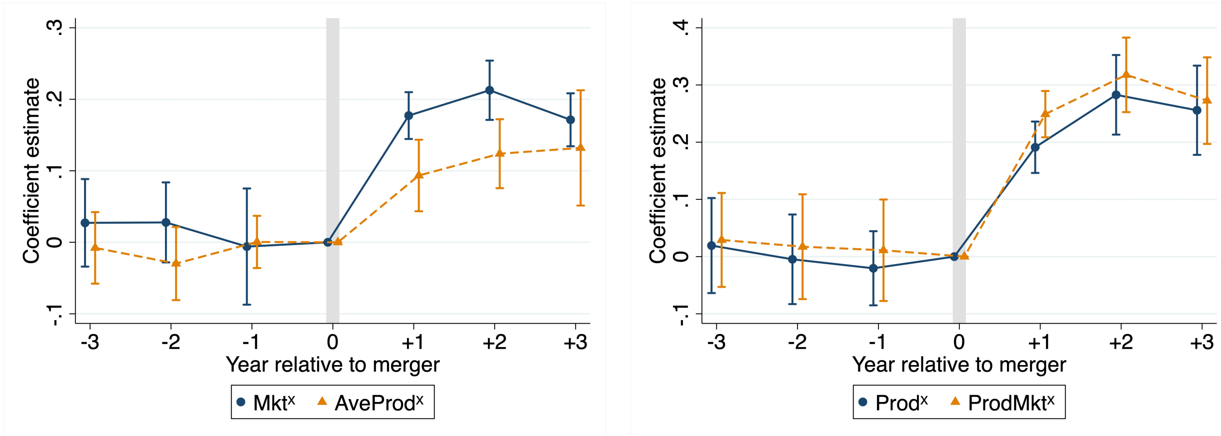
Figure 6: This figure plots coefficient estimates over the event window from estimating Eq. (16), along with 90% confidence intervals, to show the impact of mergers on (a) (log) number of domestic products ($Prod^D$); (b) (log) number of domestic products between the acquirer and target ($Prod^{D,AT}$); (c) skewness of domestic sales across products ($Skew^D$); and (d) (log) sales of product at maximum, median, and minimum of sales distribution ($Sales^{D,max}$, $Sales^{D,med}$, $Sales^{D,min}$).

after a merger, the acquirer puts greater focus on its core competency by reallocating resources and assets away from poor-performing products in the domestic market towards more successful products that generate greater revenues.

While our primary focus lies in the acquirer's adjustments of the product portfolio and the distribution of sales, we show in Appendix Table B.1 column 8 that the firm's scale, as measured by the (log) value of domestic sales, also increases (see Section 3.4.3).

4.3.2 Export market outcomes

The results shown in Figure 6 corroborate our predictions from the theoretical model. The number of products falls relative to the combined pre-merger total, which implies that product lines are discontinued. There is also substantial reallocation across the product portfolio, as demonstrated



(a)

(b)

Figure 7: This figure plots coefficient estimates over the event window from estimating Eq. (16), along with 90% confidence intervals, to show the impact of mergers on (a) (log) number of export destination markets (Mkt^X) and (log) average number of export products per market ($AveProd^X$); and (b) (log) number of export products ($Prod^X$) and (log) number of product-market pairs ($ProdMkt^X$).

by the rise in skewness. Thus, mergers appear to induce productivity gains at the firm level, which allow acquirers to be more competitive. From new trade theory (e.g., Melitz, 2003), we know that this has implications for participation and activity in the export market. From the raw data, the number of export destinations rises from an average of 9.8 to 11.1 post-merger. We now present econometric evidence to show that export activity of the merged entity increases following a merger event.

Figure 7 plots the evolution of outcomes in the export market before and after the merger. First, in Figure 7(a), we study changes in the number of destination markets (Mkt^X). With more assets and resources, the post-merger acquirer is more likely to overcome the costs of trade after consolidation with its target. Indeed, Figure 7(a) shows that the number of destinations rises by roughly 20% after the year of acquisition, strongly supporting Testable Prediction 3(i). Next, we provide empirical evidence for Testable Prediction 3(ii) by examining the export scope by destination. Our theory predicts that with more assets, the acquirer not only sells to more destinations, but also increases its export scope in markets where it was active before the merger. Because our regression is at the firm level, we count the number of products per market and compute the average over all markets for our outcome variable, $AveProd^X$. The set of destinations is restricted to those that the acquirer was already active in, which we define as having positive exports for at least one of the four years before and including the merger year. Figure 7(a) demonstrates that the acquirer's product scope per market indeed rises. All else equal, the acquirer adds over 10% more products to a given destination in the three years immediately following the merger.

For completeness, we also show changes in the total number of export products ($Prod^X$) in Figure 7(b). As in the domestic market, we find that the number of export products rises. Interestingly, the implied magnitude for the export market is roughly three to four times larger than the domestic market. This is consistent with the idea that without the anti-competitive effect in foreign markets, only the asset effect is present, which suggests the potential for a much larger change in product scope. Also in Figure 7(b), we use the number of product-destination market pairs ($ProdMkt^X$) as a measure of the firm's aggregate export activity, and substantial growth is observed post-merger. In summary, Figure 7 reveals that there is a significant increase in export activity after the merger event, both in terms of the number of markets entered and the number of products sold.

4.4 Staggered treatment

In a traditional two-group/two-period (2x2) DiD setup, the linear TWFE estimator is numerically equivalent to the standard DiD estimator. In our previous regressions, the untreated group consists of other firms that do not have a merger in the same year as well as all outsider firms. The former group of firms includes not only those that have the merger later, but also those that had the merger before, which can be thought of as prior treated units. A recent literature shows that when the treatment timing varies, the coefficients μ in Eq. (15) and μ_τ in Eq. (16) of our event study do not have the simple interpretation of the average treatment effect on the treated (ATT) as in the 2x2 DiD framework. In particular, Goodman-Bacon (2021) demonstrate that the numerical equivalence between the standard DiD estimator and the TWFE estimator in the 2x2 case does not generalize to the multi-period DiD design with staggered treatment, and that the coefficient obtained from the TWFE estimator is a weighted average of many different treatment effects. The weights depend on different factors, such as the size of the treated group in any given year. If treatment effects are constant, then the TWFE estimator obtains the ATT.

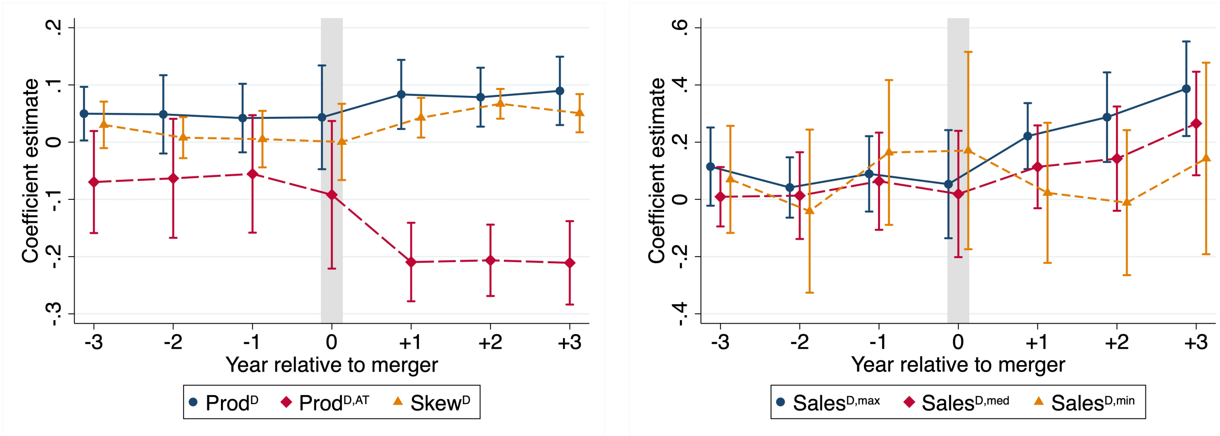
We now take into account the staggered adoption of treatment in our DiD design, in which acquirers merge with their targets at different points in time, and confirm that similar findings are nevertheless obtained. Specifically, to allow for heterogeneous treatments by firm and time, we apply the "imputation estimator" of Borusyak et al. (2021) and modify Eq. (16) to estimate:

$$\text{outcome}_{it} = \alpha_i + \beta_t + \mu_{it} D_{it} + \nu_{it}, \tag{17}$$

where $D_{it} = \mathbf{1}[t - MergerYr_i > 0]$ is the indicator variable for treatment. Untreated firms ($D_{it} = 0$) include the never treated outsider firms and acquirers that have yet to merge.[32] As before, we are interested in how the outcomes change in the post-merger period, i.e., $\mu_{i,+1}$, $\mu_{i,+2}$, and $\mu_{i,+3}$.

Results using the imputation estimator for the domestic and export markets are presented graphically in Figures 8 and 9, respectively. Appendix Tables B.4 and B.5 provide the corresponding estimates and standard errors. Unlike the linear TWFE estimator, the coefficient for the merger year is not omitted as a base group and is therefore also estimated. The coefficients are interpreted

[32] As Borusyak et al. (2021) explain, the estimator is constructed in three steps. First, firm and year fixed effects α_i and β_t in Eq. (17) are estimated by OLS on the subsample of untreated observations only. Second, these are used to impute the untreated potential outcomes and hence, the estimated treatment effect for each treated observation (i.e., $\hat{\mu}_{it} = \text{outcome}_{it} - \hat{\alpha}_{it} - \hat{\beta}_t$). The third step takes a weighted average of these treatment effect estimates.



(a) (b)

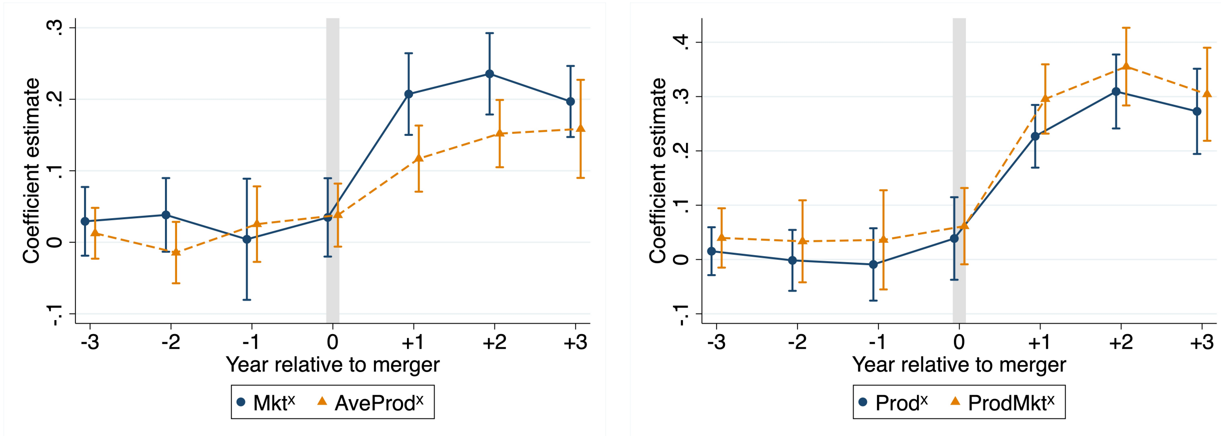
Figure 8: This figure plots coefficient estimates over the event window from estimating Eq. (17), along with 90% confidence intervals, to show the impact of mergers on (a) (log) number of domestic products ($Prod^D$), (log) number of domestic products between the acquirer and target ($Prod^{D,AT}$), skewness of domestic sales across products ($Skew^D$); and (b) (log) sales of product at maximum, median, and minimum of sales distribution ($Sales^{D,max}$, $Sales^{D,med}$, $Sales^{D,min}$).

as the difference with the untreated group. Figures 8 and 9 clearly demonstrate that our results are robust to the concern of staggered treatment. We also implement the test for parallel trends as proposed by Borusyak et al. (2021), and importantly, all of the pre-trend coefficients in both figures are generally small and both individually and jointly statistically insignificant. This implies that there are no observable differences between the pre-merger acquirers and untreated firms in any of the outcome variables. Figure 8 verifies that in the domestic market, the acquirer focuses more on core competency and cuts down on the total number of products between the acquirer and target post-merger. Again, this evidence is strongly supportive of our model's predictions. Meanwhile, Figure 9 shows that the acquirer achieves greater success abroad by expanding sales to more countries and by selling more products in active markets.

4.5 Robustness

In this section, we discuss a set of additional results that demonstrate our main findings are robust to alternative estimation methods and samples. These results are reported in Empirical Appendix B. First, in Appendix Table B.6, we use the Poisson estimator in place of OLS for outcomes in the domestic and foreign markets that are count variables (i.e., $Prod^D$, $Prod^{D,AT}$, Mkt^X, $Prod^X$, and $ProdMkt^X$). Here, we allow for zeros in the dependent variables for the export market. The coefficient estimates are qualitatively, and in most columns, even quantitatively similar to our previous results.

Next, Panels B in Appendix Tables B.4 and B.5 consider a subset of the merger deals in which the acquirer purchases only a single target in the merger-event year. We rely on the imputation



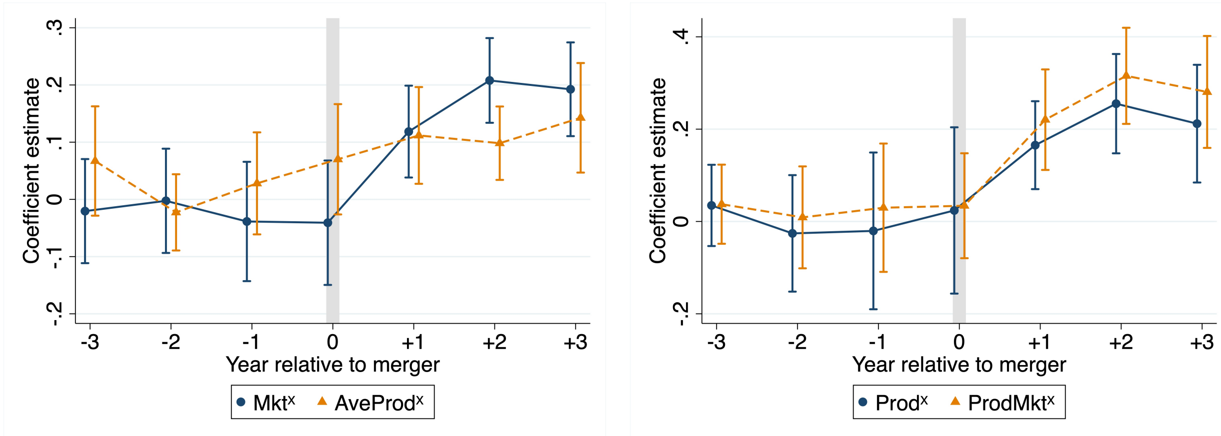
(a) (b)

Figure 9: This figure plots coefficient estimates over the event window from estimating Eq. (17), along with 90% confidence intervals, to show the impact of mergers on (a) (log) number of export destination markets (Mkt^X) and (log) average number of export products per market ($AveProd^X$); and (b) (log) number of export products ($Prod^X$) and (log) number of product-market pairs ($ProdMkt^X$).

estimator for the rest of this section. Note that the sample size remains large due to the presence of outsider firms. In general, similar qualitative findings are obtained. Some of the coefficient estimates in the post-merger period are less precisely estimated, but this is expected since the number of acquirers in the sample falls.

Next, we restrict the sample of acquirers to the MPFs that sell multiple products in all years of the sample. Appendix Tables B.7 and B.8 present the findings for the domestic and export markets, respectively. Theoretically, we showed that competing forces drive the number of products in the domestic market in opposite directions. Although we still find a statistically significant increase in the number of domestic products, under this sample restriction, the differences pre and post-merger are not as sharp as our previous estimates. For the other outcome variables, some of the estimates are less precisely estimated because the sample size is smaller, but we continue to find robust evidence in line with our theoretical predictions.

Moreover, we present robustness checks that tackle issues specific to the domestic and export market outcomes. For the domestic market, we noted in Section 2 that because information on total sales and exports at the product level is retrieved from different datasets, there are rare instances in which exports is greater than the total sales reported, i.e., negative domestic sales. Thus far, we have dropped all products with negative domestic sales to compute any outcomes related to the value of sales. In Appendix Table B.9, we take two approaches to address this concern. First, we follow Gampfer and Geishecker (2019) and drop firm-year observations in which the total sales share from products with negative domestic sales is greater than 75%. Second, we alleviate this problem by defining products at the 6-digit instead of 8-digit level. Across all columns, we find that our results for the skewness of domestic sales across products and sales of products at the maximum,



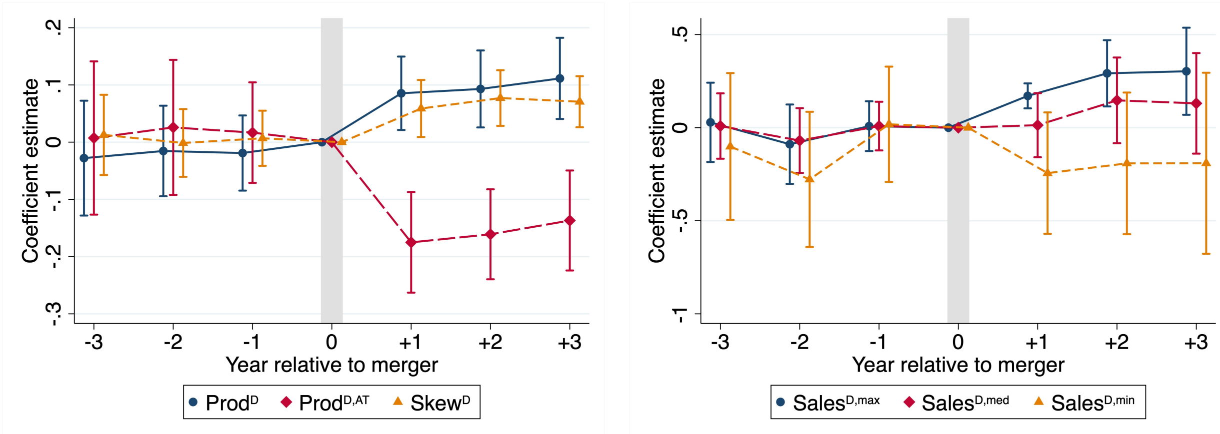
(a) (b)

Figure 10: This figure plots coefficient estimates over the event window from estimating Eq. (17), along with 90% confidence intervals, to show the impact of mergers on (a) (log) number of export destination markets (Mkt^X) and (log) average number of export products per market ($AveProd^X$); and (b) (log) number of export products ($Prod^X$) and (log) number of product-market pairs ($ProdMkt^X$). The sample of acquirers is restricted to those that purchase non-exporting target firms.

median, and minimum of the sales distribution are not affected.

For the export market outcomes, we consider two subsamples and demonstrate that the findings are qualitatively similar to our prior results. First, we analyze the subset of acquirers that purchase non-exporting target firms. On average, around one-fifth of targets are exporters at the time of the merger, which is slightly greater than the share of exporters among outsider firms. If the target's export destinations do not overlap with the acquirer's and the acquirer continues to sell the target's products in those markets after the merger, then the increase in export markets post-merger occurs even without any reallocation of resources within the product portfolio. In other words, the acquirer may selectively purchase exporting targets for the purpose of increasing sales abroad. We exclude this possibility by restricting the sample of deals to those that involve only non-exporting targets. In Figure 10 and Appendix Table B.10 Panel A, we continue to find growth in the number of destinations as well as the number of products per market for acquirers after the merger event. Not surprisingly, the magnitudes of the post-merger coefficient estimates are smaller compared to the full sample. Nonetheless, we observe a 10-20% increase in the number of markets and around 10% larger product scope even when the target did not enter foreign markets. The evidence clearly shows that mergers with non-exporting targets also lead to greater export activity. In particular, it is consistent with the idea that the re-optimization of the product portfolio by acquirers is a driving force for productivity gains, which pushes them to be more competitive in international markets.

Second, we limit the sample of firms to those that also appear in the *VARS* database. This reduces the sample size substantially because of the two additional criteria that must be met, namely, the firm must operate in a manufacturing industry and have 10 or more employees. However, despite



(a) (b)

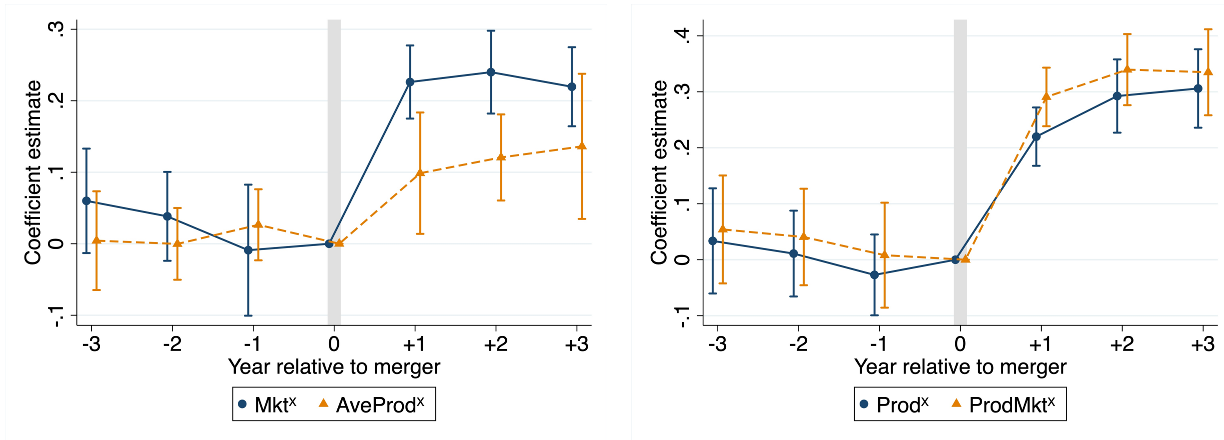
Figure 11: This figure plots coefficient estimates over the event window from estimating Eq. (17) using the propensity score reweighting estimator, along with 90% confidence intervals, to show the impact of mergers on (a) (log) number of domestic products ($Prod^D$), (log) number of domestic products between the acquirer and target ($Prod^{D,AT}$), skewness of domestic sales across products ($Skew^D$); and (b) (log) sales of product at maximum, median, and minimum of sales distribution ($Sales^{D,max}$, $Sales^{D,med}$, $Sales^{D,min}$).

these restrictions, we obtain similar qualitative findings in Appendix Table B.10 Panel B for both the number of destination markets and the number of products per market. For this subsample, we have established from our earlier results that these acquirers adjust their domestic product portfolio by lowering the product scope relative to the pre-merger acquirer and target total as well as focusing more on varieties closer to their core competency. Therefore, the evidence presented here is consistent with our theoretical model, and suggests that there is a strong link between the reorganization of domestic production lines induced by the merger and outcomes in the foreign markets.

4.6 Propensity score matching

All of our previous results showed no indication of pre-trends. In other words, we find no observable differences between the treated and untreated firms in the pre-merger period for the various outcomes of interest. Both the TWFE estimator and imputation estimator also control for time-invariant unobserved heterogeneity by including firm fixed effects. In order to more formally address the potential non-random selection of acquirer firms, we now follow the empirical methodology of Guadalupe et al. (2012) to employ a propensity score reweighting estimator and confirm that our findings continue to hold. This approach takes into account the potential selection of acquirers based on a set of time-varying firm-level characteristics. We continue to use the TWFE estimator, which controls for selection on the time-invariant characteristics of firms with firm fixed effects.

First, we construct propensity scores by estimating a probit regression of the treatment indicator



(a) (b)

Figure 12: This figure plots coefficient estimates over the event window from estimating Eq. (17) using the propensity score reweighting estimator, along with 90% confidence intervals, to show the impact of mergers on (a) (log) number of domestic products ($Prod^D$), (log) number of domestic products between the acquirer and target ($Prod^{D,AT}$), skewness of domestic sales across products ($Skew^D$); and (b) (log) sales of product at maximum, median, and minimum of sales distribution ($Sales^{D,max}$, $Sales^{D,med}$, $Sales^{D,min}$).

variable (i.e., a dummy variable for each year in the 3-year post-merger period) on time-varying firm characteristics. These include the firm's (log) number of employees, (log) total revenues, (log) productivity as measured by value added per worker, (log) number of establishments, and a year trend. Because the sample in VARS is relatively small, we pool related industries together, and estimate the propensity scores separately for broad industry groups roughly following the so-called "intermediate aggregation" of NACE Rev. 2 industries. Thus, we allow the relationship to differ, for instance, between the industries of "Food products, beverages and tobacco" versus "Textiles, wearing apparel, and leather."[33] Using these propensity scores, we reweight each observation in Eq. (16) in order to generate the same distribution of important observable characteristics across acquirers and outsider firms. The idea is that by matching along observable firm characteristics, the distribution of important unobservable characteristics may also be matched. Following Guadalupe et al. (2012), we reweight each acquirer firm that is treated (i.e., in the post-merger period) by $1/\hat{p}$, and each untreated firm by $1/(1-\hat{p})$, where $\hat{p}$ is the estimated propensity score. Therefore, untreated firms that are more likely to experience a merger event have larger propensity scores and higher weights in the regression.

Results using the propensity score reweighting estimator are presented in Figures 11 and 12, with the corresponding Appendix Tables B.12 and B.13. As in Guadalupe et al. (2012), we winsorize the propensity score weights due to extreme outliers in the weights.[34] Again, there are no clear

[33] Appendix Table B.11 lists the intermediate aggregation, or A*38 codes, for the NACE Rev. 2 classification. In order to have a sufficient number of observations, we further pool firms with the 2-digit codes of 19 to 21, and 69 to 75. Firms in the service industries of Accommodation and food service activities (55-56), Financial and insurance activities (64-66), and Real estate activities (68) are dropped due to an insufficient number of observations.

[34] We winsorize weights at the top 5% level, though results are quantitatively similar if we choose another threshold,

pre-trends observed for any of the outcome variables. Even after accounting for the potential non-random selection of acquirers, both tables show empirical evidence consistent with Testable Predictions 1 to 3. In general, the signs are consistent with our baseline results and the magnitudes of the point estimates are also similar.[35]

4.7 Product differentiation and domestic product scope

We conclude by returning to Testable Prediction 1(i), which stated that the change in number of domestic products is theoretically ambiguous and depends on the degree of product differentiation. In particular, the change is expected to be more positive when the acquirer's products are more differentiated and cannibalization effects due to the increase in assets are therefore weaker. Our previous results suggested that, on average, the anti-competitive effect is stronger than the asset effect, resulting in an increase in the number of domestic products. While it is difficult to obtain firm-specific elasticities of substitution, we present some suggestive evidence for Testable Prediction 1(i) using the Rauch (1999) classification of goods and Khandelwal (2010) classification of product differentiation. In the following regressions, we employ the simple DiD setup from Eq. (15) with both firm and time fixed effects. In Table 2, the variable $PostMerger$ (equivalent to $\mathbf{1}\left[t - \text{MergerYr}_i \in g\right]$ in Eq. (15)) is equal to 1 for any year in the 3-year post-merger period, and 0 in any year in the four years before and including the merger year. Again, the sample is limited only to manufacturing firms with 10 or more employees.

Rauch (1999) classifies 4-digit SITC Rev. 2 products into three commodity groups: (i) homogeneous goods that are traded in an organized exchange, (ii) reference priced goods that are not traded on an organized exchange but have a quoted reference price, and (iii) differentiated goods without a quoted price. We first aggregate products to the 6-digit HS level and convert them to 5-digit SITC Rev. 2 codes using the UN Trade Statistics correspondence tables.[36] We group the homogeneous goods and reference priced goods together and consider a simple split of the sample. Because regressions are at the firm level, we must classify firms as differentiated or non-differentiated goods producers. To do so, we add up the value of differentiated and non-differentiated products over the 4-year pre-merger period for each acquirer and compare the two. As Table 2 columns 1 and 2 indicate, the majority of firms sell differentiated products. Furthermore, consistent with our theoretical prediction, we find a larger impact of the merger on the number of products for acquirers that sell differentiated products. The magnitude of the coefficient for acquirers that sell homogeneous or reference priced goods is smaller, and the coefficient is also not statistically significant.

In columns 3 and 4, we also consider the classification of product differentiation from Khandelwal (2010). For the differentiated and reference priced products of Rauch (1999), Khandelwal (2010) uses

for example, at the top 1%. Only the observations that are in the region of common support are kept. We also verify that the balancing property holds in all industries, that is, all observed characteristics of treated and untreated firms are balanced. Detailed output of the propensity score estimation is available upon request.

[35] Lastly, we also confirm that the same robustness checks from Section 4.5 generally survive using the propensity score reweighting estimator. These results are available upon request.

[36] The correspondence tables are obtained from `https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp`. We employ the conservative classification from Rauch (1999).

Table 2: Product Differentiation and Domestic Product Scope

Dep. var.	$Prod^D$			
	Rauch classification		Khandelwal classification	
	Differentiated	Non-differentiated	Long ladder	Short ladder
	(1)	(2)	(3)	(4)
PostMerger	0.0942**	0.0183	0.1423*	0.0630
	(0.0441)	(0.0832)	(0.0805)	(0.0588)
N	710	91	321	376
R^2	0.91	0.86	0.90	0.91

Notes: The dependent variable is in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

nested logit estimations to infer product quality on US imports. Quality ladders for each product are constructed based on the difference between the maximum and minimum quality. We rely on the main measure of Khandelwal (2010), which is based on the inter-decile range, and conveniently, converted and classified at the SITC Rev. 2 4-digit level. We split products by differentiation based on the median quality ladder length (2.03), and follow a similar strategy as above to aggregate more and less differentiated products by acquirer in the pre-merger period. We find a larger coefficient in column 3 than 4, which again suggests that acquirers selling more differentiated products experience a greater increase in the number of domestic products due to weaker cannibalization effects.

5 Conclusion

In this paper, we study the impact of mergers on acquirer firms' domestic and foreign market product portfolios, both theoretically and empirically. Building on the frameworks of Eckel and Neary (2010) and Perry and Porter (1985), we present a model of horizontal mergers in which the merged entity increases its assets and competition in the market is reduced. While the overall impact of a merger on product scope is ambiguous for the acquirer, we show that the product range of the merged entity is smaller than the sum of products of the two firms (acquirer and target) before the merger. With flexible manufacturing, we also show that the increase in output is largest for the core variety following a merger event. This has important implications for the participation in foreign markets, as the acquirer is likely to increase the number of export destinations and the export scope per destination.

We employ the Danish register-based data to test the theoretical predictions. Our results strongly support the proposed mechanisms presented in our model, and demonstrate important changes to the product portfolio post-merger. We rely on an event-study design and show that the post-merger acquirer firm sells more domestic and foreign products, sells to more foreign destinations, and the sales of its core products in both the domestic and foreign markets increase. In turn, the concentration of sales, as measured by the Theil index, rises. Moreover, we find that the number of products of the merged entity falls relative to the sum of the pre-merger acquirer and target. Thus, the results are consistent with the idea of a within-firm reallocation of the domestic product portfolio induced by the merger on the acquirer, where product lines are cut to put more focus on the core competency. This in turn translates to greater activity in markets abroad as the acquirer becomes more competitive.

The evidence presented here establishing the effects of mergers on the product mix of firms has important policy implications, in particular, in the areas of anti-trust and international trade. As large MPFs are key players in merger markets, understanding their behavior and how they reallocate resources across products is crucial to evaluating their impact on welfare. While our paper focuses on the microeconomic implications of M&As within MPFs, a promising direction for future research is investigating the aggregate impact of multiproduct mergers on product variety and productivity.

References

Alvarez, Roberto, Hasan Faruq, and Ricardo A. López, "Is Previous Export Experience Important for New Exports?," *Journal of Development Studies*, 2013, *49* (3), 426–441.

Argentesi, Elena, Paolo Buccirossi, Roberto Cervone, Tomaso Duso, and Alessia Marrazzo, "The Effect of Retail Mergers on Prices and Variety: An Ex-post Evaluation," *DICE Discussion Papers 225*, 2016.

Arkolakis, Costas, Sharat Ganapati, and Marc-Andreas Muendler, "The Extensive Margin of Exporting Products: A Firm-level Analysis," *American Economic Journal: Macroeconomics*, 2021, *13* (4), 182–245.

Arnold, Jens Matthias and Beata S. Javorcik, "Gifted Kids or Pushy Parents? Foreign Direct Investment and Plant Productivity in Indonesia," *Journal of International Economics*, 2009, *79* (1), 42–53.

Asker, John and Volker Nocke, "Chapter 12 - Collusion, Mergers, and Related Antitrust Issues," in Kate Ho, Ali Hortaçsu, and Alessandro Lizzeri, eds., *Handbook of Industrial Organization, Volume 5*, number 1, Elsevier, 2021, pp. 177–279.

Atalay, Enghin, Alan Sorensen, Christopher Sullivan, and Wanjia Zhu, "Post-Merger Product Repositioning: An Empirical Analysis," *Federal Reserve Bank of Philadelphia WP 20-36*, 2020.

Baldwin, John and Wulong Gu, "The Impact of Trade on Plant Scale, Production-Run Length and Diversification," in "Producer Dynamics: New Evidence from Micro Data" NBER Chapters, National Bureau of Economic Research, Inc, December 2009, pp. 557–592.

Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott, "Importers, Exporters and Multinationals: A Portrait of Firms in the U.S. that Trade Goods," in "Producer Dynamics: New Evidence from Micro Data" NBER Chapters, National Bureau of Economic Research, Inc, 2009, pp. 513–552.

_ , Stephen J. Redding, and Peter K. Schott, "Multiple-product Firms and Product Switching," *American Economic Review*, 2010, *100* (1), 70–97.

_ , _ , and _ , "Multiproduct Firms and Trade Liberalization," *Quarterly Journal of Economics*, 2011, *126* (3), 1271–1318.

Berry, Steven T. and Joel Waldfogel, "Do Mergers Increase Product Variety? Evidence from Radio Broadcasting," *Quarterly Journal of Economics*, 2001, *116* (3), 1009–1025.

Beveren, Ilke Van, Andrew B. Bernard, and Hylke Vandenbussche, "Concording EU Trade and Production Data over Time," *NBER Working Paper No. 18604*, 2012.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess, "Revisiting Event Study Designs: Robust and Efficient Estimation," *Working Paper, University College London*, 2021.

Broda, Christian and David E. Weinstein, "Product Creation and Destruction: Evidence and Price Implications," *American Economic Review*, 2010, *100* (3), 691–723.

Cunningham, Colleen, Florian Ederer, and Song Ma, "Killer Acquisitions," *Journal of Political Economy*, 2021, *129* (3), 649–702.

Dhingra, Swati, "Trading Away Wide Brands for Cheap Brands," *American Economic Review*, 2013, *103* (6), 2554–84.

Dixit, Avinash, "Comparative Statics for Oligopoly," *International Economic Review*, 1986, *27* (1), 107–122.

Doraszelski, Ulrich and Jordi Jaumandreu, "R&D and Productivity: Estimating Endogenous Productivity," *Review of Economic Studies*, 2013, *80* (4), 1338–1383.

Eckel, Carsten and J. Peter Neary, "Multi-product Firms and Flexible Manufacturing in the Global Economy," *Review of Economic Studies*, 2010, *77* (1), 188–217.

_ , Leonardo Iacovone, Beata Javorcik, and J. Peter Neary, "Multi-product Firms at Home and Away: Cost-versus Quality-based Competence," *Journal of International Economics*, 2015, *95* (2), 216–232.

Eurostat, "NACE Rev. 2: Statistical classification of economic activities in the European Community," `https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF` 2008.

Fan, Ying and Chenyu Yang, "Competition, Product Proliferation, and Welfare: A Study of the US Smartphone Market," *American Economic Journal: Microeconomics*, May 2020, *12* (2), 99–134.

Farrell, Joseph and Carl Shapiro, "Horizontal Mergers: An Equilibrium Analysis," *American Economic Review*, 1990, pp. 107–126.

_ and _ , "Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition," *The B.E. Journal of Theoretical Economics*, 2010, *10*, Article 9.

Flach, Lisandra and Michael Irlacher, "Product versus Process: Innovation Strategies of Multiproduct Firms," *American Economic Journal: Microeconomics*, 2018, *10* (1), 236–77.

_ , _ , and Florian Unger, "Corporate Taxes and Multi-product Exporters: Theory and Evidence from Trade Dynamics," *Journal of International Economics*, 2021, *132*, 103515.

Fons-Rosen, Christian, Pau Roldan-Blanco, and Tom Schmitz, "The Aggregate Effects of Acquisitions on Innovation and Economic Growth," *Working Paper, University of California, Merced*, 2021.

Fontagné, Lionel, Angelo Secchi, and Chiara Tomasi, "Exporters' Product Vectors Across Markets," *European Economic Review*, 2018, *110*, 150–180.

Gampfer, Benjamin and Ingo Geishecker, "Chinese Competition: Intra-industry and Intra-firm Adaptation," *Review of World Economics*, 2019, *155* (2), 327–352.

Gandhi, Amit, Luke Froeb, Steven Tschantz, and Gregory J. Werden, "Post-Merger Product Repositioning," *Journal of Industrial Economics*, 2008, *56* (1), 49–67.

Garrido, Francisco, *Mergers between Multi-Product Firms with Endogenous Variety: Theory and an Application to the Ready-To-Eat Cereal Industry*, Georgetown University, 2020.

Goldberg, Pinelopi Koujianou, Amit Kumar Khandelwal, Nina Pavcnik, and Petia Topalova, "Imported Intermediate Inputs and Domestic Product Growth: Evidence from India," *Quarterly Journal of Economics*, 2010, *125* (4), 1727–1767.

Goodman-Bacon, Andrew, "Difference-in-differences with Variation in Treatment Timing," *Journal of Econometrics*, 2021, *225* (2), 254–277.

Guadalupe, Maria, Olga Kuzmina, and Catherine Thomas, "Innovation and Foreign Ownership," *American Economic Review*, 2012, *102* (7), 3594–3627.

Iacovone, Leonardo and Beata S. Javorcik, "Multi-Product Exporters: Product Churning, Uncertainty and Export Discoveries," *Economic Journal*, 05 2010, *120* (544), 481–499.

Johnson, Justin P. and Andrew Rhodes, "Multiproduct Mergers and Quality Competition," *RAND Journal of Economics*, 2021, *52* (3), 633–661.

Khandelwal, Amit, "The Long and Short (of) Quality Ladders," *Review of Economic Studies*, 2010, *77* (4), 1450–1476.

Koch, Michael and Marcel Smolka, "Foreign Ownership and Skill-biased Technological Change," *Journal of International Economics*, 2019, *118*, 84–104.

Maksimovic, Vojislav, Gordon Phillips, and N.R. Prabhala, "Post-merger Restructuring and the Boundaries of the Firm," *Journal of Financial Economics*, 2011, *102* (2), 317–343.

Mayer, Thierry, Marc J. Melitz, and Gianmarco I. P. Ottaviano, "Market Size, Competition, and the Product Mix of Exporters," *American Economic Review*, 2014, *104* (2), 495–536.

_ , _ , and _ , "Product Mix and Firm Productivity Responses to Trade Competition," *Review of Economics and Statistics*, 2021, *103* (5), 874–891.

Mazzeo, Michael J., Katja Seim, and Mauricio Varela, "The Welfare Consequences of Mergers with Endogenous Product Choice," *Journal of Industrial Economics*, 2018, *66* (4), 980–1016.

Melitz, Marc J., "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 2003, *71* (6), 1695–1725.

Neary, J. Peter, "Cross-border Mergers as Instruments of Comparative Advantage," *Review of Economic Studies*, 2007, *74* (4), 1229–1257.

Nocke, Volker, "Horizontal Merger Policy: New Work on an Old Problem," *Working Paper, University of Mannheim*, 2021.

_ **and Nicolas Schutz**, "An Aggregative Games Approach to Merger Analysis in Multiproduct-firm Oligopoly," *NBER Working Paper No. 24578*, 2018.

_ **and** _ , "Multiproduct-firm Oligopoly: An Aggregative Games Approach," *Econometrica*, 2018, *86* (2), 523–557.

_ **and Stephen Yeaple**, "Globalization and Multiproduct Firms," *International Economic Review*, 2014, *55* (4), 993–1018.

Ohashi, Hiroshi and Yuta Toyama, "The Effects of Domestic Merger on Exports: A Case Study of the 1998 Korean Automobile Industry," *Journal of International Economics*, 2017, *107*, 147–164.

Parenti, Mathieu, "Large and Small Firms in a Global Market: David vs. Goliath," *Journal of International Economics*, 2018, *110*, 103–118.

Perry, Martin K. and Robert H. Porter, "Oligopoly and the Incentive for Horizontal Merger," *American Economic Review*, 1985, *75* (1), 219–227.

Qiu, Larry D. and Wen Zhou, "Multiproduct Firms and Scope Adjustment in Globalization," *Journal of International Economics*, 2013, *91* (1), 142–153.

Rauch, James E., "Networks versus Markets in International Trrade," *Journal of International Economics*, 1999, *48* (1), 7–35.

Salant, Stephen W., Sheldon Switzer, and Robert J. Reynolds, "Losses from Horizontal Merger: The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium," *Quarterly Journal of Economics*, 1983, *98* (2), 185–199.

Sheen, Albert, "The Real Product Market Impact of Mergers," *Journal of Finance*, 2014, *69* (6), 2651–2688.

Siegel, Donald S. and Kenneth L. Simons, "Assessing the Effects of Mergers and Acquisitions on Firm Performance, Plant Productivity, and Workers: Newl Evidence from Matched Employer-employee Data," *Strategic Management Journal*, August 2010, *31* (8), 903–916.

Smeets, Valerie, Kathryn Ierulli, and Michael Gibbs, "An Empirical Analysis of Post-Merger Organizational Integration," *Scandinavian Journal of Economics*, 2016, *118* (3), 463–493.

Stiebale, Joel and Dev Vencappa, "Acquisitions, Markups, Efficiency, and Product Quality: Evidence from India," *Journal of International Economics*, 2018, *112*, 70–87.

Sun, Liyang and Sarah Abraham, "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects," *Journal of Econometrics*, 2021, *225* (2), 175–199.

Sweeting, Andrew, "The Effects of Mergers on Product Positioning: Evidence from the Music Radio Industry," *RAND Journal of Economics*, 2010, *41* (2), 372–397.

Wernerfelt, Birger, "A Resource-based View of the Firm," *Strategic Management Journal*, 1984, *5* (2), 171–180.

Williamson, Oliver E., "Economies as an Antitrust Defense: The Welfare Tradeoffs," *American Economic Review*, 1968, *58* (1), 18–36.

A Theoretical Appendix

A.1 Comparative statics with respect to merger analysis

In this part, we derive the comparative statics results presented in Section 3.4 with respect to the change in the acquirer's assets as well as a reduction in the number of firms in the industry.

A.1.1 Asset effect

Here, we derive the analytical results that are shown graphically in Figure 3. First, we use the two equilibrium conditions linking δ_j and X_j with $j \in \{I, O\}$ in Eq. (9) and (10). Totally differentiating the two equations gives:

$$2b'(1-e)(\beta+1)dX_j = \left[(\beta+1)\delta_j^{\beta}c_1 + \frac{\eta\beta}{2}\sqrt{\frac{2K_j\tilde{\beta}}{\delta_j}}\right]d\delta_j + \frac{\beta\eta}{2K_j}\sqrt{2K_j\tilde{\beta}\delta_j}dK_j, \tag{A.1}$$

$$c_1\delta^{\beta-1}d\delta_j = -b'edX_j - b'edY. \tag{A.2}$$

Combining the two equations by eliminating δ_j gives:

$$\left(A_j^{-1}\right)dX_j + b'edY = \frac{\eta\beta\sqrt{2K_j\tilde{\beta}\delta_j}}{2K_j\left[(\beta+1)\delta_j + \frac{\eta\beta}{2c_1\delta^{\beta}}\sqrt{2K_j\tilde{\beta}\delta_j}\right]}dK_j, \tag{A.3}$$

where

$$A_j^{-1} = \frac{2b'(1-e)(\beta+1) + b'e\left[(\beta+1)\delta_j + \frac{\beta\eta}{2c_1\delta_j^{\beta}}\sqrt{2K_j\tilde{\beta}\delta_j}\right]}{\left[(\beta+1)\delta_j + \frac{\beta\eta}{2c_1\delta^{\beta}}\sqrt{2K_j\tilde{\beta}\delta_j}\right]}. \tag{A.4}$$

Effect on total scale: Inspecting Eq. (A.3), we need an expression for dY in order to derive dX_j. Following Dixit (1986), we multiply Eq. (A.3) by A_j and sum over the reaction function by all firms to solve for total industry output Y:

$$dY = \frac{1}{1+\sum_{j'} A_{j'}b'e}\sum_{j'}\frac{\eta\beta\sqrt{2K_{j'}\tilde{\beta}\delta_{j'}}}{2K_{j'}\left(\left[(\beta+1)\delta_{j'} + \frac{\eta\beta}{2c_1\delta_{j'}^{\beta}}\sqrt{2K_j\tilde{\beta}\delta_{j'}}\right]A_{j'}^{-1}\right)}dK_{j'}. \tag{A.5}$$

Substituting this back into Eq. (A.3), we derive:

$$dX_j = \frac{A_j}{\left(1+\sum_{j'} A_{j'}b'e\right)}\left[B_jdK_j + b'e\left(B_j\sum_{j'} A_{j'}dK_j - \sum_{j'} A_{j'}B_{j'}dK_{j'}\right)\right], \tag{A.6}$$

where

$$B_j = \frac{\eta\beta\sqrt{2K_j\tilde{\beta}\delta_j}}{2K_j\left[(\beta+1)\delta_j + \frac{\eta\beta}{2c_1\delta^\beta}\sqrt{2K_j\tilde{\beta}\delta_j}\right]}. \tag{A.7}$$

This allows us to derive how a change in assets affects total firm scale for $j = I$ and $j = O$ separately:

$$\frac{dX_I}{dK_I} = \frac{A_I B_I}{\left(1 + b'e\sum_{j'} A_{j'}\right)}\left[1 + b'e\sum_{j'\neq I} A_{j'}\right] > 0 \tag{A.8}$$

and

$$\frac{dX_O}{dK_I} = -\frac{A_O}{\left(1 + b'e\sum_{j'} A_{j'}\right)}\left[b'eA_I B_I\right] < 0, \tag{A.9}$$

where $A_j > 0$, $B_j > 0$, and we exploit the facts that $dK_j > 0$ if $j = I$ and $dK_j = 0$ if $j = O$. Thus, this gives us the result from the RHS panel of Figure 3 that $X_I'^* > X_I^*$ for firm I. Note that if assets are not effective (i.e., $\eta = 0$), the composite parameter $B_j = 0$ and hence, there is no effect of assets on total scale in both I- and O-firms.

Effect on scope: In the next step, we compute the effects of a change in K_I on the optimal scope of both I- and O-firms. To do so for I-firms, we substitute Eq. (A.8) in Eq. (A.1) to derive:

$$\frac{d\delta_I}{dK_I} = -\frac{\left[1 - D_I\frac{1+b'e\sum_{j'\neq j} A_{j'}}{1+b'e\sum_{j'} A_{j'}}\right]\eta\beta\sqrt{2K_I\tilde{\beta}\delta_I}}{2K_I\left[(\beta+1)\delta_I^\beta c_1 + \frac{\eta\beta}{2}\sqrt{\frac{2K_I\tilde{\beta}}{\delta_I}}\right]} < 0, \tag{A.10}$$

where

$$D_I = \frac{2b'(1-e)(\beta+1)}{\left(2b'(1-e)(\beta+1) + b'e\left[(\beta+1)\delta_I + \frac{\eta\beta}{2c_1\delta_I^\beta}\sqrt{2K_j\tilde{\beta}\delta_j}\right]\right)}. \tag{A.11}$$

Note that $0 < D_I < 1$ and $0 < [1 + b'e\sum_{j'\neq j} A_{j'}]/[1 + b'e\sum_{j'} A_{j'}] < 1$. This gives us the result from the RHS panel of Figure 3 that $\delta_I'^* < \delta_I^*$ for firm I.

For the O-firms, we substitute Eq. (A.9) into Eq. (A.1) to derive:

$$\frac{d\delta_O}{dK_I} = -\frac{2b'(1-e)(\beta+1)A_O b'eA_I B_I}{\left(1 + \sum_{j'} A_{j'}b'e\right)\left[(\beta+1)\delta_O^\beta c_1 + \frac{\beta}{2\delta_O}\sqrt{2K_O\tilde{\beta}\delta_O}\right]} < 0. \tag{A.12}$$

Effect on individual scale: Here, we show the result for the LHS panel of Figure 3 analytically. To derive the impact on scale per variety, we differentiate Eq. (8) with respect to K_I, which entails

$$2b'(1-e)K_I\frac{dx_I(i)}{dK_I} = \frac{K_I}{\delta_I}\left\{c_1\delta_I^\beta + \eta\sqrt{\frac{K_I\tilde{\beta}}{2\delta_I^{2\beta+1}}}\left[(2\beta+1)i^\beta - \delta_I^\beta\right]\right\}\frac{d\delta_I}{dK_I} + \eta\sqrt{\frac{K_I\tilde{\beta}}{2\delta_I^{2\beta+1}}}\left(\delta_I^\beta - i^\beta\right) \gtreqless 0.$$

Evaluating the latter expression for the marginal variety $i = \delta_I$ gives:

$$2b'(1-e)K_I \frac{dx_I(\delta_I)}{dK_I} = \frac{K_I}{\delta_I}\left[c_1\delta_I^{\beta} + \eta\beta\sqrt{\frac{2K_I\tilde{\beta}}{\delta_I}}\right]\frac{d\delta_I}{dK_I} < 0, \tag{A.13}$$

as $\frac{d\delta_I}{dK_I} < 0$. Next, we evaluate the derivative for the core variety $i = 0$ and substitute Eq. (A.10) to derive:

$$\frac{\delta_I\left[2(\beta+1)\delta_I^{\beta}c_1 + \eta\beta\sqrt{\frac{2K_I\tilde{\beta}}{\delta_I}}\right]2b'(1-e)K_I}{\eta\beta K_I\tilde{\beta}}\frac{dx_I(0)}{dK_I}$$
$$= \left[1 - D_I\frac{1+b'e\sum_{j'\neq j}A_{j'}}{1+b'e\sum_{j'}A_{j'}}\right] + \delta_I^{\beta}c_1\left[(1+\frac{1}{\beta}) - \left[1 - D_I\frac{1+b'e\sum_{j'\neq j}A_{j'}}{1+b'e\sum_{j'}A_{j'}}\right]\right]\sqrt{\frac{2\delta_I}{K_I\tilde{\beta}}} + 1 > 0.$$

This gives us the result from the LHS panel of Figure 3 that $x_I'(0) > x_I(0)$ for firm I.

A.1.2 Anti-competitive effect

We now show the analytical results corresponding to Figure 4. In contrast to the effects of a change in assets, a reduction in the number of competitors affects all firms $j \in \{I, O\}$ in the same way. Totally differentiating Eqs. (9) and (10) gives

$$\frac{dX_j}{dm} = \frac{1}{2b'(1-e)(\beta+1)\delta_j}\left[(\beta+1)\delta_j^{\beta+1}c_1 + \frac{1}{2}\eta\beta\sqrt{2K_j\tilde{\beta}\delta_j}\right]\frac{d\delta_j}{dm} \tag{A.14}$$

and

$$c_1\delta_j^{\beta-1}\frac{d\delta_j}{dm} = -b'e\,(1+m)\,\frac{dX_j}{dm} - b'eX_j. \tag{A.15}$$

Combining the two equations allows us to show that a fall in m leads to an expansion in both scale X_j and scope δ_j for $j \in \{I, O\}$:

$$\frac{dX_j}{dm} = -\frac{eX_j\left[c_1(\beta+1)\delta_j^{\beta+1} + \frac{\eta\beta}{2}\sqrt{2K\tilde{\beta}\delta_j}\right]}{2(1-e)(\beta+1)c_1\delta_j^{\beta} + e\,(1+m)\left[c_1(\beta+1)\delta_j^{\beta+1} + \frac{\eta\beta}{2}\sqrt{2K_j\tilde{\beta}\delta_j}\right]} < 0, \tag{A.16}$$

$$\frac{d\delta_j}{dm} = -\frac{b'e\delta_jX_j}{c_1\delta_j^{\beta} + \frac{e(1+m)}{2(1-e)(\beta+1)}\left[(\beta+1)\delta_j^{\beta+1}c_1 + \frac{\eta\beta}{2}\sqrt{2K_j\tilde{\beta}\delta_j}\right]} < 0. \tag{A.17}$$

Thus, this gives us the results from the RHS panel of Figure 4 that $X_I'^* > X_I^*$ and $\delta_I'^* < \delta_I^*$.

A.2 Simulation exercise

To obtain further intuition for the channels at work, we conduct a simulation exercise of our model, where we investigate the full effects of a merger on all equilibrium outcomes. Using Eqs. (7), (8), (9), and (10), the following expressions determine the post-merger equilibrium for I and O firms, respectively:

$$x_I(i) = \frac{\frac{c_1}{\beta} + 2\eta\sqrt{\frac{2K_I\tilde{\beta}}{2\delta_I^{2\beta+1}}}}{2b'(1-e)}\left(\delta_I^\beta - i^\beta\right), \quad x_O(i) = \frac{\frac{c_1}{\beta} + 2\eta\sqrt{\frac{K_O\tilde{\beta}}{2\delta_O^{2\beta+1}}}}{2b'(1-e)}\left(\delta_O^\beta - i^\beta\right) \tag{A.18}$$

$$X_I = \frac{c_1\delta_I^{\beta+1} + 2\eta\beta\sqrt{\frac{2K_I\tilde{\beta}\delta_I}{2}}}{2b'(1-e)(\beta+1)}, \quad X_O = \frac{c_1\delta_O^{\beta+1} + 2\eta\beta\sqrt{\frac{K_O\tilde{\beta}\delta_O}{2}}}{2b'(1-e)(\beta+1)} \tag{A.19}$$

$$k_I(i) = \frac{2K_I\tilde{\beta}}{2\delta_I^{2\beta+1}}\left(\delta_I^\beta - i^\beta\right)^2, \quad k_O(i) = \frac{K_O\tilde{\beta}}{2\delta_O^{2\beta+1}}\left(\delta_O^\beta - i^\beta\right)^2 \tag{A.20}$$

$$\delta_I = \left(\frac{\beta\left(a - c - b'e\left(2X_I + (m-2)X_O\right)\right)}{c_1}\right)^{1/\beta}, \quad \delta_O = \left(\frac{\beta\left(a - c - b'e\left((m-1)X_O + X_I\right)\right)}{c_1}\right)^{1/\beta}. \tag{A.21}$$

Appendix Tables A.1 and A.2 show changes in different firm-level variables. All changes are computed relative to the acquirer firm before the merger, except $\Delta\delta_{AT}$ which compares the product range of the merged entity to the combined product range of the pre-merger acquirer and target. In line with our theoretical predictions, product scale increases in all cases, irrespective of the values of e and η. The impact on product scope, however, depends on the strength of the cannibalization effect. Comparing the different columns in Appendix Tables A.1 and A.2 reveals that for high values of e, and thus, a low degree of product differentiation, the product range of the acquirer shrinks. Furthermore, the decline in product scope is more pronounced if an increase in assets leads to a stronger reduction in costs and therefore, a higher increase in output. This can be detected by comparing the last columns of Tables A.1 and A.2, where $\eta = 0.5$ and 1.5, respectively.

Table A.1: Impact of a Merger for Different Degrees of Product Differentiation with Low η

	$e = 0.2$	e=0.4	$e = 0.6$	$e = 0.8$
$\Delta\delta$	5.22	4.61	3.37	-0.19
$\Delta\delta_{AT}$	-47.39	-47.7	-48.32	-50.09
$\Delta c(0)$	-1.68	-2.2	-2.84	-4.17
ΔX	12.38	12.86	13.21	13.61
$\Delta\Pi$	23.85	25.78	27.27	29.12

Notes: The table shows the impact of a merger on the acquirer firm (in percentage changes) for different model outcomes, assuming that two out of the m firms merge. All changes are computed relative to the acquirer firm before the merger, except $\Delta\delta_{AT}$ which compares the product range of the merged entity to the combined product range of the pre-merger acquirer and target. We use the following parameter values: $c = 10$, $c_1 = 0.5$, $K = 1$, $b = 3$, $L = 200$, $a = 100$, $m = 8$, $\beta = 1$, and $\eta = 0.5$.

Table A.2: Impact of a Merger for Different Degrees of Product Differentiation with High η

	$e = 0.2$	e=0.4	$e = 0.6$	$e = 0.8$
$\Delta\delta$	4.11	1.78	-2.96	-16.77
$\Delta\delta_{AT}$	-47.95	-49.11	-51.48	-58.39
$\Delta c(0)$	-5.8	-8.37	-12.73	-30.34
ΔX	13.47	14.33	14.99	15.2
$\Delta\Pi$	26.72	30.02	33.24	39.07

Notes: The table shows the impact of a merger on the acquirer firm (in percentage changes) for different model outcomes, assuming that two out of the m firms merge. All changes are computed relative to the acquirer firm before the merger, except $\Delta\delta_{AT}$ which compares the product range of the merged entity to the combined product range of the pre-merger acquirer and target. We use the following parameter values: $c = 10$; $c_1 = 0.5$; $K = 1$; $b = 3$; $L = 200$; $a = 100$; $m = 8$; $\beta = 1$; $\eta = 1.5$.

A.3 Internationalization strategies

In this section, we characterize a stylized trade scenario where firm I decides whether or not to enter a foreign destination n. Entry in country n entails competition with the m^n incumbent firms and firm I must pay additive trade costs t^n. Total industry output in country n is given by: $Y_n = X_I^n + m^n X^n$. The allocation of assets across varieties is determined by the firm's total product scope δ_I which it produces in the home country. If trade costs t^n are sufficiently high, the firm exports a subset of varieties $\delta_I^n < \delta_I$ (which can be of mass zero) to the foreign destination. Optimal output per variety is given by:

$$x_I^n(i) = \frac{a - c - t^n - \frac{c_1}{\beta} i^\beta + 2\eta k\,(i)^{0.5} - b' e\,(X_I^n + Y^n)}{2b'(1-e)}, \tag{A.22}$$

which can be rearranged by substituting information from the first-order condition for foreign scope and for optimal assets:

$$x_I^n(i) = \frac{\frac{c_1}{\beta} + 2\eta\sqrt{\frac{K_I\tilde{\beta}}{2\delta_I^{2\beta+1}}}}{2b'(1-e)} \left((\delta_I^n)^\beta - i^\beta\right). \tag{A.23}$$

Integrating over exported varieties gives:

$$X_I^n = \frac{c_1 + \eta\beta\sqrt{\frac{2K_I\tilde{\beta}}{\delta_I^{2\beta+1}}}}{2b'(1-e)(\beta+1)} (\delta_I^n)^{\beta+1}. \tag{A.24}$$

To derive optimal scope, we apply the first-order condition that states: $x_I^n(\delta_I^n) = 0$. Solving for δ_I^n then gives Eq. (13) from the main text.

To derive further results for Testable Prediction 3 in subsection 3.5.3, we totally differentiate Eq. (13), which gives:

$$\begin{aligned} d\delta_I^n = \frac{1}{\triangle_1}\Bigg\{ &- dt^n + \eta\sqrt{\frac{\tilde{\beta}}{2K_I\delta_I}}\left[1 - \left(\frac{\delta_I^n}{\delta_I}\right)^\beta\right] dK_I \\ &+ \eta\sqrt{\frac{K_I\tilde{\beta}\delta_I}{2}}\left[(2\beta+1)\left(\frac{\delta_I^n}{\delta_I}\right)^\beta - 1\right] d\delta_I - 2b' e\,dX_I^n - b' e m^n dX^n\Bigg\}, \end{aligned} \tag{A.25}$$

where

$$\triangle_1 = \left[c_1 + \eta\beta\sqrt{\frac{2K_I\tilde{\beta}}{\delta_I^{2\beta+1}}}\right] (\delta_I^n)^{\beta-1} > 0. \tag{A.26}$$

Here we observe the negative impact of trade costs on the optimal export scope. The idea behind Testable Prediction 3 is that in case of exporting, the asset effect is of first-order importance. Related to our empirical setting that considers Danish exporters, we assume that a domestic merger in the home country does not affect the degree of competition via the number of competing firms in the foreign destination. To shed more light on the asset effect in the export destination, we investigate the following derivative:

$$\frac{d\delta_I^n}{dK_I} = \frac{1}{\triangle_1}\Bigg\{\underbrace{\eta\sqrt{\frac{\tilde{\beta}}{2K_I\delta_I}}\left[1-\left(\frac{\delta_I^n}{\delta_I}\right)^{\beta}\right]}_{(1)}$$

$$+\underbrace{\eta\sqrt{\frac{K_I\tilde{\beta}\delta_I}{2}}\left[(2\beta+1)\left(\frac{\delta_I^n}{\delta_I}\right)^{\beta}-1\right]\overbrace{\frac{d\delta_I}{dK_I}}^{(-)}}_{(2)} - \underbrace{2b'e\overbrace{\frac{dX_I^n}{dK_I}}^{(+)}}_{(3)} - \underbrace{b'em^n\overbrace{\frac{dX^n}{dK_I}}^{(-)}}_{(4)}\Bigg\}. \tag{A.27}$$

Term (1): To make our argument, the most important effect in the derivative above is given by term (1). This effect is positive, since $\delta_I^n < \delta_I$ implies that $1-(\delta_I^n/\delta_I)^\beta > 0$. In contrast to the full domestic scope δ_I, the export scope δ_I^n directly depends on K_I and hence, increases in response to the asset effect of a merger. This effect is particularly large if foreign scope is small, i.e., if the firm has just entered the foreign destination with its core varieties. By contrast, the effect becomes zero if $\delta_I^n = \delta_I$, which would be a scenario where the firm exports its total range of products. However, we rule out such a scenario by assuming that trade costs t^n are large enough.

Term (2): This term captures the effect of the merger on total scope in the domestic market.[37] Again, we observe that the effect depends on the relative size of the foreign product range $(\delta_I^n/\delta_I)^\beta$. If δ_I^n is relatively small then $\left[(2\beta+1)(\delta_I^n/\delta_I)^\beta - 1\right] < 0$ and thus, any effect that reduces the domestic product range will amplify the positive effect on export scope. The reason behind this result is that a smaller domestic product range implies that assets have to be allocated among a smaller set of varieties. In particular, it is the core varieties that benefit from this reallocation which are the first varieties being exported.

Terms (3) and (4): These terms characterize firm I's as well the foreign O-firms' responses to an increase in K_I. The signs of the two derivatives follow directly from the proofs in Appendix A.1. Term (3) displays the cannibalization effect and hence, contradicts the positive impact of assets on export scope. Again, assuming that the foreign scope is sufficiently low, which implies that cannibalization is less severe, this effect does not outweigh the positive effect of assets. To see this, imagine a firm that enters a foreign market with only its core variety. In this case, cannibalization would be zero. By continuity, this result also holds true for varieties close to the core competence. Term (4) enforces the positive effect of an increase in assets on export scope as it captures the fact that foreign O-firms reduce their outputs (compare Eq. (A.9)).

[37] Note that here, we only observe the direct asset effect and not the indirect anti-competitive effect which has an opposite effect on total scope (see the discussion in the main text).

B Empirical Appendix

Table B.1: Baseline Results for Domestic Market Outcomes

	Panel A: Full sample						
Dep. var.	$Prod^D$ (1)	$Prod^{D,AT}$ (2)	$Skew^D$ (3)	$Sales^{D,max}$ (4)	$Sales^{D,med}$ (5)	$Sales^{D,min}$ (6)	$Sales^D$ (7)
Merger >+3	0.0308	-0.1944***	0.0499*	0.2693**	0.1547	-0.1393	0.2477**
	(0.0472)	(0.0558)	(0.0273)	(0.1149)	(0.1530)	(0.2645)	(0.1134)
Merger +3	0.0723**	-0.1579***	0.0550***	0.3455***	0.2342*	-0.0089	0.3441***
	(0.0293)	(0.0336)	(0.0175)	(0.1129)	(0.1288)	(0.2300)	(0.1076)
Merger +2	0.0720**	-0.1478***	0.0764***	0.3082***	0.1552	-0.1246	0.2905***
	(0.0347)	(0.0338)	(0.0227)	(0.0936)	(0.1018)	(0.1761)	(0.0872)
Merger +1	0.0715**	-0.1547***	0.0516**	0.2464***	0.1430	-0.0867	0.2492***
	(0.0314)	(0.0384)	(0.0221)	(0.0633)	(0.0986)	(0.1346)	(0.0719)
Merger year	–	–	–	–	–	–	–
Merger −1	0.0034	0.0471	0.0114	0.0415	0.0316	-0.0530	0.0515
	(0.0295)	(0.0412)	(0.0254)	(0.0741)	(0.0909)	(0.1544)	(0.0679)
Merger −2	0.0097	0.0493	0.0129	0.0037	-0.0028	-0.2419	0.0179
	(0.0355)	(0.0518)	(0.0286)	(0.0975)	(0.1052)	(0.1592)	(0.0913)
Merger −3	0.0141	0.0468	0.0373	0.0979	0.0071	-0.1136	0.0894
	(0.0530)	(0.0653)	(0.0339)	(0.1171)	(0.1193)	(0.2153)	(0.1094)
Merger <−3	-0.0586	0.0959	-0.0038	0.0060	0.0655	-0.0661	-0.0138
	(0.0527)	(0.799)	(0.0398)	(0.1118)	(0.1601)	(0.2493)	(0.1092)
Firm FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
N	21,843	21,843	21,843	21,843	21,843	21,843	21,843
R^2	0.84	0.84	0.73	0.77	0.76	0.75	0.78

	Panel B: Acquirers only						
Dep. var.	$Prod^D$ (1)	$Prod^{D,AT}$ (3)	$Skew^D$ (4)	$Sales^{D,max}$ (5)	$Sales^{D,med}$ (6)	$Sales^{D,min}$ (7)	$Sales^D$ (8)
Merger >+3	0.1709***	-0.00002	0.1270***	0.3134**	-0.0050	-0.4683*	0.3205***
	(0.0527)	(0.0624)	(0.0250)	(0.1179)	(0.1210)	(0.2647)	(0.1097)
Merger +3	0.1347***	-0.0678	0.0922***	0.3640***	0.1455	-0.1899	0.3715***
	(0.0344)	(0.0426)	(0.0198)	(0.1167)	(0.1165)	(0.2381)	(0.1071)
Merger +2	0.1133***	-0.0930**	0.0986***	0.3254***	0.1184	-0.2197	0.3156***
	(0.0353)	(0.0357)	(0.0229)	(0.1002)	(0.0993)	(0.1943)	(0.0885)
Merger +1	0.0907**	-0.1246***	0.0626***	0.2561***	0.1186	-0.1168	0.2619***
	(0.0328)	(0.0416)	(0.0203)	(0.0605)	(0.0950)	(0.1387)	(0.0670)
Merger year	–	–	–	–	–	–	–
Merger −1	-0.0083	0.0352	-0.0006	0.0324	0.0592	0.0237	0.0456
	(0.0322)	(0.0428)	(0.0263)	(0.0719)	(0.0937)	(0.1682)	(0.0651)
Merger −2	-0.0227	0.0218	-0.0111	-0.0441	0.0171	-0.1779	-0.0312
	(0.0401)	(0.0524)	(0.0327)	(0.1095)	(0.1147)	(0.1871)	(0.0986)
Merger −3	-0.0170	0.0137	0.0115	0.0794	0.0689	-0.0039	0.0710
	(0.0579)	(0.0646)	(0.0394)	(0.1218)	(0.1407)	(0.2442)	(0.1108)
Merger <−3	-0.1585*	-0.0122	-0.0678	-0.0624	0.1837	0.1879	-0.0931
	(0.0817)	(0.0901)	(0.0559)	(0.1465)	(0.2208)	(0.3169)	(0.1288)
Firm FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
N	2,124	2,124	2,124	2,124	2,124	2,124	2,124
R^2	0.85	0.82	0.74	0.77	0.79	0.76	0.77

Notes: All dependent variables except the skewness of sales across products ($Skew^D$) are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.2: Robustness Check to Control for the Change in Number of Products

Dep. var.	$Skew^D$	$Sales^{D,max}$	$Sales^{D,med}$	$Sales^{D,min}$
	(1)	(2)	(3)	(4)
Merger >+3	0.0536***	0.3119**	0.2309*	0.0149
	(0.0185)	(0.1161)	(0.1317)	(0.1928)
Merger +3	0.0476***	0.3631***	0.2886**	0.1034
	(0.0163)	(0.1149)	(0.1143)	(0.1937)
Merger +2	0.0594***	0.3246***	0.2442**	0.0381
	(0.0194)	(0.0976)	(0.0897)	(0.1484)
Merger +1	0.0374*	0.2556***	0.1995*	0.0490
	(0.0218)	(0.0601)	(0.0978)	(0.1557)
Merger year	–	–	–	–
Merger −1	0.0068	0.0325	0.0353	-0.0253
	(0.0201)	(0.0721)	(0.0729)	(0.1587)
Merger −2	-0.0003	-0.0439	-0.0176	-0.2489
	(0.0293)	(0.1092)	(0.0903)	(0.1788)
Merger −3	0.0307	0.0798	0.0071	-0.1304
	(0.0298)	(0.1207)	(0.1112)	(0.1759)
Merger <−3	0.0003	-0.0610	-0.0350	-0.2600
	(0.0337)	(0.1405)	(0.1458)	(0.1883)
Δ in # products relative to merger year	0.0719***	0.0015	-0.2309***	-0.4731***
	(0.0093)	(0.0177)	(0.0288)	(0.0542)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
N	2,124	2,124	2,124	2,124
R^2	0.85	0.77	0.84	0.85

Notes: All dependent variables except the skewness of sales across products ($Skew^D$) are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.3: Baseline Results for Export Market Outcomes

	Panel A: Full sample			
Dep. var.	Mkt^X	$Ave.Prod^X$	$Prod^X$	$ProdMkt^X$
	(1)	(2)	(3)	(4)
Merger >+3	0.1008*	0.1539***	0.1335**	0.1671**
	(0.0507)	(0.0350)	(0.0522)	(0.0676)
Merger +3	0.1713***	0.1320***	0.2558***	0.2726***
	(0.0225)	(0.0490)	(0.0474)	(0.0460)
Merger +2	0.2126***	0.1239***	0.2828***	0.3177***
	(0.0252)	(0.0293)	(0.0423)	(0.0396)
Merger +1	0.1772***	0.0934***	0.1911***	0.2490***
	(0.0199)	(0.0304)	(0.0273)	(0.0246)
Merger year	–	–	–	–
Merger −1	-0.0060	0.0005	-0.0204	0.0111
	(0.0494)	(0.0222)	(0.0394)	(0.0539)
Merger −2	0.0278	-0.0297	-0.0047	0.0173
	(0.0340)	(0.0311)	(0.0476)	(0.0557)
Merger −3	0.0272	-0.0078	0.0193	0.0291
	(0.0372)	(0.0304)	(0.0505)	(0.0499)
Merger <−3	0.0194	-0.0053	0.0252	0.0250
	(0.0271)	(0.0325)	(0.0524)	(0.0430)
N	67,274	66,078	67,274	67,274
R^2	0.82	0.70	0.76	0.82

	Panel B: Acquirers only			
Dep. var.	Mkt^X	$Ave.Prod^X$	$Prod^X$	$ProdMkt^X$
	(1)	(2)	(3)	(4)
Merger >+3	0.1554***	0.1725***	0.2216***	0.2662***
	(0.0519)	(0.0375)	(0.0544)	(0.0780)
Merger +3	0.1902***	0.1382***	0.2939***	0.3116***
	(0.0285)	(0.0489)	(0.0483)	(0.0509)
Merger +2	0.2226***	0.1295***	0.3069***	0.3416***
	(0.0260)	(0.0279)	(0.0404)	(0.0390)
Merger +1	0.1835***	0.0976***	0.2081***	0.2645***
	(0.0207)	(0.0310)	(0.0266)	(0.0259)
Merger year	–	–	–	–
Merger −1	-0.0090	0.0015	-0.0281	0.0049
	(0.0468)	(0.0227)	(0.0378)	(0.0523)
Merger −2	0.0225	-0.0283	-0.0195	0.0059
	(0.0336)	(0.0318)	(0.0462)	(0.0563)
Merger −3	0.0177	-0.0130	-0.0100	0.0042
	(0.0364)	(0.0317)	(0.0525)	(0.0532)
Merger <−3	-0.0138	-0.0075	-0.0453	-0.0394
	(0.0346)	(0.0463)	(0.0622)	(0.0577)
N	7,366	6,170	7,366	7,366
R^2	0.82	0.71	0.76	0.82

Notes: All dependent variables are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.4: Staggered Treatment for Domestic Market Outcomes

	Panel A: Baseline sample					
Dep. var.	$Prod^D$	$Prod^{D,AT}$	$Skew^D$	$Sales^{D,max}$	$Sales^{D,med}$	$Sales^{D,min}$
	(1)	(2)	(3)	(4)	(5)	(6)
Merger +3	0.0896**	-0.2109***	0.0506**	0.3868***	0.2653**	0.1431
	(0.0363)	(0.0443)	(0.0203)	(0.1005)	(0.1100)	(0.2035)
Merger +2	0.0786**	-0.2065***	0.0670***	0.2874***	0.1424	-0.0114
	(0.0313)	(0.0379)	(0.0158)	(0.0952)	(0.1108)	(0.1541)
Merger +1	0.0834**	-0.2095***	0.0427**	0.2213***	0.1138	0.0229
	(0.0367)	(0.0417)	(0.0211)	(0.0701)	(0.0880)	(0.1489)
Merger year	0.0434	-0.0920	0.0004	0.0532	0.0189	0.1707
	(0.0551)	(0.0784)	(0.0405)	(0.1149)	(0.1342)	(0.2097)
Merger −1	0.0421	-0.0555	0.0053	0.0892	0.0635	0.1640
	(0.0364)	(0.0624)	(0.0300)	(0.0801)	(0.1033)	(0.1539)
Merger −2	0.0486	-0.0632	0.0079	0.0416	0.0132	-0.0411
	(0.0416)	(0.0632)	(0.0218)	(0.0641)	(0.0922)	(0.1733)
Merger −3	0.0498*	-0.0697	0.0302	0.1146	0.0092	0.0699
	(0.0285)	(0.0542)	(0.0247)	(0.0831)	(0.0631)	(0.1138)
N	21,076	21,076	21,076	21,076	21,076	21,076

	Panel B: Acquirers with single deal in merger event					
Dep. var.	$Prod^D$	$Prod^{D,AT}$	$Skew^D$	$Sales^{D,max}$	$Sales^{D,med}$	$Sales^{D,min}$
	(1)	(2)	(3)	(4)	(5)	(6)
Merger +3	0.0591*	-0.2462***	0.0466**	0.3692***	0.2834***	0.1530
	(0.0340)	(0.0504)	(0.0191)	(0.0944)	(0.1061)	(0.1976)
Merger +2	0.0481	-0.2426***	0.0484***	0.3050***	0.2127**	0.1077
	(0.0310)	(0.0432)	(0.0169)	(0.0867)	(0.1059)	(0.1738)
Merger +1	0.0819***	-0.2176***	0.0341*	0.2550***	0.1890**	0.1206
	(0.0283)	(0.0441)	(0.0186)	(0.0593)	(0.0890)	(0.1467)
Merger year	0.0353	-0.1051	0.0086	0.0624	-0.0108	0.1650
	(0.0609)	(0.0852)	(0.0417)	(0.1062)	(0.1455)	(0.2271)
Merger −1	0.0415	-0.0668	0.0145	0.0812	0.0441	0.1138
	(0.0402)	(0.0684)	(0.0318)	(0.0814)	(0.1088)	(0.1595)
Merger −2	0.0396	-0.0807	0.0052	0.0283	-0.0039	0.0375
	(0.0441)	(0.0662)	(0.0230)	(0.0611)	(0.0841)	(0.1711)
Merger −3	0.0541**	-0.0712	0.0303	0.1132	0.0047	0.0772
	(0.0219)	(0.0548)	(0.0224)	(0.0866)	(0.0645)	(0.0956)
N	20,951	20,951	20,951	20,951	20,951	20,951

Notes: All dependent variables except the skewness of sales across products ($Skew^D$) are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.5: Staggered Treatment for Export Market Outcomes

	Panel A: Baseline sample			
Dep. var.	Mkt^X	$AveProd^X$	$Prod^X$	$ProdMkt^X$
	(1)	(2)	(3)	(4)
Merger +3	0.1969***	0.1586***	0.2728***	0.3043***
	(0.0302)	(0.0417)	(0.0477)	(0.0521)
Merger +2	0.2356***	0.1520***	0.3094***	0.3552***
	(0.0346)	(0.0286)	(0.0414)	(0.0435)
Merger +1	0.2073***	0.1170***	0.2269***	0.2956***
	(0.0347)	(0.0281)	(0.0351)	(0.0388)
Merger year	0.0348	0.0380	0.0387	0.0614
	(0.0333)	(0.0268)	(0.0462)	(0.0427)
Merger −1	0.0042	0.0254	-0.0091	0.0362
	(0.0515)	(0.0321)	(0.0405)	(0.0555)
Merger −2	0.0383	-0.0144	-0.0016	0.0335
	(0.0313)	(0.0261)	(0.0341)	(0.0459)
Merger −3	0.0293	0.0126	0.0153	0.0397
	(0.0292)	(0.0216)	(0.0268)	(0.0332)
N	64,606	63,994	64,606	64,606

	Panel B: Acquirers with single deal in merger event			
Dep. var.	Mkt^X	$AveProd^X$	$Prod^X$	$ProdMkt^X$
	(1)	(2)	(3)	(4)
Merger +3	0.1664***	0.1382***	0.2340***	0.2551***
	(0.0303)	(0.0418)	(0.0470)	(0.0518)
Merger +2	0.2150***	0.1366***	0.2871***	0.3221***
	(0.0356)	(0.0268)	(0.0371)	(0.0418)
Merger +1	0.1974***	0.1053***	0.2085***	0.2728***
	(0.0364)	(0.0284)	(0.0322)	(0.0351)
Merger year	0.0345	0.0291	0.0329	0.0530
	(0.0348)	(0.0267)	(0.0416)	(0.0423)
Merger −1	-0.0008	0.0316	0.0011	0.0398
	(0.0580)	(0.0341)	(0.0437)	(0.0650)
Merger −2	0.0514	-0.0040	0.0247	0.0597
	(0.0338)	(0.0293)	(0.0352)	(0.0503)
Merger −3	0.0265	0.0170	0.0223	0.0442
	(0.0290)	(0.0256)	(0.0306)	(0.0404)
N	64,178	63,614	64,178	64,178

Notes: All dependent variables are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.6: Poisson Estimates for Count Variables

	Domestic market		Export market		
Dep. var.	$Prod^D$	$Prod^{D,AT}$	Mkt^X	$Prod^X$	$ProdMkt^X$
	(1)	(2)	(3)	(4)	(5)
Merger >+3	-0.0056	-0.2015**	0.0287	0.1367***	0.0265
	(0.0882)	(0.0983)	(0.0508)	(0.0340)	(0.0661)
Merger +3	0.0697	-0.1379**	0.1175***	0.2430***	0.0922***
	(0.0559)	(0.0575)	(0.0295)	(0.0345)	(0.0242)
Merger +2	0.0860*	-0.1191**	0.1551***	0.2410***	0.1214***
	(0.0488)	(0.0474)	(0.0301)	(0.0353)	(0.0199)
Merger +1	0.0709	-0.1393**	0.1349***	0.1437***	0.0864***
	(0.0548)	(0.0657)	(0.0209)	(0.0256)	(0.0185)
Merger year	–	–	–	–	–
Merger −1	-0.0003	0.1109	-0.0023	0.0010	0.0218
	(0.0455)	(0.1007)	(0.0375)	(0.0232)	(0.0144)
Merger −2	0.0255	0.0679	0.0178	0.0160	0.0740*
	(0.0577)	(0.0675)	(0.0306)	(0.0354)	(0.0444)
Merger −3	-0.0183	0.0343	-0.0057	-0.0464**	0.0617
	(0.0589)	(0.0597)	(0.0240)	(0.0218)	(0.0406)
Merger <−3	-0.0770	0.1387	0.0147	0.0588	0.0757
	(0.0972)	(0.1037)	(0.0267)	(0.0468)	(0.0642)
N	21,706	21,706	112,569	112,569	112,569

Notes: Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.7: Domestic Market Outcomes for Multiproduct Acquirers

Dep. var.	$Prod^D$	$Prod^{D,AT}$	$Skew^D$	$Sales^{D,max}$	$Sales^{D,med}$	$Sales^{D,min}$
	(1)	(2)	(3)	(4)	(5)	(6)
Merger +3	0.0430*	-0.1253***	0.0501*	0.4900***	0.4135***	0.3446**
	(0.0248)	(0.0349)	(0.0283)	(0.0962)	(0.0959)	(0.1726)
Merger +2	-0.1179***	-0.2695***	0.0734***	0.4787***	0.2944**	0.3211*
	(0.0201)	(0.0406)	(0.0250)	(0.1313)	(0.1299)	(0.1657)
Merger +1	0.0495	-0.1315***	0.0366	0.1906	0.0832	0.1637
	(0.0473)	(0.0467)	(0.0277)	(0.1341)	(0.1302)	(0.1716)
Merger year	0.0215	-0.1398	-0.0434	-0.0332	0.1036	0.2847
	(0.0483)	(0.0993)	(0.0568)	(0.1691)	(0.2329)	(0.3050)
Merger −1	-0.0002	-0.0940	-0.0133	0.1189	0.2067	0.3615
	(0.0441)	(0.1266)	(0.0359)	(0.1139)	(0.1499)	(0.2633)
Merger −2	0.0317	-0.0908	0.0008	0.0755	0.1018	0.0586
	(0.0403)	(0.0870)	(0.0396)	(0.1366)	(0.1153)	(0.2866)
Merger −3	0.0226	-0.0887	0.0460	0.1538	0.0226	0.1723
	(0.0301)	(0.0856)	(0.0393)	(0.1227)	(0.0951)	(0.1771)
N	6,461	6,461	6,461	6,461	6,461	6,461

Notes: All dependent variables except the skewness of sales across products ($Skew^D$) are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.8: Export Market Outcomes for Multiproduct Acquirers

Dep. var.	Mkt^X	$AveProd^X$	$Prod^X$	$ProdMkt^X$
	(1)	(2)	(3)	(4)
Merger +3	0.1902***	0.1342***	0.2484***	0.2713***
	(0.0303)	(0.0361)	(0.0355)	(0.0435)
Merger +2	0.2493***	0.1231***	0.2710***	0.3226***
	(0.0252)	(0.0336)	(0.0332)	(0.0355)
Merger +1	0.2271***	0.0651**	0.1916***	0.2736***
	(0.0239)	(0.0288)	(0.0343)	(0.0346)
Merger year	0.0789**	-0.0313	0.0616	0.1071**
	(0.0350)	(0.0361)	(0.0396)	(0.0483)
Merger −1	0.0446	-0.0333	0.0139	0.0732
	(0.0715)	(0.0334)	(0.0503)	(0.0782)
Merger −2	0.0730	-0.0269	0.0171	0.0737
	(0.0500)	(0.0296)	(0.0325)	(0.0526)
Merger −3	0.0435	-0.0138	0.0029	0.0569
	(0.0431)	(0.0223)	(0.0314)	(0.0451)
N	28,745	28,716	28,745	28,745

Notes: All dependent variables are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.9: Robustness Checks for Domestic Market Outcomes

	Panel A: Dropping observations with negative sales share >75%			
Dep. var.	$Skew^D$	$Sales^{D,max}$	$Sales^{D,med}$	$Sales^{D,min}$
	(1)	(2)	(3)	(4)
Merger +3	0.0352*	0.3359***	0.2607**	0.1489
	(0.0201)	(0.0921)	(0.1013)	(0.2049)
Merger +2	0.0548***	0.2337***	0.1196	0.0039
	(0.0151)	(0.0889)	(0.1089)	(0.1550)
Merger +1	0.0659***	0.2717***	0.0880	-0.0116
	(0.0244)	(0.0600)	(0.0880)	(0.1542)
Merger year	0.0157	0.1218	0.0455	0.1828
	(0.0438)	(0.0856)	(0.1288)	(0.2078)
Merger −1	-0.0007	0.0413	0.0371	0.1433
	(0.0303)	(0.0671)	(0.0893)	(0.1522)
Merger −2	0.0018	0.0330	0.0270	-0.0244
	(0.0217)	(0.0588)	(0.0912)	(0.1764)
Merger −3	0.0275	0.0970	-0.0071	0.0379
	(0.0212)	(0.0741)	(0.0590)	(0.0960)
N	20,731	20,731	20,731	20,731

	Panel B: Products defined at CN6-digit level			
Dep. var.	$Skew^D$	$Sales^{D,max}$	$Sales^{D,med}$	$Sales^{D,min}$
	(1)	(2)	(3)	(4)
Merger +3	0.0449**	0.3609***	0.2787**	0.0416
	(0.0194)	(0.1127)	(0.1244)	(0.2183)
Merger +2	0.0470***	0.2588***	0.1638	-0.0200
	(0.0165)	(0.0952)	(0.1174)	(0.1588)
Merger +1	0.0362*	0.1918***	0.1299	-0.0589
	(0.0220)	(0.0712)	(0.0954)	(0.1564)
Merger year	-0.0161	0.0658	0.0366	0.2596
	(0.0333)	(0.1186)	(0.1233)	(0.2064)
Merger −1	-0.0015	0.0838	0.0198	0.2581
	(0.0302)	(0.0794)	(0.1207)	(0.1622)
Merger −2	0.0084	0.0663	0.0079	-0.0346
	(0.0217)	(0.0681)	(0.0973)	(0.1925)
Merger −3	0.0231	0.1099	0.0128	0.0773
	(0.0204)	(0.0936)	(0.0805)	(0.1124)
N	21,032	21,032	21,032	21,032

Notes: All dependent variables except the skewness of sales across products ($Skew^D$) are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.10: Robustness Checks for Export Market Outcomes

	Panel A: Non-exporting targets			
Dep. var.	Mkt^X	$AveProd^X$	$Prod^X$	$ProdMkt^X$
	(1)	(2)	(3)	(4)
Merger +3	0.1925***	0.1426**	0.2119***	0.2806***
	(0.0498)	(0.0582)	(0.0775)	(0.0737)
Merger +2	0.2079***	0.0982**	0.2552***	0.3155***
	(0.0450)	(0.0390)	(0.0654)	(0.0633)
Merger +1	0.1185**	0.1118**	0.1653***	0.2205***
	(0.0488)	(0.0514)	(0.0579)	(0.0662)
Merger year	-0.0408	0.0701	0.0239	0.0341
	(0.0661)	(0.0586)	(0.1095)	(0.0691)
Merger −1	-0.0386	0.0280	-0.0204	0.0298
	(0.0634)	(0.0542)	(0.1032)	(0.0845)
Merger −2	-0.0025	-0.0227	-0.0258	0.0089
	(0.0554)	(0.0405)	(0.0767)	(0.0671)
Merger −3	-0.0205	0.0671	0.0348	0.0374
	(0.0553)	(0.0581)	(0.0535)	(0.0521)
N	61,574	61,174	61,574	61,574

	Panel B: *VARS* sample			
Dep. var.	Mkt^X	$AveProd^X$	$Prod^X$	$ProdMkt^X$
	(1)	(2)	(3)	(4)
Merger +3	0.1329***	0.0626*	0.1727***	0.1392**
	(0.0491)	(0.0351)	(0.0561)	(0.0643)
Merger +2	0.1395***	0.0804*	0.1771***	0.1667**
	(0.0532)	(0.0431)	(0.0655)	(0.0689)
Merger +1	0.1817***	0.0660*	0.1944***	0.2274***
	(0.0453)	(0.0344)	(0.0635)	(0.0612)
Merger year	0.0043	0.0126	0.0063	0.0354
	(0.0798)	(0.0500)	(0.0832)	(0.0981)
Merger −1	0.0406	-0.0169	-0.0173	0.0412
	(0.0694)	(0.0596)	(0.0650)	(0.0820)
Merger −2	0.0245	0.0225	0.0047	0.0452
	(0.0610)	(0.0521)	(0.0763)	(0.0792)
Merger −3	0.0334	-0.0152	-0.0060	0.0376
	(0.0385)	(0.0426)	(0.0682)	(0.0608)
N	17,148	17,115	17,148	17,148

Notes: Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.11: A*38 Classification of NACE Rev. 2 Industries

	A*38 code	Nace Rev. 2	Divisions
1	A	Agriculture, forestry and fishing	01 to 03
2	B	Mining and quarrying	05 to 09
3	CA	Manufacture of food products, beverages and tobacco products	10 to 12
4	CB	Manufacture of textiles, apparel, leather and related products	13 to 15
5	CC	Manufacture of wood and paper products, and printing	16 to 18
6	CD	Manufacture of coke, and refined petroleum products	19
7	CE	Manufacture of chemicals and chemical products	20
8	CF	Manufacture of pharmaceuticals, medicinal chemical and botanical products	21
9	CG	Manufacture of rubber and plastics products, and other non-metallic mineral products	22 + 23
10	CH	Manufacture of basic metals and fabricated metal products, except machinery and equipment	24 + 25
11	CI	Manufacture of computer, electronic and optical products	26
12	CJ	Manufacture of electrical equipment	27
13	CK	Manufacture of machinery and equipment n.e.c.	28
14	CL	Manufacture of transport equipment	29 + 30
15	CM	Other manufacturing, and repair and installation of machinery and equipment	31 to 33
16	D	Electricity, gas, steam and air-conditioning supply	35
17	E	Water supply, sewerage, waste management and remediation	36 to 39
18	F	Construction	41 to 43
19	G	Wholesale and retail trade, repair of motor vehicles and motorcycles	45 to 47
20	H	Transportation and storage	49 to 53
21	I	Accommodation and food service activities	55 + 56
22	JA	Publishing, audiovisual and broadcasting activities	58 to 60
23	JB	Telecommunications	61
24	JC	IT and other information services	62 + 63
25	K	Financial and insurance activities	64 to 66
26	L	Real estate activities	68
27	MA	Legal, accounting, management, architecture, engineering, technical testing and analysis activities	69 to 71
28	MB	Scientific research and development	72
29	MC	Other professional, scientific and technical activities	73 to 75
30	N	Administrative and support service activities	77 to 82
31	O	Public administration and defence, compulsory social security	84
32	P	Education	85
33	QA	Human health services	86
34	QB	Residential care and social work activities	87 + 88
35	R	Arts, entertainment and recreation	90 to 93
36	S	Other services	94 to 96
37	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	97 + 98
38	U	Activities of extra-territorial organisations and bodies	99

Source: Eurostat (2008).

Table B.12: Propensity Score Reweighting Estimates for Domestic Market Outcomes

Dep. var.	$Prod^{D}$ (1)	$Prod^{D,AT}$ (2)	$Skew^{D}$ (3)	$Sales^{D,max}$ (4)	$Sales^{D,med}$ (5)	$Sales^{D,min}$ (6)
Merger >+3	0.1026**	-0.1216*	0.0667**	0.2205*	0.0634	-0.3001
	(0.0462)	(0.0640)	(0.0243)	(0.1195)	(0.1405)	(0.2549)
Merger +3	0.1114**	-0.1369**	0.0707**	0.3030**	0.1306	-0.1911
	(0.0431)	(0.0531)	(0.0271)	(0.1422)	(0.1642)	(0.2955)
Merger +2	0.0930**	-0.1610***	0.0771**	0.2920**	0.1467	-0.1917
	(0.0409)	(0.0478)	(0.0296)	(0.1082)	(0.1399)	(0.2312)
Merger +1	0.0854**	-0.1751***	0.0588*	0.1708***	0.0134	-0.2442
	(0.0390)	(0.0534)	(0.0303)	(0.0408)	(0.1047)	(0.1983)
Merger year	–	–	–	–	–	–
Merger −1	-0.0190	0.0167	0.0068	0.0081	0.0084	0.0182
	(0.0399)	(0.0534)	(0.0293)	(0.0813)	(0.0794)	(0.1882)
Merger −2	-0.0154	0.0258	-0.0014	-0.0889	-0.0693	-0.2778
	(0.0481)	(0.0717)	(0.0360)	(0.1297)	(0.1058)	(0.2207)
Merger −3	-0.0279	0.0073	0.0127	0.0285	0.0088	-0.1012
	(0.0610)	(0.0814)	(0.0426)	(0.1295)	(0.1068)	(0.2398)
Merger <−3	-0.1273*	0.0162	-0.0360	-0.0306	0.1160	0.0760
	(0.0636)	(0.1037)	(0.0471)	(0.1356)	(0.1807)	(0.2806)
N	21,789	21,789	21,789	21,789	21,789	21,789
R^2	0.82	0.80	0.70	0.74	0.74	0.71

Notes: All dependent variables except the skewness of sales across products ($Skew^{D}$) are in logarithms. Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.

Table B.13: Propensity Score Reweighting Estimates for Export Market Outcomes

Dep. var.	Mkt^{X} (1)	$AveProd^{X}$ (2)	$Prod^{X}$ (3)	$ProdMkt^{X}$ (4)
Merger >+3	0.1708***	0.1458***	0.1747***	0.2351***
	(0.0433)	(0.0403)	(0.0453)	(0.0614)
Merger +3	0.2196***	0.1362**	0.3059***	0.3349***
	(0.0336)	(0.0617)	(0.0426)	(0.0467)
Merger +2	0.2400***	0.1207***	0.2924***	0.3396***
	(0.0352)	(0.0366)	(0.0398)	(0.0386)
Merger +1	0.2262***	0.0987*	0.2199***	0.2908***
	(0.0311)	(0.0516)	(0.0317)	(0.0318)
Merger year	–	–	–	–
Merger −1	-0.0090	0.0265	-0.0271	0.0081
	(0.0557)	(0.0302)	(0.0439)	(0.0570)
Merger −2	0.0383	-0.0002	0.0110	0.0406
	(0.0378)	(0.0305)	(0.0466)	(0.0524)
Merger −3	0.0600	0.0043	0.0336	0.0541
	(0.0444)	(0.0420)	(0.0571)	(0.0586)
Merger <−3	0.0510	0.0320	0.0433	0.0635
	(0.0390)	(0.0541)	(0.0566)	(0.0550)
N	66,652	65,444	66,652	66,652
R^2	0.802	0.689	0.730	0.794

Notes: Standard errors in parentheses are clustered at the 2-digit NACE Rev. 2 industry level. ***, **, * denote significance level at 1%, 5% and 10% respectively.