

International Competition in the First Wave of Globalization:

New Evidence on the Margins of Trade

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We pose a seemingly ageless question in economic history. To what extent did new entrants in the late nineteenth-century cotton-textile industry endanger the customary markets of the European core? Exploiting a newly constructed data set on textile imports to Spain, we find that as transport costs fell new rivals began to sell a greater variety of products. Along this dimension, competition can be said to have increased. In response, producers in the European upgraded the quality of goods exported. By 1914, specialization mapped onto productivity differences. While firms in new industrializing countries exported low-end varieties, incumbents in the core shipped high-end goods, unit values increasing with levels of development.

Key words: globalization, cotton-textile industry, Spain, international trade models with heterogeneous firms

Objective and motivation: Why the number and variety of products matter

The long debate on the supposed failure of the British cotton-textile industry, and the decline of the European industry more generally, seems to have reached closure. The question 'why Lancashire failed' has been turned on its head. In recent studies, the puzzle to be explained is how the industry, despite the challenges of low-wage competition, continued to prosper into the twentieth century. To Clark (1987), the answer lay in the inefficiency of low-wage labor, and, conversely, the effort levels of highly paid workers. To Broadberry and Marrison (2002) and Crafts and Wolf (2013), Lancashire thrived because of the benefits induced by agglomeration, its productivity advantage procuring long years of export success. As for continental manufacturers, their longevity was based on niche markets for medium and high-value goods. The fortunes of British and continental producers were sustained because of steady improvements in mule-spinning equipment, the common type of machinery exploited in the European core (Saxonhouse and Wright 2004, 2010). It was as late as the 1920s that advances in ring-spinning technology, the machinery of choice in the United States, but also in Japan and many other low-wage economies, tilted the global competitive balance in the latter's favor.

The literature tends to draw a direct link between industry size, productivity, and export success. There is theoretical support for this line of reasoning. A Krugman (1979) type international trade model predicts that large countries produce and export more varieties. Further, this model predicts that a country will export to all markets, if it exports to any markets in a category. But this is in fact where the model breaks down. As is the case for the late twentieth century, the fit between productivity levels and export success before 1914 was not airtight.¹ Contemporaries (cited in Marrison 1996) observed that the largest producers, like the British, fared better in some markets than others and that across destinations the range of goods they sold varied considerably.

This paper gives a novel perspective on international competition in the cotton-textile industry. We do so in two ways. First, we introduce explicitly barriers to international trade, or fixed and variable trade costs (Jacks et al. 2010). Trade barriers drove a wedge between technological leadership and exports. The fixed and variable costs of selling abroad were not trivial and they varied by market and product. To be certain, productive firms had more success than unproductive ones in meeting these costs, but the collapse in trade barriers before 1914

¹ Hummels and Klenow (2005, p. 705) remarked that the Krugman model is "strikingly at odds with the evidence."

altered the nature of competition. The number of producers engaged in international trade rose, as did the range of goods exported. Because trade costs were specific to trading pairs and to the type of good, productive concerns did not ship everywhere, and even less productive firms achieved a foothold in foreign markets.

Our second contribution is at the level of detail we address competitiveness.² Conventional histories of international competition, using coarse or aggregate data, rely on trade shares as a measure of export success. Exploiting finer trade data, we introduce the number of products and varieties as a complementary dimension of competition in foreign markets. Product varieties, by themselves, are important for several reasons. In the eye of a trade economist, more variety means greater choice for consumers and producers; for a growth theorist, new products are akin to new inventions; and to the economic historian, the emergence of new products can be seen as a harbinger of changes in the competitive landscape. The upshot is that what you export matters as how much.

To gain leverage on the relation between trade costs and the emergence of new products and varieties, we rely on heterogeneous-firm trade (HFT) models (Melitz 2003; Bernard et al. 2007, 2009, 2011). To the best of our knowledge this is the first attempt to confront HFT models with historical data. Unlike standard textbook models, from Ricardo to Krugman, this approach eschews the assumption of a representative firm. Exporting is a scarce activity. Firms do not sell to all countries and they ship different goods to a variety of countries at unique prices (Schott 2004). These firms tend to be larger and more capital intensive and pay higher wages than non-exporting concerns. In these models, firms draw their productivity parameter from a fixed exogenous distribution. For each destination, firms must exceed a productivity threshold if they are to export to that country. To pin down the effect of trade costs (variable and fixed) in the presence of heterogeneous firms, these models decompose aggregate exports into extensive (number of firms or products) and intensive margins (average value of exports per firm or per product).³ A parallel decomposition holds for imports. To be clear, the extensive margin exists

² Leamer (2012, pp. 114-16) made the general point: “The problem of aggregation has to be one of the biggest headaches confronting anyone who studies international comparative advantage.”

³ Using U.S. export data for 2006, Lawless (2010a) reported that the extensive margin was more responsive to trade costs than the intensive side. Similarly, Hummels and Klenow (2005) found a much larger contribution of the extensive margin in world trade in 1995. The literature contains a number of definitions of the two margins depending on data availability. Bernard et al. (2009) define the extensive margin at the country-product level, Amiti and Freund (2010) at the product level, and Helpman, Melitz, and Rubinstein (2008) and Felbermayr and Kohler

because firms that cannot cover their fixed costs will not export at all. Thus trade costs affect trade via the margins of trade. An implication of this line of research is that the same decline in trade barriers has a larger impact on trade flows in HFT than in representative firm models.⁴

We analyze the effects of trade costs through the prism of imports of cotton textiles to Spain. Why Spain? Aside from data availability, it was a representative middle-income country with a large domestic market. The country had a sizeable and growing textile industry of its own that, again typically, benefitted from tariff protection. Certainly, textile imports comprised a small fraction of the value of total Spanish consumption, but outcomes were not the same as processes. Hardly remote or landlocked, the industry's fortunes were tied to the international context. Spain traded with countries of various sizes and with different endowments and was integrated in the European network of intraindustry trade in manufactured goods. By the mid nineteenth century, the movement of Spanish textiles prices corresponded to that of international goods (Prat and Soler 2002). The country had several additional features that provide insights on international competition before 1914. First, it had and lost Empire. Imperial connections are believed to have reduced trade costs for the metropolis (Mitchener and Weidenmier 2008). Conversely, the end of Empire improved the competitiveness of rivals, entry in the Iberian market being considered the first step in a larger strategy of gaining access to Spain's former overseas colonies. The second feature was that Spain initiated substantive changes in commercial policy in the period. Like the rest of Europe, Spain imposed specific tariffs that had implications for the relative prices of imports of high and low-end goods (Tena-Junguito et al. 2012). The response of established and new entrants to tariff changes provides a window on the strengths and weakness of different exporters, and the nature of product variety competition more generally.

In the spirit of HFT models, we find that the fall in trade costs intensified competition in product varieties. Developed countries had an initial advantage in exporting, but as trade barriers fell and technologies spread new entrants shipped new and established goods (the extensive margin). Along this dimension, global competition can be said to have intensified. Belgium and Switzerland, as did the U.S, expanded their presence, because they were the most productive of newcomers and overcame obstacles to trade. However, other competitors had only partial success

(2006) at the country level. In this paper we use the product definition, except for the last section, in which we employ a country-product classification.

⁴ To illustrate, Rose (2004) reported an insignificant effect of WTO membership on the volume of bilateral trade flows. However, Dutt et al. (2013) found that WTO membership, by reducing fixed costs of entry, actually operated through the extensive margin and reduced the intensive side.

in increasing average sales (the intensive margin), because of their lack of experience in marketing and distribution. Nonetheless, the emergence of new exporters and new products was perceived as a challenge in the Spanish market, let alone because comparable waves of entry occurred in other destinations. Incumbent producers in the European core responded by improving distribution, cutting markups, adjusting technology, and upgrading the quality of goods. Spanish manufacturers were not insulated from these changes. By 1914, international competition had left its mark on the global distribution of output. Firms in different regions specialized in different varieties in line with their endowments of capital and labor.

The paper is organized as follows. We first begin with a portrait of international competition in the cotton-textile industry and the trade costs of conducting business in Spain. We then consider the effects of the emergence of new foreign products on the Spanish industry. To fix ideas on the relation between productivity, exports, and trade costs, we present the basic HFT model's predictions of the effects of decline in trade costs on the extensive and intensive margins. Next we introduce our data source and information on trading partners, the number of products imported and their prices, and the degree of similarity in the exports of rich and poor countries. We proceed to estimate the contributions of the margins in total imports, before turning our attention to the response of competitors to changes in commercial policy. We conclude with some implications of our findings for the history of international trade before 1914.

Technology vs geography in the world textile industry

The main lines of the development of the global cotton-textile industry are well known to economic historians. Table 1 presents a snapshot of industries around 1914. The British industry commanded a greater proportion of workers, spindles, and looms than its share in world GDP dictated (columns 1-7). Lancashire's competitive edge was based on the agglomeration of skilled labor, merchants, bankers, insurance agents, and satellite industries in and around Manchester (Broadberry and Marrison 2002). Wages were lower in the rest of Europe, but so was productivity (column 8 and 9). Into the 1880s, continental producers, like those in France and Germany, did not pose a threat to Lancashire's supremacy, their industries being more dispersed than that of the British and agglomeration economies consequently less important (A'Hearn 1998). By the turn of the century, the French and Germans had begun exploiting market niches

for their own brand items (Brown 1995). Intra-European trade was the mainstay of continental producers (column 11).

Overall, strong productivity performance did not map onto export success. Britain was the world's leading exporter, but its share of the European market was steadily declining (Marrison 1996). By 1913, Lancashire's part of the Spanish market was slightly less than its share of European exports (column 13). The French had fewer exports (columns 12 and 13) to Spain than elsewhere in Europe, whereas the Germans seem to have had greater success, exporting twice as much as their continental share.⁵ The U.S. trade representative (Odell 1911, p. 12; Odell 1912) in Barcelona provided an explanation of the poor fit between the size of industries and exports. "England predominates in the trade in cotton fabrics and yarns, Germany in velvets, ribbons, and knit goods, and Switzerland in tulles and laces." Notwithstanding their technological advance, firms based in the European core had to expend resources on marketing and distribution to sell distinct brands. But they also had to be sensitive to the likelihood of competition from similar goods manufactured in Spain or elsewhere.

Sometime before the end of the century, developments in spinning technology began to undermine the hegemony of established manufacturers in their customary markets. The U.K., France, and Germany operated mule-spinning machinery, which required a high-skill and high-wage workforce and inferior cotton, the combination of factors found in the European core (Table 1 column 4). The mule's specialty was medium to fine-yarn counts. The diffusion of ring frames altered the competitive landscape. Commonly used in the manufacture of coarse grades, rings were dominant in the U.S., and in certain middle and low-wage economies in Europe and elsewhere, with certain exceptions like India.⁶ By the 1880s, improvements in ring frames, and to some extent mules, made possible a greater overlap in types of yarn spun (Saxonhouse and Wright 2004, 2010). It was in this period that Spain, as we discuss below, also adopted ring spinning. In export markets, medium and low-wage producers using rings, from Belgium and Italy through to Japan, began to expand sales. Although the quality of the new export lines was a continuous source of contention, these goods were price competitive. Belgium and Italy exported more than 40 percent of their production of piece goods (column 10).

⁵ The import figures to Spain in Table 1 are from Kertesz (1917) who uses a broader definition of textile goods than we do in the empirical sections of this paper. That said, Kertesz's estimates conform to ours, Germany being the leader in 1914, followed by the U.K. and France.

⁶ Leunig (2003) compared U.S. and British industries. Lancashire had superior productivity in mule spinning on all yarn counts; in New England, ring spinning had higher productivity on medium counts (no. 50s) and below.

The decline in geographic barriers mediated the distribution of global production. Adopting the language of Eaton and Kortum (2002, p. 1771), competitive advantage was the outcome of a “race between technology and geography.” Beginning in 1870, the fall in geographic barriers prompted a shift in manufacturing to large countries in the core because of their concentration of inputs, like skilled labor, raw materials, and managerial talent. However, as trade barriers continued to shrink, manufacturing output increased in developing and newly industrialized countries, whereas that of incumbents contracted.

It is difficult to generalize about trade costs because they were not uniform across countries. Trade costs comprised fixed and variable components. Of the latter, the collapse in transport costs has been well documented. Shipping costs from Hamburg, Liverpool, and New York to Barcelona declined by about 30 percent between 1870 and 1914, most of the change occurring before 1900 (Jacks and Pendakur 2011). Generally, landlocked and less developed countries did not share in the full extent of the decline because of their poorer infrastructures. The expansion of the Barcelona harbor in the early 1900s benefited all exporters, but countries with larger ships gained more (U.K. Consular Reports [UKCR] 1902).

More than transport, transaction costs were a decisive component of trade costs because they varied considerably across rivals. There were the sunk or beachhead costs of entry which included collecting primary information on local preferences and setting up marketing networks; the fixed costs of shipment, such as altering packaging to meet changes in demand, or converting prices and measurements into local units (UKCR 1900, p. 18); and variable costs, in addition to freight rates, such as import duties and legal fees. Since market information was often imperfect, fixed and variable costs were uncertain or unknown before goods were actually shipped. To address these issues, the development and nurturing of personal relations with customers was indispensable, because Spain, "had no large independent importers who buy goods in the best market," and, consequently, "orders must come from dealers who style themselves as wholesalers and retailers, but who purchase in comparatively small quantities (Odell 1911, p. 14)." Spanish firms incurred similar costs, resulting in a level playing field for foreign and domestic firms alike. To be sure, trade obstacles came down because of the extension of the MFN treaty network, the pegging of exchange rates, and empire connections, but, again, not all countries shared equally in these arrangements. Typically, the British trade delegate implored London to renew its trade treaty with Spain as to avoid an uneven playing field (UKCR 1887).

Exporters originating in big and rich countries in the European core had discrete advantages in reducing marketing and related costs. On the demand side, firms gained experience in catering to local demand for high-value goods in large and wealthy domestic markets (Hummels and Klenow 2005; Fajgelbaum et al. 2011). On the supply side, big and rich countries had a talented pool of human capital to support the manufacture of goods across the quality spectrum. Because they were first on the ground, firms in the established industrial core had developed marketing channels and gathered information on tastes and customs, previous export experience having a recognizable effect on the probability of future activity in identical and new items (Roberts and Tybout 1995).

Still, there was great diversity in firms' attempts to manage trade costs. Exploiting the beemfits of agglomeration, Lancashire firms outsourced retailing to merchant houses (Farnie 2004; Marrison et al. 2008) or resident buyers. Refreshingly candid, trade delegates in Spain commented on their own poor language skills, the failure of British catalogues to publish weights in metric equivalents (UKCR 1900, p. 16), and the general inability "to study the requirements of their customers (UKCR 1886, p. 4; Pratt 1917)." Most often the British allowed the local buyer to use his own private brand and to have a say in the design and color of the fabric (Pratt 1917, p. 12). Again this proved problematic, because it jeopardized the Lancashire label. "In Barcelona the shops display so-called English wares which are imported from Germany and Belgium, so that superior English goods cannot be sold for the prices asked (UKCR 1887, p. 2)."

Facing higher unit costs of production than the British, German firms tended to be larger and vertically integrated. Their size mitigated, to some extent, the fixed costs of entry. Contemporaries lauded German exporters for their system of commercial travelers who had "thorough knowledge of Spanish (Odell 1911, p. 14)," taking special orders often considered too small by Lancashire standards (Brown 1995, p. 512). They also provided financing, an exorbitant privilege untapped by rivals, which cemented their related-party trade network (Odell 1911, p. 14). Newcomers like the Swiss and Belgians seem to have mimicked German habits and practices. By 1900, the Belgians had twenty-five trade delegates across Spain providing information to producers back home (Belgium 1910).

As for France, in the wake of its trade war with Spain, shipments lapsed for several years after 1891 (Fernandez 2009). Manufacturers, whose concerns were smaller on average than their German rivals (Sisic 1994), lambasted government authorities for their lackluster manner in

engaging foreign-trade diplomats (Petitpas 2012, p. 373). After 1900, the export potential of firms in Picardy improved because of substantial investments in new equipment (Petitpas 2012, pp. 341-43). In general, French success leaned heavily on its reputation in selective brands, and, in the case of Spain, its close distance.⁷ Unlike its major continental rivals, France shipped goods by rail.

Certain new entrants did not have the resources to expend on marketing or extending credit, and, as a result, the presence of some of their products was shortlived. In this regard, U.S. trade was distinct, the probability of persistence being greater since firms had the resources to establish and develop marketing networks. The success of the U.S. industry was built on its large domestic market. By 1914 around 10 percent of production of southern mills was exported, the north shipping goods on a smaller scale (Rose 2000, p. 187). Like other new competitors firms, tended to specialize in coarse and medium goods. Among new entrants, U.S. mills had a productivity advantage, but exports were “greatly handicapped by lack of proper representation (Odell 1911, p. 14).” Manufacturers depended on New York selling agencies that, in turn, relied on field reports of U.S. trade delegates (Prat 2009a). Unlike the British, American mills rarely gave exclusive agency to one importer, but sold to anyone who applied. Goods were “made to stock” and sold in a fixed assortment that was not subject to change. American mills stamped their goods with the mill brand (Pratt 1917, p. 12). This strategy made sense in markets in which U.S. good were unknown and had to be demarcated. Whereas distance remained a barrier, exporters benefitted from the large holds of U.S vessels and the quality of their packaging. Finally, U.S. manufacturers took a long-term perspective. The fixed costs of entry would be attenuated since Spain was projected to serve as the basis for future expansion in Latin America (Odell 1911, p. 15). Ever confident, the American trade consul in Barcelona forecast a bright future, because of the price competitiveness and the “superior quality” of its products (Odell 1911, p. 14).

The Spanish industry and international competition

The Spanish market had particular challenges for exporters because unanticipated changes in commercial policy and exchange rate volatility magnified the costs of entry. There was also a domestic industry to contend with. Highly concentrated in and around Barcelona, the industry

⁷ Becuwe et al. (2012) report that, in the decades before 1914, French producers were increasingly shut out from long-distance trade, exports being directed to markets of close neighbors.

was composed of integrated spinning and weaving mills, many of which were small, employing a high proportion of women. Plagued by high-energy costs, low speeds of operation, and overstaffing, industry wages in 1910 were about half that of Britain's (see Table 1; Clark 1987). Until the 1880s, Spanish firms relied on mules to manufacture medium counts. Thereafter, the industry adopted frames in increasing number.⁸ However, labor productivity remained low, if not stagnant, into the Belle Époque (Domenech 2008, p. 20). The overall picture was one of incremental growth.⁹

Spanish firms confronted many of the same trade costs as their foreign rivals in their domestic market, thereby weakening any home bias or local advantages. Financial institutions were not well developed and cotton manufacturers acted as their clients' bankers (Prat 2009b). Establishing a customer base could not be taken for granted. Although wholesalers visited Barcelona, Catalan manufacturers, following the German example, came to involve themselves directly in marketing goods via agents in the field (Prat and Soler 2002). In terms of both finance and distribution, there appears to have been convergence in the practices of foreign and domestic firms.

Throughout the period, Spain, like other European producers, was both an exporter and importer of cotton goods.¹⁰ The trade balance in textiles was in fact positive. The Spanish-American War was detrimental to the export trade, but producers specializing in printed and dyed goods were able to rebound from the collapse in sales to the Philippines and deepen markets in Argentina. To the chagrin of the U.S. and other exporters who sought to use Spain as a springboard for accessing markets in Latin America, Spanish trade in the region endured, a characteristic of commercial relations in which trade costs mattered. With European countries, Spain had a deficit. Imports rose in the late 1880s, but then fell in the 1890s, even before the substantial devaluation of 1898. Imports rebounded in the mid 1900s and continued to increase after the tariff changes of 1906. We give more information on the growth and nature of imports and exports below.

⁸ While there were technological improvements in mule and ring spinning throughout the period, the latter was favored. Developed in Spain in 1913, the Casablancas method of drawing out the fibers in pre-ring spinning operations provided for much higher levels of fiber control than was previously possible. Saxonhouse and Wright (2010, p. 555) claim the "the impact of the innovation was still in doubt in the early 1920s."

⁹ For a more optimistic view of the Spanish textile industry, see Nadal and Sudrià (1993). See Prados de la Escosura and Rosés (2009) on Spain's general economic performance in the period.

¹⁰ Spain's degree of openness doubled between 1870 and 1914, much of the increase occurring in the first half of this period which was then followed by a period of levelling off (Tena-Junguito 2007).

The local industry received hefty tariff protection, at least nominally. The 1891 tariff increase was general; that of 1906 was part of an industrial strategy to protect, ostensibly, the manufacture of high-value goods (Sabaté 1995). The 1891 tariff did cut into imports, but that of 1906 had more mixed results, even as ad valorem rates amounted to as much as 30 percent. The anticipation was that the restrictive commercial policy would give Catalan producers more leeway in the home market and they would begin to encroach on foreign competitors. The evidence on this score is mixed. On the one hand, the tariff was believed to have encouraged local mills to manufacture a wide range of goods on short production runs (Odell 1911, p. 22). On the other, foreign products, owing to their name brands, retained a hold on markets. The U.S. trade representative (Odell 1911, p. 11) summarized the problem:

A close comparison of these [foreign] goods and the native zephyrs does not reveal any great difference as regards quality, weave, texture, and finish. In fact, many of the goods advertised as English zephyrs are made in Spanish mills. In one I found Spanish-made cotton goods stamped in English, "Cambric, Superior Quality," and attached to the piece was a tag made in imitation of the kind used by the customhouse on imported goods. Any existing preference for foreign goods would seem to be founded on prejudice and a feeling that articles from abroad possess a particular excellence rather than on any real difference in quality.

In this regard, the presence of foreign varieties cast a long shadow on the local producers, even as the industry was protected behind a tariff wall. Moreover, foreign competitors, to anticipate our findings below, responded to changes in commercial policy, altering the mix of goods they shipped. At issue was the nature of the tariff itself. Since rates were specific, a general tariff adjustment like that of 1891 was the equivalent to an equal rise in transport costs across the product spectrum (Falvey 1979; Hummels and Skiba 2004), thereby affecting low-value items disproportionately.¹¹ The designers of the 1906 tariff seemed to be aware of this, because they introduced new categories of goods, each category having its specific rate.¹² But the changes in 1906 were insufficient.¹³ Thus, the new tariff schedule embedded the paradoxical effect of changing relative prices in favor of more expensive items, and, as a result, new entrants shipping mainly low-end items continued to bear the burden of the tariff. As for the Spanish industry despite the lofty intentions of its architects, the tariff intensified competition at the high end.

¹¹ This is the classic Alchian-Allen result. Feenstra (1988), for instance, found that U.S. quotas and Japanese voluntary export restraints resulted in quality upgrading of Japanese auto exports. Since Spanish trade policy precipitated the entry of high-end goods, it may have had the unintended consequence of limiting the domestic industry's development of human capital necessary to move up the product ladder (Nunn and Trefler 2010).

¹² On the adjustment of specific duties and issues of measurement, see Tena-Junguito et al. (2012).

¹³ Sabaté (1995) gives examples. Thus, for unprinted and unbleached white or dyed textiles, the equivalent ad valorem 1906 tariff was 42 percent for coarse grades, and that for the medium grade, 39 percent.

Theoretical considerations: Trade costs and new products

Our objective in the remainder of this paper is twofold. First, we appraise whether the challenge posed by new entrants and new products caused by the collapse in trade costs and the diffusion of ring frames was real or imagined; second, we evaluate how established manufacturers in the European core and in Spain responded to the threat. To address these issues, we rely on insights of HFT models which are particularly well suited to intraindustry trade.

In HFT models, trade costs affect trade via the extensive and the intensive margins. The Melitz (2003) model makes several predictions of the determinants of trade margins and their relative importance that guide our empirical strategy. Define the extensive margin as the number of products exported by firms; the intensive margin as averages sales per firm. To begin, the model predicts that the extensive margin is negatively related to fixed and variable trade costs. The effect of changes in trade barriers on the intensive side is more subtle. A reduction in fixed costs lowers average sales per firm, the intuition being that incumbent firms sell less because of the presence of new, less productive entrants. As for variable costs, the effect on sales is unclear. Incumbent firms sell more, but the decline in marginal costs pulls in less productive concerns, and depending on the relative importance of incumbent and new firms, average sales per firm may rise or fall. Because of the ambiguous effects on the intensive side, studies have found that the extensive margin is more responsive to changes in trade costs and its contribution much larger.¹⁴

To be clear, because our data is limited to countries and products, in the empirical sections of this paper we define the extensive and intensive margins as products per country and sales per country. This procedure follows Lawless (2010a) and Dutt et al. (2013). In essence, a new product can be thought of as a new exporting firm. Thus, the decline in trade costs is observed in the entry of new products of established countries and in new products of new countries. For our purposes, the number of export lines per country captures a dimension of the rivalry between new entrants and incumbents that is not evident in measures of aggregate exports. As for average sales, since new entrants, who were less productive, did not have fully developed marketing

¹⁴ More precisely, the relative importance of the trade margins depends on the definition of the margins adopted. See Besedeš and Prusa (2011) and footnote 3 above. In defining margins at the product level, Lawless (2010a) and Dutt (2013) find a larger contribution of the extensive margin. We adopt their approach.

networks to expand sales, the intensive margin of these countries would be smaller than that of incumbents.

In order to identify the effect of trade costs on the relative size of the margins, we exploit Chaney's (2008) extension of the basic HFT model to incorporate the degree of substitution between home and foreign goods.¹⁵ A low elasticity of substitution implies a relatively larger extensive margin, because competition is limited and new firms capture market share, even if they have low productivity. Thus a low elasticity of substitution magnifies the impact of trade barriers on trade flows. For the same fall in trade costs, but with a high degree of substitution, the action is on the intensive side, because new, low-productivity firms make only a small dent in the market.¹⁶ A high elasticity of substitution dampens the impact of trade barriers on trade flows. A feature of the Spanish market, as we have described, was the degree of product differentiation, especially at the high end. For these producers, the extensive trumped the intensive margin.

Using aggregate values of trade, it would appear that the Spanish industry was shielded from the effects of the collapse in trade costs. The decomposition of trade into its margins gives a more nuanced portrait. To begin, the costs of doing business in Spain had to be met by domestic and foreign firms alike, the fall in trade costs impacting all manufacturers, although not proportionally. Like their foreign rivals, the degree of product differentiation mediated the effect of the fall in trade costs on the Spanish sector. On the one hand, in competitive markets, the emergence of new import products would have forced local firms to narrow product lines, leaving Spanish consumers with the same or even a smaller number of varieties to choose from.¹⁷ On the other, in markets for differentiated goods even unproductive Spanish firms, like their foreign rivals, would have survived. This may explain in part the overall poor productivity record of the Spanish industry. Regardless of the response, the conclusion that the domestic industry was unaffected by the emergence of new products would appear to be premature.

¹⁵ Chaney (2008) also includes a parameter for firm heterogeneity. In industries in which there are few large firms aggregate exports are sensitive to changes in transport costs, because many firms exit and enter when variable costs fluctuate.

¹⁶ Thus Chaney (2008) inverts the basic Krugman (1979) result that trade barriers have a stronger impact on trade flows when the elasticity of substitution between goods is high.

¹⁷ Baldwin and Forslid (2006) refer to this phenomenon as the anti-variety effect.

Data and descriptive statistics: How important was the emergence of new products?

Empirical applications of HFT models demand granular trade data. Our main source, *Estadísticas de Comercio Exterior de España*, gives detailed information on products traded, countries of origin and shipping, and prices. Our work expands on that of Tena-Junguito (2007). The product information provides more detailed than the 5-digit level of the Standard International Trade Classification. For instance, we have information on cotton woven (printed) fabrics, containing more than 85% cotton, and weighing less than 200 g./m, which are embroidered (our category 24), embroidered with a mixture of metal (25), and embroidered in relief (26). The SITC code for all three is 65234; we consider each a separate item so as not to lose information on product types. The appendix gives full details on products and countries.

The data have several flaws. For the entire period, we have information on the number of products and countries involved in trade. However, before 1897, with the exception of the period from 1885 to 1889, authorities conflated the import good's origin and country of shipping. Thus, we restrict our study at the country level to the period 1885-1889 and that after 1897.¹⁸ Second, with the adoption of the 1906 tariff, the Spanish authorities added several new product categories and changed demarcations of older products. To address this problem, we have standardized the classification across periods (pre- and post 1906). All together, we have 90 potential import categories until 1909, and 100 from 1910 to 1913, and 40 possible trading partners. In this paper, we use both a crude 14-group classification and a finer 100-product classification. A complete listing of items in the 14 product groups is given in the appendix.

The price information poses a different sort of problem. The custom officers gave identical prices to imports from all countries. To calculate unit values, we divided the export values by physical quantities (in kg) of the 90 or 100 items.¹⁹ To obtain annual average unit values per country, we weighted the prices of items by the export share of each item per year. For some purposes in this paper, and using the same procedure, we also construct average unit values by country per year based on the 14-group classification. We recognize the limits of our series, but our method conforms to modern studies (Hallak 2006). The resulting series conforms as well to

¹⁸ Exceptionally, in the last section of the paper, we infer the value of trade by origin before 1897 using the ratio of trade values between shipping and origin countries after 1897 (which was stable).

¹⁹ More precisely, we calculate values by country $j = \frac{\sum_{i=1}^n (p_i \cdot q_i)}{\sum_{i=1}^n q_i}$, where $n = 90$ or 100 , or the number of items included in each 14-group classification.

historical series on export prices of textiles for Germany and the U.K. (Brown 1995), and Belgium (Huberman 2012).²⁰

Figure 1 registers the numbers of exporting countries and products.²¹ In line with the greater fall in transport cost before the end of the century (Jacks et al. 2010), the number of countries participating in trade increased in the 1880s, from 11 to 23 partners, after which the number stabilized. The number of foreign goods in Spain rose from 20 to 45 between 1880 and 1890, peaking at 65 in 1906. The effects of the tariff varied, a point that we stress below. The 1891 tariff reduced the number of countries implicated in trade; that of 1906 reduced the number of products.

By 1900, Spain imported from a range of high and low-income countries. Table 1 gives the relative shares of exports by country. The U.K. was the leading exporter until 1908, when it was replaced by Germany. Contemporaries' flattering commentary on German linguistic skills, financing, and overall abilities to nurture commercial relations seems to have been on the mark. The share of French and Swiss imports more than doubled. The U.K., Germany, France, and Switzerland shipped the most popular items, cotton yarn (categories 1-6 in the appendix), and cotton woven fabrics, printed and plain (categories 7-14).²² Big and rich countries, it would seem, exported higher volumes of each good, but not necessarily in proportion to their size and wealth. The effects of technology and geography are difficult to separate in these cases. Export success of all firms, even productive ones, was conditional on their ability to manage trade costs. Consider the Belgium example. The country doubled its share of Spanish exports, even though there were few large firms in the industry. In fact, average firm size declined in the period and industry productivity stagnated. Still, the country underwent a major trade boom. Plummeting trade costs, caused by, among other factors, investments in the country's rail grid and port facilities, and the development of an extensive diplomatic network, were an important part of the story (Huberman 2012).

Table 3 gives the breakdown of product numbers by country. Once established, countries shipping more than five separate items, with the exception of Puerto Rico, maintained their

²⁰ The converse was also the case. For Spain, the import price index (Tena-Junguito 2007, pp. 34-35) doubled from 1890, the terms of trade moving decidedly against the country.

²¹ These are net entries of products and countries.

²² From 1905, the most popular items were cotton gauze, tulle, and lace (categories 39, 61, and 69). The leading exporters of these items were France, Germany, and Switzerland.

presence. The persistence of commercial ties is typical of markets with substantial trade costs.²³ The availability of U.S. goods during the Spanish-American War is a particular example of perseverance. There was greater volatility in the number of products each country sold. With imperfect information, a firm may have entered export markets, incurred beachhead costs, and exited shortly after evaluating its per-period fixed costs (Besedeš and Prusa 2011). Big and rich countries sold a greater number varieties, although, again, not in proportion to their size and wealth. One possible explanation of Table 3 is that for established exporters product diversification over time had a U-shape: an early phase of specialization, followed by diversification, and, finally, a return to specialization.²⁴ Perhaps a more compelling reading of Table 3 relates the general decline in products to the adoption of the 1906 tariff, the number of goods declining from 65 to 39 by 1913 as trade costs increased. Before the tariff, France exported a variety of products, from coarse and fine yarn to printed fabrics (categories 1-6 in the 14 product grouping in the appendix). But the number of products peaked in 1906, firms concentrating in a narrower range of high-end goods, mainly laces, tulles, and high end printed fabrics (categories 4, 9, 10). Among low-wage countries, the number of products exported by Italy and Portugal also topped out around the enactment of the 1906 tariff.

The arc of U.S. exports was different. The number of categories expanded throughout the period. In 1897, it exported mainly coarser materials, like cotton yarn and unbleached woven fabrics (categories 1 and 2), but by 1914 the country was also exporting cotton gauze, and a variety of miscellaneous goods, including hunting nets and hammocks, textile wall coverings and fabrics, and painting canvases (categories 6 and 14). Was it technology or geography driving U.S. exports? The answer is both. The U.S. industry was always on the technological frontier. The fall in trade costs relaxed the “tyranny of distance,” manufacturers making their first successful inroads abroad. The tariff increase of 1906 did not cause a decline in varieties sold because the U.S. industry had other margins of adjustment, like larger shipping holds and improved packaging, offsetting the rise in variable costs caused by the policy change.

²³ Besedeš and Prusa (2006) refer to this pattern as negative duration dependence, meaning that if a country is able to survive in the exporting market for the first few years, it will face a very small probability of failure and export the product for a long period of time.

²⁴ Imbs and Wacziarg (2003) found a similar pattern for a large sample of exporters after 1945. They surmised that, in the initial stage, specialization provided a foothold in foreign markets; an intermediate stage of diversification was the outcome of broader productivity change in the exporting country; the final phase saw a return to specialization as a result of agglomeration economies.

The relationship between the number of varieties shipped and level of development evolved over the period. To see this, we divide exporting countries into low, middle, and high-income countries in Figure 2.²⁵ (The U.S. is included in the high-income group.) While big and rich countries exported the largest range of varieties, relatively poorer countries began exporting many of the same types of goods. In 1900, about 25 percent of products were exported by low, middle, and high-income countries; by the end of the period, the same group exported 35 percent of products. By this yardstick, global competition between countries was real and intensifying.

This conclusion is partial, however. To get an idea of the importance of each export line, Table 4 calculates the degree of overlap, or similarity score, for the 100 product varieties exported in 1913. The index takes into account the share of each product in each country's exports. Following Fontagné et al. (2008), the similarity score between country A (column) and B (row) is calculated as one minus half the sum of the absolute value of the differences between the product or variety shares in manufacturing exports of country A and those of country B. It ranges between 0 (perfect dissimilarity) and 1 (perfect similarity). The figures in bold are similarity scores that declined between 1897 and 1913. The turn of the century seems to have been a period heightened competition. In response to this challenge, exporters actively sought to differentiate their products, 74/132 or 56 per cent of possible country pairs becoming more dissimilar.²⁶ For instance, by the end of the period, the Portuguese distinguished themselves at the low end of the product spectrum; their major competitor seems to have been the U.S., and, as we discuss below, local Spanish manufacturers. Overall, the U.S. appears to have established itself as a medium range producer. As for France, it had a sizeable overlap with Germany, but also competed against the Swiss and Belgians. The U.K. seems to have been the least successful in separating itself from its rivals. Because of its size, it produced a variety of goods, leaving itself most open to international competition. Its declining share of the Spanish market indicates that Lancashire could not count on its superior level of productivity to compensate for deficiencies in marketing and distribution.

In response to competition in similar product lines (horizontal differentiation), producers sought to improve the quality of goods exported (vertical differentiation). Big and rich countries sold a larger volume of each item and a greater variety of products, and they also shipped goods

²⁵ Our approach follows Schott (2004).

²⁶ We conducted a similar exercise for the cruder 14-product grouping. As expected, there was greater similarity at this level.

of higher quality. Figures 3a and 3b track the annual unit values of exports by country. Although these measures do not provide information on upgrading within product categories, they are a reasonable proxy for average quality. Whereas competition between high and low producers ebbed, that within high and low-end groupings intensified. In line with our previous results on product overlap, Figure 3a depicts the rivalry between Germany and France in more expensive goods. Spinning on mules, French and German industries increasingly specialized in high-end brands, a development that was already in place before the adoption of the 1906 tariff. Specialization was ongoing. Belgian firms initially exported cheap goods, but by 1913 emerged as producers of higher quality items, the improvement in prices being in the order of 30 percent. Still, prices were below those of its close neighbors and rivals, indicating that the accumulation of skills in Belgian industry lagged behind that of the leaders (Huberman 2012). Figure 3b confirms that Portugal, Italy, and the U.S. sold low and medium quality goods whose value was about the same at the beginning and the end of the period.²⁷ These goods resembled those manufactured by Spanish industry. The outlier was the U.K. that despite its early start, or perhaps because of it, specialized in a wide range of medium-value goods.

The emergence of new products and new competitors, along with the movement to higher-valued imports, had ramifications for Spanish producers.²⁸ As firms installed ring frames, itself an outcome of international forces, the range of products narrowed. The accounts of several leading manufacturers reveal a history of increased specialization in the face of competition. La España Industrial, an established large firm whose early reputation was based on the wide range of its product line, began installing ring frames in 1887. Within ten years all yarn was spun on rings, the proportion of nos. 15-24 in total yarn production rising from 30 to 90 percent between 1890 and 1913.²⁹ At the same time, the range of products contracted. Corduroy comprised 3 percent of production around 1900; by 1912 it was in the order of 50 percent. The story was not much different at La Fábrica la Rambla, a large Catalan business adopting ring frames around 1895 (Soler 1997). For many years, the firm manufactured a wide range of white and colored textiles for sheeting, but the years after 1909, in the aftermath of the tariff revision—a development we explain more fully below—saw a concentration in patterned towels. The average

²⁷ To illustrate, France's chief export in 1910, lace, commanded a price of 14.10 pesetas per kg; the leading U.S. export was unbleached woven fabrics at 6.12 per kg.

²⁸ Unfortunately, Spanish exports are not as detailed as imports. Still, from 1900 on, the proportion of dyed and printed goods rose at the expense of more broadly defined white goods.

²⁹ These figures are calculated from Calvo (2004, p. 255).

price of the firm's goods fell considerably, by about 30 percent around 1890, after which prices moved in a very small band (Soler 2000). In the face of competition, both firms made a concerted effort in establishing networks of sales agents across Spain (Prat and Soler 2002). Overall, the collapse in trade costs prompted the greater specialization of Spanish producers in low to middle-end items, with the result that some domestic varieties were displaced by imports.

The margins of trade: What drove the expansion in new products?

So far we have documented the emergence of new products and new exporters in the Spanish market. In this section, we ask which countries were in best position to take advantage of the fall in trade costs and why. To do so, we decompose the value of trade into intensive and extensive margins. Recall that the effects of trade costs on trade are mediated by the margins of trade. The fall in trade costs precipitated the entry of new products and the increased sales of established and new products. The relative contribution of the extensive margin varied with the degree of product differentiation. Because many of the new entrants had low average sales, the intensive margin was smaller.

We use the methodology of Hummels and Klenow (2005) to derive estimates of the two margins for 1900 and 1910.³⁰ The method of calculation is described in detail in the appendix. In brief, the extensive margin gives an idea of the relative importance of each exporter's good set relative to that of all other exporters; the intensive margin compares each country's export share relative that of its rivals.

For the entire sample of countries, the contribution of the extensive margin was about five times greater than the intensive one. Big and rich countries had a relatively larger extensive margin than producers in the European periphery, in the order of between 2 and 3 to 1. But trade costs mattered too. The extensive margin of the U.S. more than doubled between 1900 and 1910, while that of new competitors increased by more than 50 percent (last row of Table 5). Since productivity levels of many latecomers remained way below that of the European core, it is reasonable to suppose that entry costs had fallen and the degree of product differentiation had increased. The intensive margin of core countries was relatively larger, an expected result since seasoned exporters like the Germans had well developed relationships with its Spanish clients. In

³⁰ We have also calculated margins on a five-year basis from 1885. The results are similar to those reported in Table 5.

contrast, the intensive margin for new entrants remained small. The inference is that new rivals encountered difficulties in extending market share upon introducing new product lines.

The decomposition of trade into its margins gives a different picture of the nature of competition than is possible with aggregate values. To see this, we contrast in Tables 6 and 7 the determinants of total value of exports by country and that of the two margins. We are interested in separating the innate and acquired advantages of core countries from other factors affecting trade, consisting of distance to the Spanish market, and specific trade relations, like the existence of most favored nation treaties and diplomatic representation in Spain. To be sure, the procedure is marred because of omitted and poorly measured variables, but our specification, and for that matter findings, do not differ from that of more recent studies (Lawless 2010a; Dutt et al 2013). We use GDP per capita and wages to capture the advantages of exporters' domestic market size and productivity. For aggregate exports, the coefficients are in line with other studies (López Córdova and Meissner 2003) of bilateral trade. Big and rich countries, and those closer to Spain and on the gold standard, exported more. The adoption of changes in the tariff (calculated as the annual ad valorem equivalent) was inconsequential.³¹ So so was signing a MFN treaty, a plausible explanation being that countries having negotiated MFN agreements had long-established trade relationships (Lampe 2011). Diplomatic representation in Spain, again the privilege of the club of rich countries, did grow trade volumes. Based on these results, it would appear that new entrants had little likelihood of success in the Spanish market.

Table 7 presents another perspective. The dependent variables are the two margins as calculated by Hummels and Klenow's (2005) procedure. As before, in both cases, GDP per capita is positive and significant, big and rich countries selling a greater variety of goods and a larger value of each good. Again, the tariff is insignificant. Having a MFN does not seem to have had a positive effect, if anything it may have been counterproductive with regard to the number of items sold. But the coefficient on distance varies across the two regressions, the extensive being less responsive than the intensive margin. On the intensive side, farflung exporters were disadvantaged in expanding sales. On this score, the U.S. had to work hard to deepen sales, whereas France had the luxury of a common border. However, on the extensive side, as long as countries positioned themselves in markets for differentiated goods, distance was less of a

³¹ The ad valorem rate = $\frac{\sum_{i=1}^{n=100} Duties_i}{\sum_{i=1}^{n=100} unit\ value_i * q_i}$, where q_i are the quantities traded of the 14-item grouping.

handicap. The implication is that while industries in European core had the advantage of size and wealth, new exporters and new products were not shut out of the Spanish market either.

Challenge and response: Adapting product variety to changes in commercial policy

In practice, policy uncertainty casts a shadow on firms' decisions on investing in foreign markets (Handley and Limão 2012). Success in the Spain rested on firms' adaptability to unanticipated changes in commercial and marcoeconomic policy and exchange rate volatility. Since policy changes affected relative pieces of goods imported, they also altered the competitive landscape. To get a sense of firms' responses to changes in global competition and in Spanish commercial policy, we examine the adjustment in margins over time. Following Bernard et al. (2009), we calculate the extensive margin as the change in trade due to the net entry of countries and products, and the net intensive margin as the increase in trade due to the contribution of already established countries and products.

Table 8 presents the margins for three sub-periods and for the entire period: the early years of expansion in country, products, and total imports; a second period of decline which included the adoption of the 1891 tariff; and a third phase of volatility marked by the 1906 tariff. The extensive margin comprises the net entry of countries and the net entry of products by continuing and new countries (lines 1-6). The intensive margin is the increase in trade due to the contribution of continuing countries and products (lines 7-9). As constructed, a new product or new country in the first sub-period is considered an established product or incumbent trade partner in the successive period. For the entire period, products and countries are considered new if they were not present in 1885. Line 10a gives the annual change of imports for each sub-period and line 10b the total change in imports in the period. With the exception of line 10b, all figures are annual averages for the period indicated. Lines 12 and 13 reports the percentage contribution of the two components of the extensive margin, and line 14 that of the intensive margin.

A feature of the sub-periods was the difference in gross versus net entry of products (lines 4 to 6), the type of churning we would expect to find in a model of heterogeneous firms. As trade costs fell, new countries often shipped untested goods, some finding markets and others not. After related-party trade was initiated, product-country changes, which represented fluctuations in demand, were substantial. Thus, the intensive trumps the extensive margin in the sub-periods,

the average being in the order of 100 percent.³² The contribution of the extensive margin varies. The early period saw a net entry of countries; the second, the entry of new products. The third phase was more complicated. There were entry and exit of product lines, an outcome of the drive to specialization or differentiation reported in Table 4. Over the entire period, the change in the extensive margin was only slightly less than the intensive side. An extensive margin of this order gives comfort to our claim about the presence of entry costs in export activity.

The decomposition in Table 8 extends our previous discussion on the responses of countries to changes in commercial policy. On the extensive side, a handful of countries abandoned exporting after the adoption of the 1891 general tariff (line 3). But all countries, even rich ones, were hit by a drop in sales, and, as a result, the change in the intensive margin was large in absolute and percentage terms (line 14).³³ As imports declined, Spanish firms would have filled the void across the product spectrum. The selective 1906 tariff had different implications. The tariff aimed to restrict imports of high-value goods, but despite the intention of its designers, it had the opposite effect. Whereas all countries suffered to some extent a fall in sales in certain product lines, average annual product-country increases (line 7) were in fact twice as large (in absolute size) as decreases between 1905 and 1913 (line 8). Some of these gains came from the relative fall in prices of high-end items and the increase in their demand. The total change in imports (line 10b) is actually positive in this sub-period which meant greater competition, not less, for foreign as well as Spanish firms.³⁴ The changes in the extensive margin were large, with incumbent exporters faring better than new entrants because of their innate and acquired advantages.

The new tariff seems to have coincided with ongoing changes in the number and type of export products we have previously identified. Recall that European core manufacturers cut back on their export lines sometime after 1900 (Figure 1), shipping more high-end items (Figure 3). The overlap in the varieties of goods exported narrowed (Table 4), a process that was underway

³² The intensive margin is generally larger in the short run, because of the small size of entrants relative to the number of incumbents (products and countries), and relatively strong growth of incumbents conditional on survival (Bernard et al. 2009).

³³ In theory, the intensive margin conflates two opposing effects: the general fall in sales and the exit of some of the lowest sale or unproductive countries. Depending on the relative importance of these two effects, average sales of existing products per country could have risen or fallen. In the aftermath of the 1891 tariff, the general fall in sales (line 8) overwhelmed that attributed to the exit of low-productivity countries (line 4), the net intensive margin (line 9) being negative as a result.

³⁴ In the post 1906 period, unproductive concerns exited and there was a shift in sales to productive firms, the net intensive margin being positive as a result (line 9).

after 1900. The tariff changes encouraged countries to further intensify product differentiation. In the case of France, the number of products exported fell (Table 2), even as its share in trade increased (Table 1). Among new entrants, the U.S. was exceptional, the number of varieties it sold doubled after 1908. Spanish manufacturers were not isolated from these changes. In these years La España Industrial and La Fábrica la Rambla reduced the number of their product lines. The irony is that the adoption of stiffer tariffs which aimed to harm manufacturers in the core had instead the opposite effect, postponing catch-up in less developed countries and giving a second breath to industries of rich economies.

The contraction in product lines after 1900 gives credence to this paper's main claim that product variety was a dimension of international competition. In Table 9, we report results of a regression on the determinants of exporter specialization.³⁵ The dependent variable is unit values by exporting country for the 14-group classification. The independent variables are pretty much the same as in Tables 6 and 7. We use GDP per capita and wages to capture the advantages of exporters' domestic market size and productivity. The regressions control for capital-labor ratios and cost structures in 1910. Having a MFN did not increase unit values; the effect of the gold standard was mixed. While insignificant, the sign of the tariff coefficient is negative, unit values increasing as a result of the 1906 changes.³⁶ The deeper factors behind the drive to specialization lay elsewhere. Across all regressions, the effect market size of exporters on unit values is positive and significant. We find a *positive* effect of distance on the value of goods traded. This result, which has been reported elsewhere, is consistent with a strategy of pricing to market in differentiated goods.³⁷ Controlling for distance, border countries did ship higher valued goods. This may reflect the French advantage of transport by rail. As expected, the value of goods sold in Spain increased as income rose, a tendency favoring exporters in the European core because of their experience in catering to wealthier markets. Established exporters concentrated in higher valued goods; and new entrants and Spain in lower end ones, a sector in which competition was stiffer. The bottom line is that even before the adoption of the 1906 tariff, a new global division

³⁵ Our regression setup follows Fontagné et al. (2008, p. 72).

³⁶ Recall that import values rose after the adoption of the 1906 tariff. So, if the increase in the denominator exceeded that of the numerator, ad valorem rates would have fallen. The negative sign of the tariff coefficient indicates that unit values increased as a result of the 1906 changes.

³⁷ Using recent data on Chinese exports, Manova and Zhang (2012) report that unit values of high-end goods increased with distance; the opposite held for low-end goods. See, also, Bernard et al (2007), and Martin and Florian Mayneris (2013).

of output was taking shape in which firms across the core and the periphery, and in Spain, specialized in products corresponding to factor endowments of labor and capital.

Implications: Product variety and globalization before 1914

During the great wave of globalization before 1914, contemporaries routinely delivered warnings about the pending invasion of cheap textile goods in the customary markets of manufacturers in the European core. These claims are difficult to justify using aggregate or coarse trade data. In this paper, exploiting highly disaggregated information on Spanish imports, we have given credence to contemporary statements on international competition. The type and number of products was a dimension of competitiveness as much as the share of exports. To see this, we have decomposed trade into its extensive and intensive margins. In line with HFT models, as trade costs collapsed, new competitors accessed foreign markets, the number of products they shipped, the extensive margin, increasing as a result.

Newcomers faced serious constraints in the Spanish market. They did not have the experience of incumbents in marketing or the resources to extend credit. With the exception of the U.S., their productivity levels were inferior to producers in the European core. Moreover, the goods they sold had close substitutes. Altogether, the new entrants had difficulty in growing their markets, the intensive margin of these countries being relatively smaller as a result. That said, established producers recognized the challenge posed by new rivals, and they responded by upgrading product lines, adjusting prices accordingly. By 1914 countries' export specialization was pinned down by factor endowments of labor and capital. While firms in new industrializing countries exported low-end varieties, their rivals in the rich industrial core shipped high-end goods, unit values increasing with levels of development. The implication is that certain products formerly produced by Spanish firms were now imported.

While these findings are limited to bilateral trade for a single country, our approach casts a fresh perspective on the nature and consequences of international trade in the great wave of globalization in two ways. First, invoking Heckscher-Ohlin, O'Rourke and Williamson (1999) claim that declining trade costs in interindustry trade resulted in real-wage convergence before 1914. Assuming perfect competition and homogenous goods, these types of models operate at high level of aggregation and ignore the roles of firms and products (Bernard et al. 2007). Using granular trade data, we have found that declining trade costs in intraindustry trade triggered the

export of new products. If home and foreign goods were not identical, pressures on wages would have been moderated, all the more since intraindustry trade comprised a large share of the period's trade. In this regard, the Spanish case was representative because of its position in the European commercial network. Second, our study suggests that the relationship between globalization and productivity growth may not have been as tight as we have come to accept. The decline in trade costs pulled in low-productivity firms that survived because transaction costs kept on falling or because the goods market became increasingly differentiated. Whether or not the Spanish case holds more generally serves as a starting point for an ample research agenda.

References

- A'Hearn, Brian (1998). "Institutions, Externalities, and Economic Growth in Southern Italy: Evidence from the Cotton Textile Industry, 1861-1914." *Economic History Review* 51: 734-62.
- Albornoz, Facundo, Hector F. Calvo Pardo, Gregory Corcos, and Emanuel Ornelas (2012). "Sequential Exporting." *Journal of International Economics* 88: 17-31.
- Almanach de Gotha (1939). *Annuaire généalogique, diplomatique et statistique*. Gotha: Justus Perthes.
- Amiti, Mary and Caroline Freund (2010). "An Anatomy of China's Export Growth," in Robert C. Feenstra and Shang-Jin Wei, editors, *China's Growing Role in World Trade*. Chicago; University of Chicago Press.
- Baldwin, Richard and Rikard Forslid (2006). "Trade Liberalization With Heterogeneous Firms." NBER working paper 12192.
- Becuwe, Stéphane, Berttrand Blancheton, and Léo Charles (2012). "The Decline of French Trade Power during the First Globalization (1850-1913)." *Cahiers du GREThA*, no. 2012-22.
- Belgium (1910). *Recueil consulaire: les rapports commerciaux des agents belges à l'étranger*. Brussels.
- Bernard, Andrew B., J. Bradford Jensen, Stephen J. Redding, and Peter K. Schott (2007). "Firms in International Trade." *Journal of Economic Perspectives* 21: 105-30.
- Bernard, Andrew B., J. Bradford Jensen, Stephen J. Redding and Peter K. Schott (2009). "The Margins of US Trade." *American Economic Review* 99: 487-93.
- Bernard, Andrew B., J. Bradford Jensen, Stephen J. Redding, and Peter K. Schott (2011). "The Empirics and Firm Heterogeneity and International Trade." NBER Working Paper 17627.
- Besedeš, Tibor and Thomas J. Prusa (2006). "Ins, Outs, and the Duration of Trade." *Canadian Journal of Economics/Revue canadienne d'économique* 39: 266-95.
- Besedeš, Tibor and Thomas J. Prusa (2011). "The Role of Extensive and Intensive Margins and Export Growth." *Journal of Development Economics* 96: 371-79.
- Broadberry, Stephen and Andrew J. Marrison (2002). "External Economies of Scale in the Lancashire Cotton Industry, 1900-1950." *Economic History Review* 55: 51-77.
- Brown, John (1995). "Imperfect Competition and Anglo-German Trade Rivalry: Markets for Cotton Textiles Before 1914." *Journal of Economic History* 5: 494-527.
- Calvo, Angel (2004). "Estrategia de competitividad: la diferenciación del product en la industria algodoner catalan. Una aproximación desde la La España Industrial." *Estudis d'història Agraria* 17: 243-64.
- Chaney, Thomas (2008). "Distorted Gravity: The Intensive and Extensive Margins of International Trade." *American Economic Review* 98: 1707-21.
- Clark, Gregory (1987). "Why Isn't the Whole World Developed? Lessons from the Cotton Mills." *Journal of Economic History* 49: 707-14.
- Crafts, Nicholas and Nikolaus Wolf (2013). "The Location of the UK Cotton Textiles Industry in 1838: A Quantitative Analysis." CAGE Online Working Paper Series 147.
- Domenech, Jordi (2008). "Labour Market Adjustment a Hundred Years Ago: The Case of Catalan Textiles, 1880-1913." *Economic History Review* 61: 1-26.

Dutt, Pushan, Ilian Mihov, and Timothy Van Zandt (2013). "The Effect of WTO on the Extensive and Intensive Margins of Trade." INSEAD, working paper, 2013/38/EPS.

Eaton, Jonathan and Samuel Kortum (2002). "Technology, Geography, and Trade." *Econometrica* 70: 1741-79.

Fajgelbaum, Pablo, Gene M. Grossman and Elhanan Helpman (2011). "Income Distribution, Product Quality, and International Trade." *Journal of Political Economy* 119: 721-65.

Falvey, Rodney E. (1979). "The Composition of Trade Within Import-restricted Categories." *Journal of Political Economy* 87: 1105-1114.

Farnie, Douglas A. (2004). "The Role of Merchants as Prime Movers in the Expansion of the Cotton Industry, 1760-1990." In *The Fibre That Changed the World: The Cotton Industry in International Perspective, 1600-1990s*, edited by Douglas A. Farnie and David J. Jeremy. Oxford: Oxford University Press. Pp. 15-55.

Feenstra, Robert C. (1988). "Quality Change under Trade Restraints in Japanese Autos." *Quarterly Journal of Economics* 103: 131-146.

Felbermayr, Gabriel J. and Wilhelm Kohler (2006). "Exploring the Intensive and Extensive Margins of World Trade." *Review of World Economics* 142:642-74.

Fernandez, Alexandre (2009). "Théorie et Pratiques du Protectionnisme à la fin du XIXe siècle et au début du XXe siècle en Espagne. Réflexions à partir de l'action de l'industriel et publiciste basque Pablo de Alzola." In *La croissance en économie ouverte (XVIIe-XXIe siècles). Hommages à Jean-Charles Asselain*. Brussels: Peter Lang. Pp. 237-62.

Fontagné, Lionel, Guillaume Gaulier, and Soledad Zignago (2008). "North-South Competition in Quality Specialisation across Varieties within Products and North-South Competition." *Economic Policy* 23: 51-91.

Hallak, Juan Carlos (2006). "Product Quality and the Direction of Trade." *Journal of International Economics* 68: 238-65.

Handley, Kyle and Nuno Limão (2012). "Trade and Investment under Policy Uncertainty: Theory and Firm Evidence." CEPR Discussion Paper 8798.

Helpman, Elhanan, Marc Melitz, and Yona Rubinstein (2008). "Estimating Trade Flows: Trading Partners and Trading Volumes." *Quarterly Journal of Economics* 123: 441-87.

Huberman, Michael (2012). *Odd Couple: International Trade and Labor Standards in History*. New Haven: Yale University Press.

Hummels, David and Peter J. Klenow (2005). "The Variety and Quality of a Nation's Exports." *American Economic Review* 95: 704-23.

Hummels, David and Alexandre Skiba (2004). "Shipping the Good Apples Out? An Empirical Confirmation of the Alchian-Allen Conjecture." *Journal of Political Economy* 112: 1384-1401.

Imbs, Jean and Romain Wacziarg (2003). "Stages of Diversification." *American Economic Review* 93: 63-86.

International Labour Organisation (1937). *The World Textile Industry. Volume I: Economic and Social Problems*. Geneva.

Jacks, David, Christopher Meissner, and Denis Novy (2010). "Trade Costs in the First Wave of Globalization." *Explorations in Economic History* 47: 127-41.

- Jacks, David and Krishna Pendakur (2011). "Global Trade and the Maritime Transport Revolution." *Review of Economics and Statistics* 92: 745-55.
- Kertesz, Adolf (1917). *Die Textilindustrie sämtlicher Staaten*. Braunschweig: F. Vieweg.
- Krugman, Paul (1979). "Increasing Returns, Monopolistic Competition, and International Trade." *Journal of International Economics* 9: 469-79.
- Lampe, Markus (2011). "Explaining Nineteenth-century Bilateralism: Economic and Political Determinants of the Cobden–Chevalier Network." *Economic History Review* 64: 644-68.
- Lawless, Martina (2010a). "Deconstructing Gravity: Trade Costs and Extensive and Intensive Margins." *Canadian Journal of Economics* 43: 1149-72.
- Lawless, Martina (2010b). "Geography and Firm Exports: New Evidence on the Nature of Sunk Costs." *Review of World Economics (Weltwirtschaftliches Archiv)* 146: 691-707.
- Leunig, Timothy (2003). "A British Industrial Success: Productivity in the Lancashire and New England Cotton-Spinning Industries a Century Ago." *Economic History Review* 56: 90–117.
- López Córdova, J. Ernesto and Christopher M. Meissner (2003). "Exchange Rate Regimes and International Trade: Evidence from the Classical Gold Standard Era, 1870-1913." *American Economic Review* 93: 344-53.
- Maddison, Angus (2013). *Historical Statistics of the World Economy*. (webpage).
- Manova, Kalina and Zhiwei Zhang (2012). "Export Prices Across Firms and Destinations." *Quarterly Journal of Economics* 127: 379-436.
- Marrison, Andrew (1996). "India Summer," in Mary B. Rose, ed., *The Lancashire Cotton Industry: A History Since 1700*. Preston, U.K.: Lancashire County Books. Pp. 238-65.
- Marrison, Andrew, Stephen Broadberry, and Timothy Leuing (2008). "Selling English Cotton Into the World Market: Implications for the Rationalisation Debate, 1900-1939." In *Essays in Lancashire & Textiles History: A Tribute to Douglas A. Farnie*, edited by F. Wilson. Lancaster, U.K.: Carnegie Books.
- Martin, Julien and Florian Mayneris (2013). "High-End Variety Exporters Defying Distance: Micro Facts and Macroeconomic Implications." Paris School of Economics G-MonD Working Paper 35.
- Melitz, Marc J. (2003). "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71: 1695-1725.
- Mitchener, Kris James and Marc Weidenmier (2008). "Trade and Empire." *Economic Journal* 118: 1805-34.
- Nadal, Jordi and Carles Sudrià (1993). "La controversia en torno al atraso económico español de la segunda mitad del siglo XIX (1860-1913)." *Revista de Historia Industrial* 21: 201-25.
- Nunn, Nathan and Daniel Trefler (2010). "The Structure of Tariffs and Long-Term Growth." *American Economic Journal: Macroeconomics* 2: 158–194.
- Odell, Ralph M. (1911). *Cotton Goods in Spain and Portugal*. Washington D.C.
- Odell, Ralph M. (1912). *Cotton Goods in Italy*. Washington D.C.
- Officer, Lawrence (2008). "Gold Standard." Eh.net Encyclopedia. Webpage.

- O'Rourke, Kevin H. and Jeffrey G. Williamson (1999), *Globalization and History: The Evolution of a Nineteenth-Century Atlantic Economy*. Cambridge, Mass: MIT Press.
- Petitpas, Philippe (2012). "Industries et industriels français du textile face au défi international 1871-1914." Ph.D. thesis, Université de Montréal.
- Prados de la Escosura, Leandro and Joan R. Rosés (2009). "The Sources of Long-Run Growth in Spain, 1850-2000." *Journal of Economic History* 69: 1063-92.
- Prat, Marc (2009a). "Between the Firm and the Market: An International Comparison of the Commercial Structures of the Cotton Industry (1820-1939)." *Business History* 51: 181-209.
- Prat, Marc (2009b). "Textile Trade and Trade Credit in Spain, 1840-1913." *Financial History Review* 16: 73-94.
- Prat, Marc and Raimon Soler (2002). "Weaving the Network? The international Marketing's Failure of Catalan Cotton Textiles (1850-1930)." In *Transnational Companies, 19th -20th Centuries*, edited by Hubert Bonin et al. P.L.A.G.E.: Paris. Pp. 219-37.
- Pratt, Edward Ewing (1917). *Cotton Textiles: International Trade and Merchandising Methods*. Washington: GPO.
- Roberts, Mark J. and James R. Tybout (1995). "An Empirical Model of Sunk Costs and the Decision to Export." The World Bank International Economics Department, working paper 1436.
- Rose, Andrew (2004). "Do We Really Know That the WTO Increases Trade?" *American Economic Review* 94: 98-114.
- Rose, Mary B. (2000). *Firms, Networks, and Business Values: The British and American Cotton Industries Since 1750*. Cambridge: Cambridge University Press.
- Sabaté, Marcela (1995): "La impronta industrial de la reforma arancelaria de 1906." *Revista de Historia Industrial* 7: 81-107.
- Saxonhouse, Gary and Gavin Wright (2004). "Technological Evolution in Cotton Spinning, 1878-1933." In *The Fibre That Changed the World: The Cotton Industry in International Perspective, 1600-1990s*, edited by Douglas A. Farnie and David J. Jeremy. Oxford: Oxford University Press. Pp. 129-52.
- Saxonhouse, Gary and Gavin Wright (2010). "National Leadership and Competing Technological Paradigms: The Globalization of Cotton Spinning, 1878-1933." *Journal of Economic History* 70: 535- 66.
- Schott, Peter (2004). "Across-Product Versus Within-Product Specialization in International Trade." *Quarterly Journal of Economics* 119: 647-78.
- Sisic, Pierre (1994). "Establishment Size and Economies of Scale in 19th-century France." *Explorations in Economic History* 31: 453-78.
- Soler, Raimon (1997). "Réditos algodóneros. Las cuentas de la fábrica de 'la Rambla', de Vilanova (1840-1914), revisión y ampliación." *Revista de Historia Industrial* 12: 205-29.
- Soler, Raimon (2000). "Estratègies empresarials en la indústria cotonera catalana. El cas de la Fàbrica La Rambla de Vilanova, 1833-1965." PhD thesis, Universitat de Barcelona.
- Spain (various years). *Estadísticas de Comercio Exterior de España*. Madrid.
- Spain (1910). *Census of Population*. Madrid.

Tena-Junguito, Antonio (2007). "New Series of the Spanish Foreign Sector, 1850-2000." Universidad Carlos III de Madrid, Working Papers in Economic History, WP7-14.

Tena-Junguito, Antonio, Markus Lampe, and Felipe Tâmega Fernandes (2012). "How Much Trade Liberalization Was There in the World Before and After Cobden-Chevalier?" *Journal of Economic History* 72: 709-43.

United Kingdom (1884-1914). *Diplomatic and Consular Reports. Spain*. London.

Appendix

Exporting Countries

1) Algeria	2) Andorra	3) Arabia,	4) Argentina	5) Austria-Hungary
6) Belgium	7) Bolivia	8) Brazil	9) Bulgaria	10) Chile
11) China	12) Colombia	13) Cuba	14) Denmark	15) Egypt
16) Eq. Guinea	17) Finland	18) France	19) Germany	20) Guatemala
21) Italy	22) Japan	23) Mexico	24) Morocco	25) Netherlands
26) Norway	27) Panama	28) Paraguay	29) Peru	30) Philippines
31) Portugal	32) Puerto Rico	33) Russia	34) Sweden	35) Switzerland
36) Turkey	37) Uruguay	38) UK	39) USA	40) Venezuela

List of products and SITC classification

Num.	SITC Classification
1	65122 Cotton sewing thread, packaged for retail sale
2	65133 Cotton yarn, one or two threads, count <35
3	65133 Cotton yarn , one or two threads, count >36
4	65133 Cotton yarn , three threads, count <35
5	65133 Cotton yarn, three threads, count >36
6	65133 Cotton yarn , twisted, three or more threads
7	65221, 65231, 65232, 65233 Cotton woven fabrics, unbleached, bleached, dyed, of yarns of different colours, not under 85% cotton, weighing not over 200 g/m2
8	65221, 65231, 65232, 65233 ... embroidered
9	65221, 65231, 65232, 65233 ... clothing or finished
10	65221, 65231, 65232, 65233 ... embroidered and clothing
11	65221, 65231, 65232, 65233 ... embroidered with mixture of metal
12	65221, 65231, 65232, 65233 ... embroidered in chain stitched
13	65221, 65231, 65232, 65233 ... embroidered in relief
14	65221, 65231, 65232, 65233 ... embroidered and clothing with mixture of metal
15	65222, 65241, 65242, 65244 Cotton woven fabrics, unbleached, bleached, dyed, of yarns of different colours, not under 85% cotton, weighing over 200 g/m2
16	65222, 65241, 65242, 65244 ...embroidered
17	65222, 65241, 65242, 65244 ...clothing or finished
18	65222, 65241, 65242, 65244 ...embroidered and clothing
19	65222, 65241, 65242, 65244 ...embroidered with mixture of metal
20	65222, 65241, 65242, 65244 ... embroidered in chain stitched
21	65222, 65241, 65242, 65244 ... embroidered in relief
22	65222, 65241, 65242, 65244 ... embroidered with mixture of metal and clothing
23	65234 Cotton woven fabrics printed, not under 85% (weight cotton) weighing not over 200 g/m2
24	65234 ... embroidered
25	65234 ...embroidered with mixture of metal
26	65234 ...embroidered in relief
27	65234 ... embroidered in chain stitched
28	65234 ... clothing or finished
29	65234 ... embroidered and clothing
30	65234 ...embroidered and clothing with mixture of metal
31	65245 Cotton woven fabrics printed, not under 85% (weight cotton) weighing over 200 g/m2
32	65245 ... embroidered
33	65245 ... embroidered in relief
34	65245 ... embroidered in chain stitched
35	65245 ... embroidered with mixture of metal
36	65245 ... clothing or finished

37	65245	... embroidered and clothing
38	65245	... embroidered and clothing with mixture of metal
39	65211	Cotton gauze (we include woven diaphanous, muslins, gauze)
40	65211	... embroidered
41	65211	... embroidered with mixture of metal
42	65211	... embroidered in relief
43	65211	... embroidered in chain stitched
44	65211	... clothing or finished
45	65211	... embroidered and clothing or finishing
46	65211	...embroidered and clothing with mixture of metal
47	65497	Woven tufted textile fabrics (other than narrow or special fabrics)
48	65497	... embroidered
49	65497	... embroidered with mixture of metal
50	65497	... clothing or finished
51	65497	... embroidered and clothing
52	65497	... embroidered and clothing with mixture of metal
53	65214, 65215	Cotton pile and chenille woven fabric
54	65214, 65215	...embroidered
55	65214, 65215	...embroidered with mixture of metal
56	65214, 65215	...embroidered in relief
57	65214, 65215	...embroidered in chain stitched
58	65214, 65215	...clothing or finished
59	65214, 65215	...embroidered and clothing
60	65214, 65215	...embroidered with mixture of metal and clothing
61	65641	Tulles and other net fabrics (not including woven, knitted or crocheted fabrics)
62	65641	...embroidered with mixture of metal
63	65641	...embroidered
64	65641	...embroidered in relief
65	65641	...embroidered in chain stitched
66	65641	...clothing or finishing
67	65641	...embroidered and clothing
68	65641	...embroidered with mixture of metal and clothing
69	65642, 65643	Lace (mechanically made and hand-made)
70	65642, 65643	...embroidered
71	65642, 65643	... embroidered with mixture of metal
72	65642, 65643	... clothing or finished
73	65642, 65643	... embroidered and clothing
74	65511, 65512, 65519, 65529	Knitted or crocheted
75	65511, 65512, 65519, 65529	...embroidered
76	65511, 65512, 65519, 65529	Socks, gloves embroidered with mixture of metal
77	65511, 65512, 65519, 65529	... clothing or finished
78	65511, 65512, 65519, 65529	... clothing or finished
79	65511, 65512, 65519, 65529	In pieces, T-shirts, pants
80	65511, 65512, 65519, 65529	... in pieces, T-shirts, pants embroidered
81	65511, 65512, 65519, 65529	...in pieces, T-shirts, pants embroidered with mixture of metal
82	65511, 65512, 65519, 65529	...in pieces, T-shirts, pants, clothing
83	65511, 65512, 65519, 65529	... in pieces, T-shirts, pants, clothing with mixture of metal
84	65511, 65512, 65519, 65529	...in pieces, T-shirts, pants, clothing and embroidered
85	65511, 65512, 65519, 65529	Socks, gloves
86	65511, 65512, 65519, 65529	...socks, gloves embroidered
87	65511, 65512, 65519, 65529	... socks, gloves embroidered with mixture of metal
88	65511, 65512, 65519, 65529	... socks, gloves finished
89	65511, 65512, 65519, 65529	... socks, gloves finished embroidered
90	65511, 65512, 65519, 65529	... socks, gloves embroidered and finished with mixture of metal
91	65953	Carpets and other textile floor
92	 clothing or finished

93	65735	Textile wall covering
94	65761	Hats forms, hat bodies and hoods of felt
95	 clothing or finished
96	65731	Textile fabrics coated gum, for book covers, prepared painting canvas,
97		Towels and similar textiles
98		Wicks for lamps and candles
99		Nets for hunting and hammocks
100		Corduroy

Product Groups

The 14-product grouping is composed of: 1) Cotton yarn (from 1-6 variety number); 2) cotton woven fabrics weighing not over 200 gr./m² (7-14); 3) cotton woven fabrics weighing over 200 gr./m (15-22); 4) Cotton woven fabrics printed not over 200 gr./m² (23-30); 5) cotton woven fabrics printed over 200 gr./m² (31-38); 6) cotton gauze (woven diaphanous, muslins, gauze (39-46); 7) woven tufted textile fabrics (47-52); 8) cotton pile and chenille woven fabric (53-60); 9) tulle and other net fabrics (61-68); 10) lace (mechanically made and hand-made)(69-73); 11) knitted or crocheted fabrics (74-78); 12) knitted or crocheted in pieces, T-shirts, pants (79-84); 13) knitted or crocheted socks and gloves (85-90); 14) other cotton textiles (91-100), only for 1910 and 1913. The finer product grouping consists of 90 products for all years before 1910; and 100 for 1910 and 1913.

Extensive and Intensive Margins

To start, define country j = exporter; k = all other exporters or the reference country; m = Spain; I is total available product categories; and I_{jm} the set of observable categories in which country j has positive exports to m . The ratio of country j to country k exports to m , or the share of country j exports to total exports to m , equals the product of the extensive and intensive margins. The *extensive margin* gives an idea of the relative importance of each exporter's good set relative to the reference group, or the weighted count of j 's categories relative to country k 's categories.³⁸ The idea is that if all categories are of equal importance, the extensive margin is simply the fraction of categories in which j exports to m (Spain). This setup prevents a category from appearing to be important only because country j and no other country exports a lot of this category to m . More formally, the extensive margin is the ratio of country k exports to country m in I_{jm} (or the set of observable categories of which country j has positive exports to m), relative to country k 's exports to m in I categories (or all available categories). In our case, the total number of available categories in 1910 is 48.

$$EM_{jm} = \frac{\sum_{i \in I_{jm}} p_{kmi} \cdot x_{kmi}}{\sum_{i \in I} p_{kmi} \cdot x_{kmi}} .$$

The *intensive margin* compares the nominal trade values of j and k , defined as the ratio of j 's nominal exports relative to k 's exports in the categories in which j exports to country m (I_{jm}):

$$IM_{jm} = \frac{\sum_{i \in I_{jm}} p_{jmi} \cdot x_{jmi}}{\sum_{i \in I_{jm}} p_{kmi} \cdot x_{kmi}} .$$

³⁸ Hummels and Klenow's definition gives weights to individual products. A country that exports cars and computers will have a larger extensive margin than a country that exports carrots and potatoes, although both export just two goods.

The ratio of country j to country k exports to m is the product of both margins:

$$EM_{jm} \cdot IM_{jm} = \frac{\sum_{i=1}^I p_{jmi} \cdot x_{kmi}}{\sum_{i=1}^I p_{kmi} \cdot x_{kmi}} .$$

Consider the following example. Before the war, Germany's overall share of trade (last column in Table 5) with Spain was 2.11 as large as Switzerland's (36 vs 17 percent). As befitting its size, some of this difference originated with the greater number of categories Germany exported. In 1910, Germany shipped $37/48 = 77$ percent of all categories, and Switzerland $26/48 = 54$ percent. If all categories were of equal weight, the extensive margin of Germany would be 1.42 times greater, resulting in an intensive margin (exports per product) for Germany 1.48 (= $2.11/1.42$) times larger than Switzerland's. But not all categories are of equal weight, Switzerland shipping categories that comprised a larger share of all countries' exports to Spain. After adjustment, Germany's extensive margin was therefore only 1.05 greater than Switzerland's, and its intensive margin 2.05 times larger as a result.

Variable Definitions

GDP: Geary-Kamis international dollars 1990. Maddison (2013).

Distance: Great circle distance in km between Barcelona and capital of exporter. Huberman and Meissner (2010).

MFN: Treaty information from Huberman and Meissner (2010).

Diplomatic representation: Almanach de Gotha (1939).

K/L ratios, capital and labor costs from Clark (1987).

Gold standard: Countries on gold standard from Officer (2008).

Real exchange rate: Trade weighted index of the product of the nominal exchange rate and relative price indexes. López Córdova and Meissner (2003).

Table 1 The Global Cotton-Textile Industry, ca. 1913

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Textile							Weekly	Machines	Export %	Exports to	Share of	% Spanish
	% of world	labor force	Spindles	Mules %	Looms	Spindles %	Looms %	wage rate	per worker	of piece goods	Europe as	European	imports
	GDP 1913	(thousands)	1908	1908	1913	of world	of world	1910 (\$US)	1910	production	% of exports	exports	1913
										1929 (volume)	1913	1913	
UK	0.08	1359	52818	83.6	805452	43.64	28.69	5	1	70.8	40	28	25.99
US	0.19	898	23200	17.7	696387	19.17	24.82	7.1	1.45	6.7	16		0.44
Germany	0.09	1200	9192	55.5	230200	7.59	8.2	3.8	0.63	8.2	73	16	33.92
Russia	0.09		7562	50.2	213179	6.25	7.59	2.4	0.77	4.1			1.54
France	0.05	913	6609	60	108000	5.46	3.85	3.7	0.81	31.8	77	21	17.84
India	0.08		5280	28	94136	4.36	3.35	0.78	0.33	10.5			
Austria	0.01		3584	61	170000	2.96	6.06	2.8	0.65	26.3	89	5	
Italy	0.04	455	2868	26.6	140000	2.37	4.99	2.4	0.76	40.4	70	7	5.73
Spain	0.02	120	1850	40	55000	1.53	1.96	2.7	0.73	6	42	4	
Switzerland	0.01	177	1485		21500	1.23	0.77	3.7	0.7	20.3	71	5	5.07
Japan	0.03		1540	3.3	20634	1.27	0.73	0.8	0.52	49.8			
Brazil	0.01		1000	3	50000	0.83	1.78						0.22
Belgium	0.01	263	1200	51.5	24000	0.99	1.78			45.6	93	13	8.37
Canada	0.01	20	894	46	30674	0.74	1.09	8.8	1.41	0.3			
China	0.09		756		5852	0.62	0.22	0.54	0.34				
Mexico	0.01		733	4	27019	0.61	0.96	2.6	0.77				0.22
Netherlands	0.01	60	465		39800	0.38	1.42			44.4	67	2	0.22

Sources: Column 1: Maddison (2013). Column 2: ILO (1937), except Spain (Spain 1910). Columns 3 and 4: Saxonhouse and Wright (2010). Columns 5 and 10: ILO (1937). Columns 6 and 7: authors' calculations. Columns 8 and 9: Clark (1987). Columns 10-13: Kertesz (1917).

Table 2
Cotton Textiles Exports to Spain by Country, 1897-1913

Countries:	1898	1900	1902	1904	1906	1908	1910	1912
U.K.	100	123.99	123.48	121.85	129.60	105.38	96.60	94.26
France	24.39	33.45	32.47	41.21	54.98	55.42	53.74	60.98
Germany	14.79	24.91	30.02	35.16	67.70	101.47	110.13	103.73
Switzerland	14.34	20.15	16.44	17.34	29.36	52.84	56.59	55.61
Austria-Hungary	1.53	1.74	0.96	0.80	1.11	3.21	3.61	3.60
Belgium	0.46	0.65	0.55	0.39	0.50	1.01	1.06	1.24
Italy	0.33	0.47	0.43	0.33	0.34	0.27	0.22	0.15
U.S.A	0.13	0.12	0.11	0.05	0.07	0.27	0.59	0.35
Portugal	0.06	0.05	0.06	0.05	0.07	0.19	0.28	0.42
Netherlands	0.01	0.02	0.10	0.07	0.15	0.36	0.40	0.87

Source and notes: *Estadísticas de Comercio Exterior de España*. Three-year moving average centered on U.K. average (1897-1899 = 100).

Table 3 Number of Products by Country, 1897-1913

Country	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
All	51	49	53	53	55	53	55	49	48	65	57	55	50	48	38	40	39
1 Algeria	3	4	7	4	3	4	6	3	3	4	4	4	5	5	8	4	5
2 Andorra	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
3 Arabia	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
4 Argentina	7	5	5	3	5	2	4	4	6	6	7	8	4	12	11	12	10
5 Austria-Hungary	16	10	10	15	12	11	17	14	12	13	13	16	14	15	14	15	15
6 Belgium	13	15	13	11	12	12	13	13	7	14	13	18	14	18	14	16	19
7 Bolivia	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
8 Brazil	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0
9 Bulgaria	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
10 Chile	4	0	0	1	2	0	1	3	0	1	1	2	3	4	4	5	2
11 China	2	1	0	0	0	0	1	1	0	1	0	1	0	0	0	0	0
12 Colombia	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 Cuba	8	1	2	6	7	4	5	4	7	9	4	4	4	5	5	6	5
14 Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 Egypt	0	0	1	0	3	0	0	0	0	0	0	0	0	0	1	0	0
16 Eq. Guinea	0	1	0	1	1	0	0	0	5	4	3	2	5	2	1	0	1
17 Philippines	3	4	4	2	0	1	1	0	1	3	2	0	0	0	1	0	0
18 Finland	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 France	49	46	52	51	52	52	51	47	47	64	53	47	46	46	34	37	36
20 Germany	36	34	41	45	47	46	46	37	36	51	46	40	42	37	31	35	33
21 Guatemala	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0
22 Italy	14	11	13	10	12	11	13	12	13	13	14	8	6	6	5	6	6
23 Japan	2	0	5	2	4	3	2	1	0	1	2	3	4	2	2	2	1
24 Mexico	0	0	0	1	0	3	1	5	5	3	2	1	0	7	2	2	0
25 Morocco	2	1	3	0	2	1	2	0	1	2	3	1	1	1	7	4	6
26 Netherlands	1	1	3	1	4	2	7	1	2	5	6	9	3	6	7	8	6
27 Norway	0	0	0	0	0	0	0	0	0	0	3	1	0	1	1	1	0
28 Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
29 Paraguay	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
30 Peru	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
31 Portugal	13	14	11	10	15	10	13	9	11	13	15	11	12	11	8	5	10
32 Puerto Rico	0	1	3	0	0	6	3	2	1	1	4	0	0	3	4	0	0
33 Russia	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 Sweden	0	1	0	1	0	0	0	0	0	0	0	1	1	1	1	3	1
35 Switzerland	39	28	34	33	34	34	36	27	30	29	24	29	22	26	23	21	25
36 Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
37 Uruguay	3	2	0	0	0	0	1	1	2	0	2	2	2	0	6	1	1
38 UK	34	34	38	35	37	34	38	34	32	38	33	35	34	29	26	30	30
39 USA	7	4	3	3	8	6	6	4	7	10	5	5	8	9	12	13	12
40 Venezuela	0	0	0	0	2	0	0	0	0	2	0	0	0	0	2	0	0

Table 4 Similarity Index 100 products

	Germany	UK	France	Belgium	SWI	USA	Italy	Portugal	A-H	Argentina	Cuba	Algeria	Ave
UK	0.48												
France	0.78	0.42											
Belgium	0.51	0.24	0.52										
Switzerland	0.28	0.30	0.36	0.19									
USA	0.21	0.14	0.17	0.18	0.10								
Italy	0.37	0.66	0.30	0.17	0.11	0.11							
Portugal	0.17	0.09	0.13	0.18	0.09	0.59	0.05						
A-H	0.42	0.46	0.53	0.63	0.21	0.16	0.42	0.10					
Argentina	0.28	0.39	0.40	0.49	0.25	0.14	0.32	0.06	0.54				
Cuba	0.08	0.09	0.11	0.08	0.04	0.05	0.13	0.03	0.13	0.22			
Algeria	0.31	0.33	0.30	0.25	0.08	0.11	0.26	0.05	0.34	0.33	0.10		0.26
													Total
Dissimilar	5	4	5	5	6	9	7	10	3	5	10	5	74
from 1900	11	11	11	11	11	11	11	11	11	11	11	11	132

Sources and notes: Estadísticas de Comercio Exterior de España. Similarity between country A (column) and B (row) is calculated as one minus half the sum of the absolute value of differences between the product shares in manufacturing exports of country A and those of country B. It ranges between 0 (perfect dissimilarity) and 1 (perfect similarity). The figures in bold are similarity scores that have declined between 1897 and 1913. See Fontagné et al. (2008).

Table 5
Extensive and Intensive Margins of Imports by Country, 1900 and 1910

	1900			1910		
	Extensive Margin	Intensive Margin	Overall	Extensive Margin	Intensive Margin	Overall
Developed countries:						
UK	0.9962	0.5981	0.5959	0.9981	0.2996	0.2990
France	0.9999	0.1565	0.1565	0.9999	0.1594	0.1594
Germany	0.9995	0.1263	0.1262	0.9995	0.3574	0.3573
Switzerland	0.9895	0.1049	0.1038	0.9537	0.1741	0.1660
Belgium	0.6380	0.0078	0.0050	0.9401	0.0039	0.0036
USA	0.3051	0.0009	0.0003	0.6485	0.0018	0.0012
Average	0.8214	0.1658	0.1646	0.9233	0.1660	0.1644
Developing countries:						
Austria-Hungary	0.6662	0.0137	0.0091	0.9328	0.0125	0.0117
Italy	0.4594	0.0046	0.0021	0.5323	0.0011	0.0006
Portugal	0.4706	0.0004	0.0002	0.7296	0.0007	0.0005
Argentina	0.1138	0.00003	0.000003	0.3223	0.0001	0.00004
Cuba	0.1686	0.0001	0.00001	0.2579	0.0002	0.00004
Algeria	0.2245	0.0001	0.00003	0.6476	0.0002	0.0001
Average	0.3505	0.0031	0.0019	0.5704	0.0025	0.0022

Notes: Overall is the share of country imports in total Spanish imports. Calculations based on Hummels and Klenow (2005). For definitions, see text.

Table 6 Determinants of Total Exports, 1885-1913

Dependent variable:	Total Exports		
	(1)	(2)	(3)
ln Population	1.648*** (3.56)		
ln GDP per capita		4.676*** (4.19)	
ln Wages			3.706*** (2.88)
ln Distance	-3.59*** (-4.49)	-1.562*** (-4.28)	-2.277*** (-4.61)
ln Tariff	-0.004 (-0.18)	-0.018 (-0.62)	-0.008 (-0.24)
Border	-1.517*** (-3.91)	1.051** (1.93)	0.009 (0.01)
Common language	1.210 (0.52)	-4.934*** (-4.81)	-4.784*** (-4.11)
MFN	0.270 (0.74)	-0.149 (-0.47)	0.315 (0.92)
Gold standard	5.244*** (11.23)	2.764*** (3.76)	5.189*** (6.40)
Diplomatic rep in country	-0.870 (-0.59)	1.397*** (3.84)	5.388*** (13.05)
Diplomatic rep in Spain	2.624 (1.53)	0.932** (1.96)	
Intercept	0.649 (0.21)	-33.728*** (-4.46)	-12.079*** (-2.90)
Year dummies	Yes	Yes	Yes
Num. obs.	83	71	55
Pseudo log-likelihood	-20.733	-21.703	-18.913
R²	0.771	0.647	0.690

Notes: Method of estimation is Pseudo Poisson Maximum Likelihood. Dependent variable is total share of country's trade as defined in Hummels and Klenow (2005). Countries included are eight European countries (Austria-Hungary, Belgium, France, Germany, Italy, Portugal, Switzerland, and the U.K.), and Algeria, Cuba, Argentina, and the U.S. Years: 1885, 1889, 1897, 1900, 1905, 1910, and 1913. Distance is the great circle distance between Barcelona and exporter's capital; border dummy is 1 for Portugal and France, and 0 otherwise; tariff is calculated by product as the ad-valorem equivalent; MFN dummy is 1 if exporter had a trade treaty with Spain and 0 otherwise; gold standard dummy is 1 if exporter was on the gold standard; diplomatic representation in country dummy is 1 if Spain had representation in exporting country; diplomatic representation in Spain is 1 if exporter had representation in Spain; common language dummy is 1 if country shared language or was a former colony. See appendix for details. t-statistics in parentheses. *** significant at 1%; ** significant at 5%.

Table 7 Determinants of Intensive and Extensive Margins, 1885-1913

Dependent variable:	Intensive Margin			Extensive Margin		
	(1)	(2)	(3)	(4)	(5)	(6)
ln Population	1.639*** (3.49)			0.016 (0.34)		
ln GDP per capita		4.676*** (4.34)			0.642*** (5.57)	
ln Wages			3.773** (2.96)			0.279 (1.29)
ln Distance	-3.589*** (-4.39)	-1.570*** (-4.35)	-2.269*** (-4.65)	-0.157* (-1.65)	-0.312*** (-6.56)	-0.321*** (-3.80)
ln Tariff	-0.004 (-0.18)	-0.018 (-0.63)	-0.008 (-0.23)	-0.005 (-1.26)	-0.006 (-1.51)	-0.001 (-0.30)
Border	-1.486*** (-3.73)	1.088** (2.02)	0.069 (0.11)	-0.060 (-0.65)	0.119 (1.59)	-0.063 (-0.75)
Common language	2.373 (1.01)	-3.916*** (-3.92)	-3.788*** (-3.35)	-0.510* (-1.86)	-0.155 (-0.79)	-0.192 (-0.76)
MFN	0.234 (0.63)	-0.152 (-0.48)	0.307 (0.91)	-0.088 (-1.16)	-0.199*** (-4.06)	-0.210*** (-2.85)
Gold standard	4.744*** (10.61)	2.292*** (3.22)	4.546*** (5.63)	0.354*** (3.50)	0.077 (0.72)	0.357** (2.25)
Diplomatic rep in country	-1.074 (-0.75)	1.292*** (3.47)	4.876*** (12.08)	0.128 (0.73)	0.117 (1.20)	0.130 (0.52)
Diplomatic rep Spain	2.862* (1.74)	0.970** (2.12)		0.369* (1.60)	-0.071 (-0.74)	
Intercept	1.205 (0.40)	-33.122*** (-4.56)	-11.304*** (-2.71)	0.185 (0.44)	-3.042*** (-3.82)	0.619 (1.06)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Num. Obs.	83	71	55	84	71	55
Pseudo log-likelihood	-21.467	-22.294	-19.428	-70.450	-61.827	-47.408
R²	0.754	0.635	0.678	0.581	0.692	0.643

Notes: Method of estimation is Pseudo Poisson Maximum Likelihood. Dependent variables are the extensive and intensive margins as defined in Hummels and Klenow (2005). Years: 1885, 1889, 1897, 1900, 1905, 1910, and 1913. See Table 6 for definition of variables. t-statistics in parentheses. *** significant at 1%. ** significant at 5%. * significant at 10%.

Table 8
Extensive and Intensive Margins of Imports, 1885-1913

			1885-1889	1889-1905	1905-1913	1885-1913
1	Country	Country entry	198989.34	0.75	6.51	1415.88
2		Country exit	-13.19	-246.88	-22.38	-75.60
3		Net entry	198976.15	-246.13	-15.87	1340.28
4	Product-country	New product-country	366575.78	165669.03	301925.06	65783.32
5		Retired product-country	-600774.36	-94981.32	-230240.19	-21765.55
6		Net product-country	-234198.58	70687.71	71684.87	44017.77
7	Intensive Margin	Product-country increases	1250229.56	152836.29	1048748.78	347482.46
8		Product-country decreases	-414500.88	-518399.20	-583141.54	-293615.74
9		Net Intensive	835728.68	-365562.91	465607.24	53866.73
10a	Annual change in Imports		800506.25	-295121.32	537276.25	99224.78
10b	Total change in Imports		3202025.01	-4721941.19	4298209.97	2778293.79
11	Percentage of annual growth due to:					
12	%Net entry country		24.86	0.083	-0.003	1.35
13	%Net add product		-29.26	-23.95	13.34	44.36
14	%Net intensive margin		104.40	123.87	86.66	54.29

Notes: Calculations based on Bernard et al. (2009). All figures are annual averages, except for line 10b.

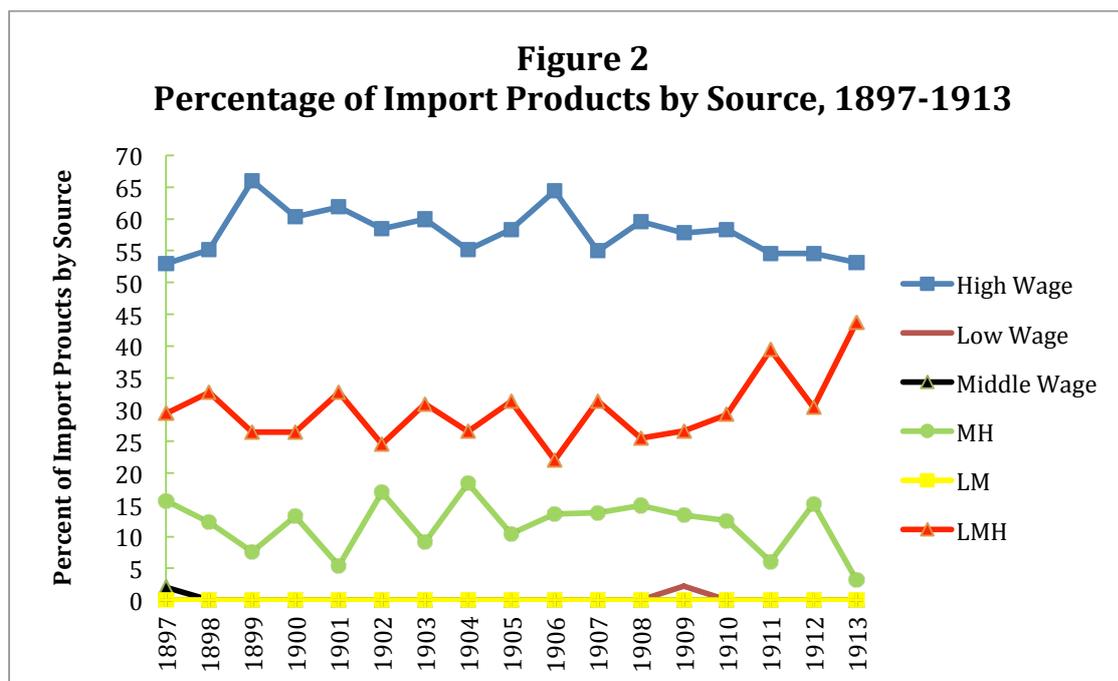
Table 9 Determinants of Unit Values, 1885-1913

Dependent variable: ln Unit value	(1)	(2)	(3)	(4)
ln GDP per capita	0.222*** (8.75)	0.078** (2.03)		
ln GDP per capita Spain		0.491*** (4.69)		
ln Wages			0.448*** (6.89)	0.166** (2.40)
ln Wages Spain				1.255*** (9.15)
ln Distance	0.086*** (3.09)	0.037 (1.26)	0.574*** (3.32)	0.302 (1.92)**
ln Tariff	-0.064*** (-4.55)	-0.025 (-1.39)	-0.002*** (-4.75)	-0.001*** (-3.39)
Border	0.121*** (5.17)	0.044 (1.74)	0.338*** (3.54)	0.175** (2.00)
MFN	-0.028** (-2.01)	-0.009 (-0.70)	0.012 (0.88)	-0.007 (-0.56)
Gold standard	-0.061*** (-3.39)	-0.014 (-0.79)	-0.080*** (-2.69)	0.007 (0.26)
Diplomatic rep. in country	0.064*** (2.42)	0.021 (0.80)	-0.105 (-1.49)	-0.125* (-1.78)
Intercept	-1.381*** (-5.37)	-3.887*** (-6.50)	-2.181*** (-3.66)	-5.504*** (-8.70)
Product dummies	Yes	Yes	Yes	Yes
Num. Obs.	572	572	407	407
Pseudo log-likelihood	-783.37	-782.93	-555.92	-555.17
R ²	0.719	0.735	0.733	0.775

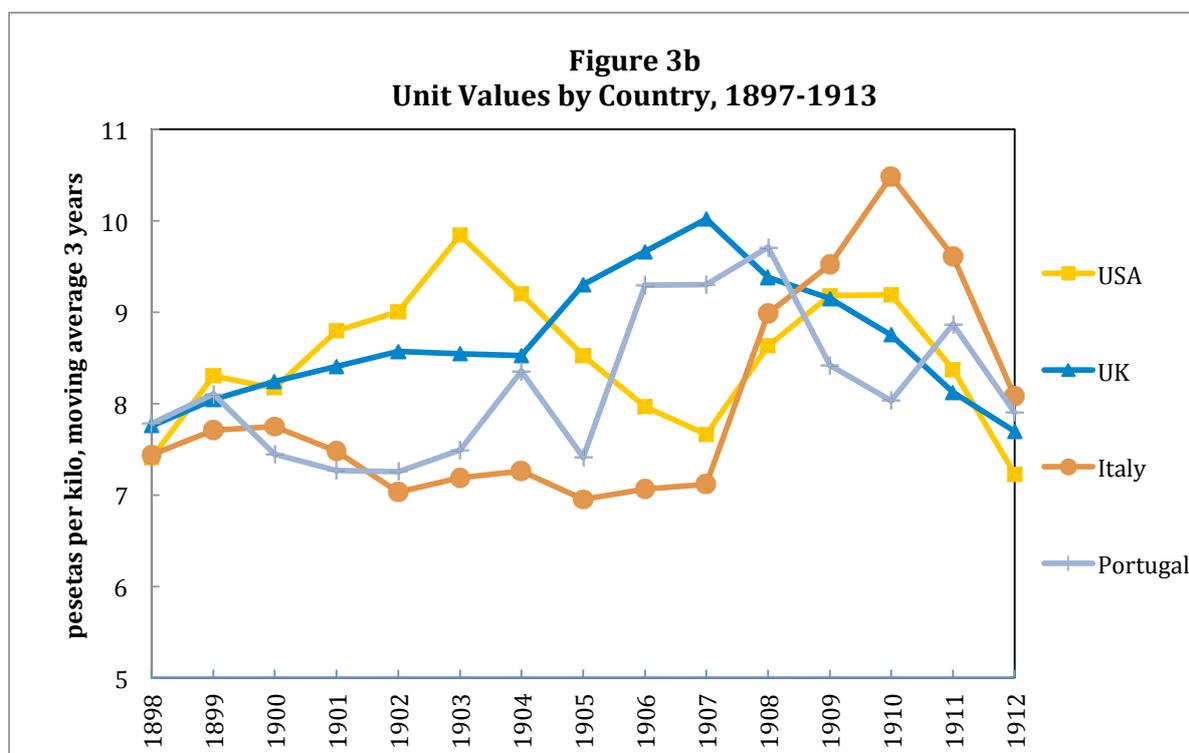
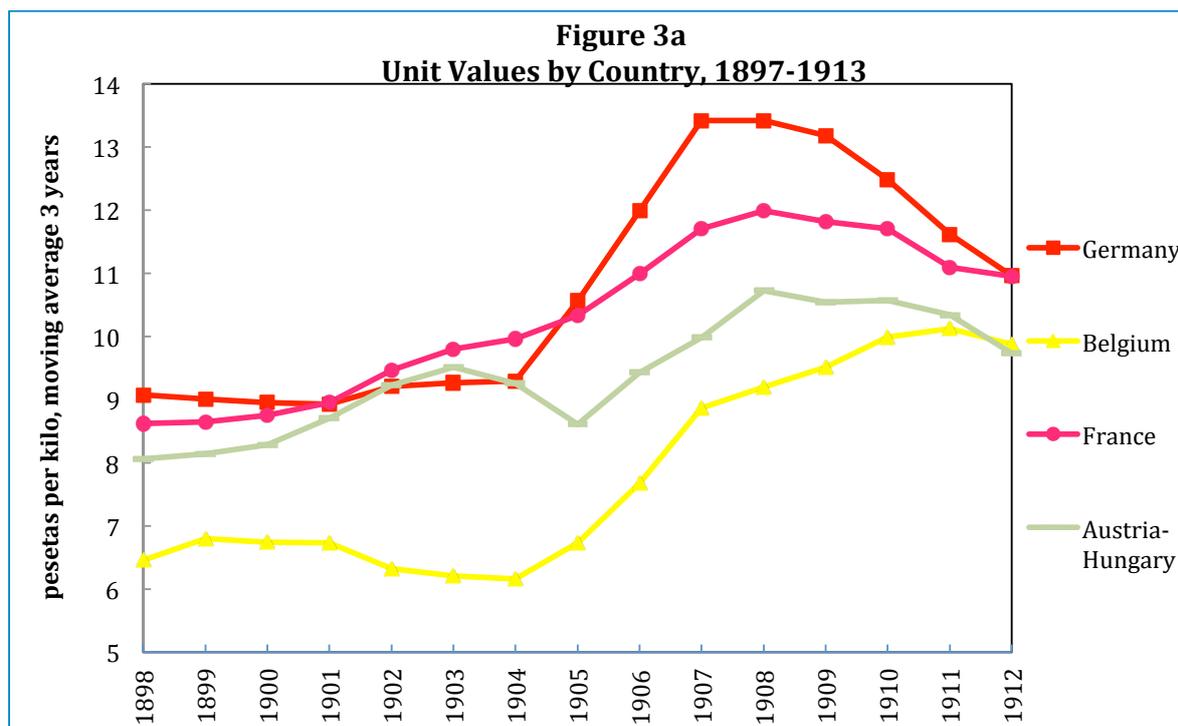
Notes: Method of estimation is Pseudo Poisson Maximum Likelihood. Dependent variable is unit export values per country for the 14 product groups. Countries included are eight European countries (Austria-Hungary, Belgium, France, Germany, Italy, Portugal, Switzerland, and the U.K.), and Algeria, Cuba, Argentina, and the U.S. Years: 1885, 1889, 1897, 1900, 1905, 1910, and 1913. The regressions control for K/L, labor and capital costs in cotton textiles for each country in 1910. See Table 6 for definition of variables and appendix. t-statistics in parentheses. *** significant at 1%, ** significant at 5%.



Source: *Estadísticas de Comercio Exterior de España*.



Sources and notes: We classified countries, following Schott (2004), as low, middle, and high wage if GDP per capita was less than that of the 30th percentile, between the 30th and 70th, or greater than the 70th percentile of the world distribution of GDP per capita in 1913 (Maddison 2013). *High Wage*: Argentina, Belgium, France, Germany, Switzerland, U.K., and U.S.; *Middle Wage*: Austria-Hungary, Chile, Cuba, Italy, Norway, Sweden, and Uruguay; *Low Wage*: all remaining countries. Products are classified, following Schott (2004), into six mutually exclusive groups based on GDP per capita: *L*, *M*, and *H* refer to products originating in low, middle, or high-wage countries; *LM* and *MH*, products from at least one country of each type; *LMH*, products originating in a least one low-wage and one high-wage country.



Source and notes: Unit values are export values divided by physical quantities for the 100 items (see appendix for full list). Annual average unit values by country are prices weighted by the export share of each item per year. All values from *Estadísticas de Comercio Exterior de España*.