

No Pain, No Gain: The China Shock and Portuguese Manufacturing*

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Abstract

In a widely cited series of papers, [David Autor](#), [Gordon Hanson](#), [David Dorn](#), and their coauthors have documented the surprisingly strong effect of increased competition from Chinese exports on U.S. employment, political polarization, and even R&D spending and innovation ([Autor et al., 2013](#); [Autor et al., 2016a, b](#)). China’s exports to Western Europe have also grown sharply in recent decades. A number of papers have sought to follow [Autor et al. \(2013\)](#) in exploring the impact of these exports on European labor markets. The chief finding of this paper is that the nature of the impact of the China shock in Portugal and the mechanism through which it operates are quite different than that highlighted by [Autor et al. \(2013\)](#). We strongly suspect our findings for Portugal reflect economic realities common to other Southern European countries.

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1 Introduction: The China Shock and Southern Europe

In a widely cited series of papers, David Autor, Gordon Hanson, David Dorn, and their coauthors have documented the surprisingly strong effect of increased competition from Chinese exports on U.S. employment, political polarization, and even R&D spending and innovation (Autor et al., 2013, 2014, 2015, 2016b,a). China's exports to Western Europe have also grown sharply in recent decades, but the impact of this rapid growth on the various European economies is just beginning to be explored by economists (Balsvik et al., 2015; Bloom et al., 2016; Dauth et al., 2014; Donoso et al., 2015). The varied findings of this nascent literature suggest that the impact of the "China shock" depends on the particular Western European economy being studied and the empirical method used to estimate the impact; in many cases, the economic effect is quite different from the one documented in the U.S. context.

This paper seeks to contribute to this growing literature by exploring the impact of rising Chinese exports to the domestic and main export markets on employment in Portugal's manufacturing sector, and by conducting our analysis at the level of the firm, rather than at the regional or industry level. By merging Portugal's matched employer-employee database with firm-level information on export products and the export destination markets of these products, we are able to measure the degree to which the "China shock" displaced the exports of individual Portuguese firms in their core export markets. By using firm-level data on output by product reported to the EU's Prodcom database, together with firm-level export data, we are able to measure the impact of rising imports from China in the Portuguese domestic market on the same firms. We can not only compare the relative impact of these two shocks on firm-level employment outcomes, but also compare the degree to which firm responses take place at the intensive and extensive margins.¹

Portugal provides an excellent context in which to evaluate the effects of increasing competition from China. First, it is a small open economy with a comparative advantage more similar to China than other developed economies (Cabral and Esteves, 2006). Second, it is an interesting case not only to revisit the direct effects previously examined by the previous literature but also to illustrate the less documented export displacement effects. Indeed, manufacturing exports are important to the Portuguese economy accounting for nearly all of Portuguese export activity, with manufacturing exports comprising between 80% and 90% of total exports (Figure 1). Portugal's exports are focused on the big Western European markets and these markets have seen a sharp rise in import penetration by China (Figure 2). While China's import share to Portugal increased by 1.5% between 1990 and 2007, in the main Western European markets China's import share increased by 5%, reaching a level in 2007 more than fifteen times higher than the one in 1990. At the same time, the manufacturing share of total employment in Portugal nearly halved over the same period (Figure 3). Thus, it is quite plausible that one of the ways China has affected

¹Intensive margins refers to employment adjustments made by the firms, for example in the number of employees, hours worked or hourly wage while extensive margins refers to firm exit.

Portugal has been through export displacement in these key European markets. Third, Portugal's labor market regime is highly restrictive (Figure 4), soaring high above the official indices of other Western European countries. These labor market restrictions might play a significant role in shaping Portugal's reaction to the "China shock".

Our study finds that the impact of rising competition with China on Portuguese manufacturing firms is significant, statistically and economically, but the mechanisms through which this shock operates and the nature of its effects are different from those documented by Autor et al. (2014).²

In the early 1990s, Portugal possessed a manufacturing sector that was large relative to the size of the Portuguese economy, reliant on exports to the core Western European economies, and concentrated in commodity categories that would see substantial competition from Chinese exporters in later years. As Chinese exports grew, they displaced Portuguese exports from core Western European markets. Direct Chinese exports to Portugal also grew, but the most important channel of competitive impact was through export displacement rather than direct import competition. Rising competition from China was, in the European context, highly correlated with rising competition from emergent Eastern European manufacturers, who could also target core EU markets with lower-cost goods.

Operating under one of the most restrictive labor market regimes in the industrial world, Portuguese manufacturing firms were constrained in their ability to respond to these negative shocks to their exports to the rest of Western Europe. With limited freedom to lay off workers or reduce nominal wages, many firms had no alternative but to cease operations altogether in the face of the China shock. Data limitations preclude firm-level analysis using our methods prior to the mid-1990s, but as the volume of Chinese exports to Portugal's main EU markets grew in the mid-to-late 1990s, the primary mechanism of adjustment was firm exit. We find evidence consistent with the view that it was the weaker, smaller firms that exited in the years up to 2000. Our results suggest no statistically significant effect of direct exports to Portugal on manufacturing employment, possibly because any depressive effects were partly offset by a domestic boom, albeit one that came to an abrupt halt at the end of the 1990s. In the second period, 2000-2007, the magnitude of the China shock intensified, but the Portuguese exporting firms that survived the initial China import wave in their core foreign markets proved more resilient. The statistically significant reductions

²As we were completing the analysis in this paper, we became aware of the work of Cabral et al. (2018), who also examine the impact of the China shock on Portuguese manufacturing. Cabral et al. (2018) use Portuguese industries as their unit of analysis, whereas we conduct our study at the level of the firm. Both these levels of aggregation have their benefits and costs, enhancing the complementarity of these two studies. Because Portugal's largest exporters are multiproduct firms, Cabral et al. (2018) face challenges in assigning the workers employed by these firms to particular industries. It is also impossible to compare responses at the extensive and intensive margins, as we do in our firm-level analysis, when analysis is conducted at the industry level. Finally, the IV strategy we employ at the firm level to contend with the possible endogeneity of demand for imports from China is more challenging to implement at the industry level. On the other hand, for reasons that will become clear in later sections, Cabral et al. (2018) are arguably able to measure the competitive effect of Chinese exports to the Portuguese market more accurately than we can. Fortunately, their results on the impact of this direct export channel are consistent with ours.

in employment in the second period were made at the intensive margin, and consist principally of headcount reductions. Anecdotal evidence suggests that our firms made increasing use of loophole in Portugal’s otherwise highly restrictive employment law that allowed for the dismissal of entire divisions within the enterprise in the case of extenuating economic circumstances. Additionally, firms took advantage of temporary contracts to hire their employees. In this way, firms reduced the number of employees by not renewing their temporary contract. There is little evidence of reductions in wages or changes in the intensity of worker utilization. Despite growing volumes of direct Chinese exports to Portugal, we find no statistically significant negative effects on our sample firms. This presents a stark contrast with the highly cited results of Autor et al. (2014) for the U.S., but is consistent with the results of Cabral et al. (2018) for Portugal.

In its struggles to contend with the China shock, Portugal probably had much in common with other nations on the European periphery. We believe the effects that we document in the Portuguese context also obtained in nations like Greece, Spain, and even Italy, where clusters of relatively labor-intensive manufacturing industries operating under inflexible labor market regimes faced a wave of low-cost competition in their traditional European export markets. As the China shock hit these economies, it drove unemployment up and exports down. The worsening budget deficits and current account deficits that emerged in the aftermath of these shocks made peripheral Europe all the more vulnerable to the crisis of investor confidence that arrived in the wake of the global financial crisis. While the European sovereign crisis certainly cannot be blamed on China, there is little doubt that the consequences of the China shock were a contributing factor.

The remainder of this study is organized as follows. In section 2, we provide a brief overview of the literature on the effects of rising imports from low-wage developing countries. Section 3 describes Portugal’s unique labor market regime and its historical antecedents. Section 5 outlines the empirical strategy while section 6 presents the results and robustness check. Finally, section 7 concludes.

2 Related Literature

A burgeoning literature in international economics have looked at the economic effects of the rapid increase in import competition from low wage developing countries. The majority of studies focuses on its effects on labor market outcomes of the developed countries. They find that trade with developing countries reduces manufacturing employment (Autor et al., 2013; Utar and Ruiz, 2013; Malgouyres, 2017; Feenstra et al., 2017), lowers earnings and wages (Autor et al., 2014), increases unemployment (Flückiger and Ludwig, 2015) and reduces demand for unskilled workers (Wood, 1995).³ Other studies report additional firms’ reactions in response to this international trade

³See also Autor et al. (2016c) and Muendler (2017) for a comprehensive survey of the literature on labor market effects.

shocks. In a seminal paper, Bernard et al. (2006) find that plant survival and employment growth are lower in the U.S. manufacturing industries facing higher exposure to imports from low-wage countries. Evidence that the rise on import competition increases exit or/and reduces firms' sales and employment growth is available for Chile (Álvarez and Claro, 2009), Mexico (Iacovone et al., 2013), Belgium (Mion and Zhu, 2013), Denmark (Utar, 2014), and a group of European countries (Bloom et al., 2016).⁴ Others provide evidence of consumer benefits from trade with low-wage developing countries, such as price reductions (Auer and Fischer, 2008; Amiti et al., 2017), larger product varieties (Broda and Weinstein, 2006) and product upgrading and/or quality improvements (Bernard et al., 2006; Utar and Ruiz, 2013; Martin and Mejean, 2014).

Closely related to our study are the research on labor market outcomes. In this regards, Autor et al. (2013) make an important contribution to this literature by pioneering an econometric approach to examine the effect of increasing competition from China on the U.S. local labor markets. This approach exploits cross-regional variation stemming from differences in industry specialization. They conclude that the rapid increase in imports from China caused higher unemployment and reduced wages in those regions that were more affected by import competing.⁵ Recently, Feenstra et al. (2017) also find a negative effect of Chinese import competition on U.S. employment, but argue that this effect was largely offset by the global expansion of the U.S. exports. Looking at the worker-level, Autor et al. (2014) find that workers facing higher import competition were more likely to gain lower cumulative earnings and face higher risk of exiting the labor force and obtaining public disability benefits.

Autor et al. (2013)'s straightforward approach has led a number of European researchers to attempt to replicate their results for a number of European countries. Like Autor et al. (2013), those papers generally focus on the "China shock," though they sometimes include imports from other, similar, low-wage developing countries and take a regional approach to measure trade shocks on employment outcomes. As European scholars have applied the Autor et al. (2013)'s methodology, they have gotten results that differ significantly from theirs.⁶ For example, Dauth et al. (2014) find that the China shock has no negative effect on German manufacturing employment, a result attributed to German's large persistent trade surplus in the manufacturing sector vis-à-vis China. In a latter study, Dauth et al. (2018) find that import and export shocks, not only from China but also from Eastern European countries, have mainly positive effects, particularly for high-skilled workers who benefited from increased export opportunities. In a related paper, Dauth et al. (2017)

⁴Unlike previous studies, Mion and Zhu (2013) find that trade with China is associated with higher chances of firm survival, higher skill upgrading but lower firms employment growth, especially in low-tech industries

⁵In the service sector, Liu and Treffer (2011) find similar results: a rise of imports in services from India and China is associated with an increase in lower paid employment and unemployment, and a decrease on earnings for workers who stay in the same occupation in the U.S..

⁶Pereira (2016) applies the Autor et al. (2013)'s methodology to Portugal and, like them, he finds that between 2004 and 2012, regions more exposed to Chinese imports face larger decline in manufacturing employment. Nevertheless, these results were obtained using high aggregated data for industries and regions. But most importantly, these results might also reflect the Portuguese economic and sovereign debt crisis.

find that, in contrast to the U.S., China and Eastern Europe shocks did not accelerate the secular decline of manufacturing employment in Germany. Malgouyres (2017), using French data, finds weaker results. There is a partial equilibrium job displacement effect – Chinese imports displace jobs, though the effect is smaller than in the U.S.. Nevertheless there seems to be little impact of this on the French wage distribution, overall. Donoso et al. (2015) find statistically significant effects of a China shock on the probability of becoming unemployment but no evidence of lower manufacturing wages. Yet, they do not inform the reader what fraction of Spanish manufacturing job loss could be plausibly attributed to the shock. Balsvik et al. (2015) exploit Norwegian data and find statistically significant, negative effects on employment, but their effects are much smaller – only about one half to one-fifth of the size of those estimated to the U.S., and they find no wage effects.⁷ With greater labor market rigidity than the U.S. and, in many cases, larger manufacturing sectors, we would have expected these European researchers to find labor market impacts at least as great as those found by Autor et al. (2013). So far, previous literature has found a spectrum of results that runs from nothing to much weaker effects than in the U.S..

Moreover, most studies focuses on the direct effect of the rise of China’s imports on the domestic labor markets of developed countries. As explained above, we argue that export displacement stemming from increased competition of China in the export markets may be as or more important. In this regard, Flückiger and Ludwig (2015) find that the rise of China imports in the export markets reduces exports and employment in the manufacturing sector of European countries. Additionally, Martin and Mejean (2014) show how low-wage competition in international markets affects the quality content of French exporters. They find that quality improvement is more pronounced in markets that faced higher competition. Cabral et al. (2018) study the direct and indirect labor market effects of intensified competition in the export markets. They find that China’s competition reduced workers’ earnings and employment, but only through the indirect ‘market-stealing’ channel.

Our paper seeks to contribute to this literature by quantifying the magnitude of the direct and export displacement effects of China competition on Portugal’s manufacturing employment. We measure the “China shock” at the level of the firm, rather than at the regional or industry level. With this approach, we control better for firm heterogeneity and analyze within industry re-allocation effects.

⁷Like Autor et al. (2013), Ashournia et al. (2014), using Danish data, find that the rise on Chinese imports decreases wages for low-skilled employees and Hakkala and Huttunen (2016), using Finnish data, find that both import competition in final products and offshoring increases the risk of unemployment, specially for production workers. In addition, Pessoa (2018) finds that import competition from China significantly decreases UK workers’ years of employment and earnings.

3 Before the Fall: Portugal's Manufacturing Sector Prior to China's Export Boom

Because the impact of Chinese exports on Portuguese manufacturing employment is deeply affected by Portugal's unique institutional history, it is necessary to describe briefly the unique labor market setting and its historical antecedents.

Founded in the first decade of the 20th century, Portugal's Republic was politically unstable and economically poorly managed. Inflation and sovereign debt problems prompted a military coup that brought Minister of Finance, Antonio de Oliveira Salazar, to power. At the nadir of the Great Depression, Portugal reconstituted itself as an authoritarian state in which Salazar ruled with an iron hand. Like its Iberian neighbor, Spain, Portugal remained under this dictatorship well into the 1970s. Initially quite restrictive in its trading relationships with Western Europe, Portugal gradually opened to more extensive trade and investment ties vis-a-vis the rest of the continent, and Portuguese per capita income began to converge with that of continental Western Europe, but a large gap persisted into the 1970s.

The dictatorship collapsed with the so-called Carnation Revolution of 1974. The post-dictatorship political regime was dominated by left ideologies, seeking to defend workers' rights that had been regularly trampled on during the dictatorship. It was therefore not surprising that the new government enshrined high levels of worker protections in the nation's new constitution. Under the new regime, workers benefited from extensive labor and social rights, sizeable participation and oversight rights in enterprises, favorable collective bargaining and strike law. It was nearly impossible for employers of any size to fire workers or to reduce nominal wages. The labor law prioritized employment security over flexible dismissals.

The post-revolutionary economic performance of Portugal was not good. Macroeconomic instability and the need for a bail-out from the International Monetary Fund (IMF) in the early 1980s helped prompt a shift to more centrist economic policies, and this shift was reinforced by efforts to accede to what was then known as the European Economic Community (EEC). Over the course of the 1980s, Portugal opened up to greater trade and investment links with the EEC and harmonized a number of its laws and economic institutions with Western European norms (as a condition for EEC accession) (Handley and Limao, 2015). As a result, there was increasing domestic and international pressure to change the rules of collective bargaining and to cut dismissal costs of permanent workers (OECD, 1994). The pressure was such that the union confederations co-organized the first general strike in 1988, which was partially successful in preserving union rights and most legal protections on job security and strike law. Unable to lower employment protection for regular workers, the Portuguese government allowed temporary⁸ and service contracts (*Recibos Verdes*). These new type of contracts by-passed the otherwise rigid firing rules, reducing the employment

⁸Temporary contracts include short-term and fixed-term contracts.

protection legislation. The idea was to institutionalize a tradeoff between labor and capital in which employment protection would answer workers' demands while temporary contracts would satisfy the firm demands (Centeno and Novo, 2012). Note that hiring a worker for permanent position through a temporary contract is considered a fraud in Portugal. Nevertheless, the use of these atypical and temporary contracts created divisions between workers. It created a dualism in the labor market between protected and unprotected workers. Protected workers have indefinite contracts, job stability and access to employment protection offered by the welfare state. In contrast, unprotected workers are much more likely to have interrupted work histories and greater levels of financial volatility. In addition, they often fall between the cracks of social protection systems. As a result, they are at much greater risk of being ineligible for unemployment compensation, have less access to paid vacations and their work histories will reflect lower retirement benefits. Overall, the extremely strong protections for Portuguese workers were relaxed to some degree, especially for smaller firms,⁹ but Portugal retained what was, by the OECD's official measure, the most restrictive labor market regime in the Western world into the mid-1990s (Figure 4).¹⁰ Regular employees in all but the smallest firms continued to enjoy extremely strong labor protections, making it difficult for them to be dismissed, even in situations of financial duress. Protections against nominal wage cuts remained for most firms above modest size thresholds, making wage adjustments nearly as difficult, and additional social mandates and protections drove a further wedge between the total cost of labor to the firm and the nominal wage received by the worker.

Despite this, Portugal benefited from its position as a relatively low cost manufacturer on Europe's geographical periphery with privileged access to the core European markets, and manufactured exports to Western Europe grew rapidly in the mid-to-late 1980s. Portugal also benefited from inward investment from more advanced economies, which provided better technology as well as capital. Although inflation was persistently higher in Portugal than in the core European economies, exchange rate movements maintained the competitiveness of Portuguese labor vis-a-vis that in the more productive and advanced core European economies. The Portuguese manufacturing sector that we observe at the beginning of our data window reflects the advantages conferred by this history. As shown in Figure 3, manufacturing employment represented a large share of total employment at the start of our sample period, and ranges from 37% to 23% over the period. Clearly, Portugal experienced a sharp decline in manufacturing employment between 1990 and 2007, both in terms of the absolute number of workers and as a share of total employment. We also see that a very large share of Portuguese manufacturing activity was driven by exporting. During our sample period manufacturing exports accounted for between 27% and 42% of gross manufacturing output. Finally, manufacturing accounted for nearly all of Portuguese export activity, with manufacturing

⁹See Martins (2009) for an excellent description and detailed analysis of the impact of this relaxation of labor regulations for small firms.

¹⁰At that point, the accession of Turkey to the OECD brought Portugal to the number two position, and it remained there as the China shock began to grow.

exports comprising between 80% and 90% of total exports (Figure 1).¹¹ Hence, developments in Portugal's key export markets were likely to have a large impact on the manufacturing sector and on the labor market as a whole.

As Portugal entered the 1990s, some of its favorable circumstances began to shift in less favorable directions, and these negative developments included more than just the rise of Chinese competition. In the early 1990s, Portugal, like other Western European countries, effectively pegged its currency to the German Deutschemark, as part of preparation for an eventual common currency. The de facto loss of currency flexibility undermined Portuguese competitiveness in ways that will be discussed below.¹² Furthermore it also intensified international pressure on Portugal to reform their labor markets. Reforms achieved were through both labor market flexibility and economic security (Ferrera and Hemerijck, 2003). On the one hand, more flexible labor markets would reduce the costs of firms in adjusting to the dynamics of a highly integrated global economy. On the other hand, increased labor participation and higher income security would contribute to higher levels of social inclusion. As a result, several employment protection policies were enacted to address the enduring qualifications deficit of the Portuguese workforce. The urgency to train workers in new skills increased as the competition from other low wage countries intensified (Valadas, 2011). The collapse of Leninism in Eastern Europe brought a new set of competitors into the relatively low-tech industries in which Portugal had been a successful exporter and this is reflected in the trade statistics. The expansion of the EU in an eastward direction opened up a whole new range of attractive options for Western European multinationals seeking to engage in forward direct investment (FDI) at the European periphery, and we see this, too, reflected in the data.

In the mid-to-late 1990s, as all of these adverse phenomena intensified, their macroeconomic effects were masked for a while by the twin investment and consumption booms described by Blanchard (2007). As Portugal's former currency became more tightly linked to that of its more developed European trading partners over the course of the 1990s, and as the prospects for Portugal's early entry into a European currency union advanced, inflation and currency risk diminished. Portuguese interest rates rapidly fell from fairly high levels to much lower levels approaching those of the slower growing core European economies. Portuguese businesses and consumers responded to these rapid and substantial declines in interest rates in a predictable fashion, and booming investment and debt-fueled consumption increases drove Portuguese unemployment rates down to historically low levels while raising real wages to unsustainably high levels. Domestic savings was insufficient to finance a simultaneous consumer credit boom and an investment boom, and Portugal began running large current account deficits.

This loss of export competitiveness coincided with the beginning of a boom in Chinese exports to Western Europe. While the literature since Autor et al. (2014) has tended to focus on the

¹¹This and previous sentence: authors' calculations using the INE's *Comércio Internacional* and *Quadros de Pessoal* databases.

¹²The issues in this paragraph are noted in Blanchard (2007).

acceleration of Chinese export growth after its accession to the WTO, the value of China's nominal exports to the 15 original member states of the EU (excluding Portugal) already exceeded the value of Portugal's exports by the early 1990s, and China's export growth to the EU sharply accelerated in the late 1990s, even as Portugal's export growth stagnated. The longstanding concentration of Portugal's exports in commodity categories that were among the first to be dominated by China meant that Portugal may have felt the impact of Chinese competition far earlier than the U.S. manufacturing industries studied by Autor et al. (2014). Our results suggest that a group of weaker exporting firms were forced to exit in the late 1990s due to this early China shock. On the other hand, for firms focused on Portugal's domestic market, the late 1990s boom may have partly offset the negative impact of rising imports from China.

In the early 2000s, Portugal's twin investment and consumption booms abruptly stopped. Dramatically slower growth in the domestic economy and rising unemployment produced persistent fiscal deficits, as government spending sought to fill the gap left by the collapse of the boom. The financing of these growing deficits increasingly relied on foreign investors. The common currency prevented Portugal from responding to excessively high real wages by allowing the currency to depreciate. It was in this difficult environment that China acceded to the World Trade Organization and its export machine shifted into even higher gear. This marks another striking difference between the context of our study and that of Autor et al. (2014). The China export wave hitting the U.S. in the 2000-2007 period coincided with a period of robust domestic growth (the housing boom), making it statistically easier to associate manufacturing employment declines with the China shock. In Portugal, the intensifying China shock coincided with a period of dramatically poorer domestic economic performance. For firms that depended on both export and domestic sales, the confounding shock of a significant domestic slowdown may complicate estimation of the impact of the China shock. We will return to this issue later in the paper.

In principle, Portugal could have regained competitiveness by allowing wages to fall, but wages appear to be characterized by downward rigidity in even the most flexible economies, and rigidities in the Portuguese labor market were extreme, even by European standards, slowing downward adjustment in wages even in the presence of high unemployment. Instead, the policies enacted endured the dualism of the labor market between protected and unprotected workers. The main changes were extend the maximum duration of fixed-term contracts to six years (before it was three) and abolish the principle that collective agreements can only establish more favorable conditions than those set by the general law. Because of these changes, the unions argued that the reform presented employers with the opportunity to let existing agreements expire and/or that it pressured unions to negotiate more flexible conditions. The labor market reforms undertaken in the 2000s were praised by OECD, IMF and the EU ((González and Figueiredo, 2015) and as a result, the share of workers in temporary contracts increased, reaching 23% of the total employment contracts in 2007 (Figure 5). Importantly, the probability of transitioning from a temporary to a permanent

contract is very low in Portugal.

4 Data and Sample

We use a variety of firm-level and product-level databases to implement the empirical analysis. More specifically, we merge firm-level workforce information from a matched employer-employee database with a firm product-level database and an export transaction database. These datasets are from Statistics Portugal (INE).

Information on firm-level employment outcomes comes from the administrative database, *Quadros de Pessoal* (QP). This remarkable matched employer-employee dataset covers nearly all firms and employees in the Portuguese private sector, as it is based on a mandatory annual survey collected by the Portuguese Ministry of Employment and Social Security from all firms with at least one employee. For the month of October in each year, the data report each employee’s contract type (full-time, part-time, furlough/paid leave, etc.), hours, and earnings. We use this information to calculate firm-level employment, wagebill, average hourly wages, and average hours per worker. At the firm level, the database includes entry year, location, main industry, sales, number of employees.

We identify firms’ product mix by matching firms from QP with the mandatory *Inquérito Anual à Produção Industrial* (IAPI), which provides annual information on outputs, inputs, and energy sources for the largest firms in each industry.

Then, we identify the exporting firms and their exports product mix by matching firms and products from the above sample with the aforementioned official *Comércio Internacional* (CI) database. This database provides firm-level trade flows for each month, trading partner country, and product.

Finally, we use product-level trade flow data from EUROSTAT and UN Comtrade to calculate China’s share of imports of each product in the main Portuguese export markets and the U.S., respectively. In particular, we focus on five large destination markets for Portuguese exporters: France, Germany, Great Britain, Italy, and Spain, which we refer to collectively as the EU5. We aggregate 6-digit HS product codes as necessary to ensure consistent codes across datasets and years, yielding a consistent classification with 5,460 products.

Our sample includes firms active in 1995 and 2000, located in mainland Portugal (omitting those in the Azores and Madeira islands) that appear both in QP and IAPI in either 1995 and 2000. The match rate between IAPI and QP datasets is extremely high. Of the firms in IAPI, in 1995 or 2000, we match 93.5 percent (1995) and 93 percent (2000) to information in QP. This process generates a set of 9,323 unique firms: 5,977 in 1995 and xx in 2000, with many firms appearing in both time periods. More than 47% of the firms export (4,411 are exporting firms), of those 3,225 firms export to EU5. We analyze these firms in the years between 1995 and 2007. Our analysis ends in 2007 to avoid the economic recession and financial crisis, which was followed by a decline in international

trade worldwide.

Further details of the datasets and sample construction are explained in Appendix A

5 Variables and Empirical Approach

Our empirical approach examines the change in employment outcomes for Portuguese firms whose products face different degrees of Chinese competition in the local and export markets.

5.1 Employment Outcomes

The firm-level employment outcomes include the real wagebill,¹³ defined as the total wages paid to all workers, employment, defined as the number of workers, average hourly wage, and average hours per worker. These outcomes are conveniently related, since the wagebill equals the product of employment, average hourly wage, and average hours.

5.2 Firm Trade Shocks

In this subsection, we describe our firm level "China shock" measures. First, we describe the direct measure of import competition from China in the Portuguese domestic market, and then the export displacement measure, that is the measure of import competition from China to the main export markets.

To compute those measures, we need to calculate the changes in Chinese competition for each product. We define it as the change in China's (S) share of imports of a good into importing country over the analyzed periods:

$$\Delta IS_{cjt}^S \equiv \frac{\Delta M_{cj}^S}{M_{cj t_0}} \quad (1)$$

where j is the product, c is the importing country (Portugal or $EU5$) and t is the 1995 – 2000 or 2000 – 2007 or 1995 – 2007 periods. ΔM_{cj}^S is the change in imports of a product j from China to country c , from initial period t_0 (1995 or 2000) to a subsequent period (2000 or 2007). We scale the change in imports by the initial-period total imports, $M_{cj t_0}$, so that variation comes only from the change in imports from China.

Each domestic firm faces a different degree of Chinese competition by virtue of selling domestically a different mix of products. We can therefore measure the degree of Chinese competition facing every Portuguese firm in its domestic market in every year, FCS_{it}^P , by using a simple weighted average of product-level Chinese competition shocks, defined in (1) for Portugal, weighted using the firm's initial product's share in the domestic market.

¹³Our wagebill measure includes the annual base wage (gross pay for normal hours of work) and the regular annual subsidies and annual premiums.

$$FCS_{it}^P \equiv \sum_{jt} \phi_{ij}^P \Delta IS_{Pjt}^S, \quad \text{with } \phi_{ij}^P \equiv \frac{Y_{ijt_0} - X_{ijt_0}}{Y_{it_0}} \quad (2)$$

where i is the firm, Y_{ij} is the firm's sales for each product j and X_{ij} is the firm's exports for each product j .

The weighted average is calculated over products j , and the weights depend upon each product's share of domestic sales ($Y_{ijt_0} - X_{ijt_0}$) in the firm's total sales (Y_{it_0}), both measured in the initial period, t_0 .¹⁴ Note that (2) is well defined even for non-exporting Portuguese firms whose sales are entirely in the Portuguese market, so they are included in the Portuguese domestic shock analysis.

As mentioned previously, the rise of Chinese exports can impact the Portuguese manufacturing sector not only through intensifying competition in the domestic market, but also in the main exporting markets where Portuguese firms compete with China. In the case of Portugal, this effect is particularly relevant due to the similar level of product specialization between Portugal and China's exports (Cabral and Esteves, 2006). France, Germany, Great Britain, Italy, and Spain (EU5) are the five largest destination markets for Portuguese exporters, representing approximately 70% of total exports of goods between 1995 and 2007. More importantly, their market share has reduced along the years. In 2017, EU5 only accounted for 60% of Portuguese total exports. Hence, we select those countries as the export markets where competition from Chinese products will be assessed. Our export displacement measure, FCS_i^E , evaluates the exposure of Portuguese exporters to Chinese competition in EU5 (E) markets. Similarly to Equation (2), it is also a weighted average of the product-level Chinese competition shocks, defined in (1) but for EU5, weighted using the firm's initial export product mix:

$$FCS_{it}^E \equiv \sum_{jt} \varphi_{ij}^E \Delta IS_{Ejt}^S, \quad \text{with } \varphi_{ij}^E \equiv \frac{X_{ijt_0}^E}{Y_{it_0}} \quad (3)$$

where $X_{ijt_0}^E$ is firm i 's exports of j to the EU5 in the baseline period.

Intuitively, this measure evaluates the degree of firm exposure to China competition, by taking into account its initial export share in that product-country market and the rise of China imports on each product-country market. For example, a Portuguese firm with a large market share in a specific product in Spain in 1995 is more exposed to competition from China if Spain experiences a rise in imports from China on these products compared to a Portuguese firm that only has a minor

¹⁴A potential problem arises when $Y_{ijt_0} < X_{ijt_0}$ and consequently, the domestic sales appear to be negative. Because the output measure in IAPI database is "produced output," it omits sales related to carry-along trade, so a firm can appear to export more than it produces. To deal with this issue, when $Y_{ijt_0} < X_{ijt_0}$, we behave as if the true value of sales precisely equals exports.

export market share of this product in Spain.

The direct and export displacement measures above, when taken together, reflect the competition from China faced by Portuguese firms both in the domestic market, Equation (2), and in its main export markets, Equation (3). **We also consider a complementary measure in our robustness checks.**

5.3 Empirical Strategy

We examine the effects of these direct and export displacement competition shocks on changes in firm-level employment outcomes, y_{it} , using the following specification.

$$\Delta \ln y_{it} = \beta_0 + \beta_1 FCS_{it}^P + \beta_2 FCS_{it}^E + \Gamma' X_{it} + \varepsilon_{it} \quad (4)$$

where i is the firm and t is the period.

The dependent variable is the change in log employment outcome (employment, wagebill, average hourly wages, and average hours per worker), and the independent variable of interests are FCS_{it}^P and FCS_{it}^E . We expect to find $\hat{\beta}_1 < 0$ and $\hat{\beta}_2 < 0$, indicating that Portuguese firms whose sales in the domestic market and in the EU5 faced larger increases in Chinese competition exhibit larger declines in workforce outcomes, respectively. Note that by differencing the dependent variable in (4), we account for time-constant differences in workforce outcomes across firms (equivalent to firm fixed effects). X_{it} is a vector of firm-level controls including region fixed effects (5 NUTS regions), industry fixed effects (155 3-digit ISIC industries), an indicator for foreign ownership (≥ 50 percent foreign ownership share), firm age and age squared at the beginning of the relevant time period, firm's initial share of highly educated workers (college degree or more), two variables to capture the size of the firm - the number of establishments and the logarithm of firm's sales in 2007 euros. Because the dependent variable is expressed as a change, these controls allow for differential outcome trends for firms with different initial characteristics, and in some specifications we include industry-specific linear time trends as additional controls.

Our empirical analysis considers three time periods, i) 1995-2000, ii) 2000-2007, and iii) 1995-2007. We estimate Equation (4) for each time period, using a long difference in which Δ corresponds to the average yearly change from the beginning to the end of the period. For example Δx for 1995-2000 is equivalent to $(x_{2000} - x_{1995})/5$ and for $(x_{2007} - x_{2000})/7$. Period i) covers the years before China's accession to the World Trade Organization (WTO), while period ii) covers the subsequent years. Period iii) spans the entire sample range. We exclude the years after 2007 to avoid potential confounding effects of the Portuguese economic and sovereign debt crises spanning 2008-2014.

During the period of analysis, China experienced productivity gains, transitioned to a market oriented economy and had its quotas and trade barriers eliminated due to its accession to WTO.¹⁵

¹⁵See Branstetter and Lardy (2008) for a detail of the factors that drove China's export growth.

An important concern is that the change in China's share of Portugal and EU5 imports, ΔM_{cj}^S , may reflect not only changes in those Chinese supply factors but also changes in domestic demand and changes on Portuguese supply. For example, if EU5 and Portuguese consumers' tastes shift toward products for which China has a comparative advantage, its import share may increase along with that of Portuguese firms producing similar products, driving upward bias.¹⁶

To isolate the effects of Chinese growing productivity and falling trade costs as opposed to EU5 and Portuguese demand shocks, we follow an approach similar to that of Autor et al. (2013). Our instruments for (2) and (3) are based upon increases in China's share of U.S. imports. Using the notation from (1) and letting U refer to the U.S., we construct versions of all of the shocks above using ΔIS_{Uj}^S . Specifically, our instruments are

$$IVFCS_{it}^P \equiv \sum_{jt} \phi_{ij}^P \Delta IS_{Ujt}^S \quad (5)$$

$$IVFCS_{it}^E \equiv \sum_{jt} \varphi_{ij}^E \Delta IS_{Ujt}^S \quad (6)$$

where ΔIS_{Ujt}^S is the change in China's share of U.S. imports of product j and period t .

By restricting attention to variation in Chinese import share that is common across Portugal, EU5 and the U.S., we reduce the likelihood that the observed relationships are driven by EU5 and Portugal demand shocks in favor of variation based on changes in Chinese supply. We select the degree of Chinese competition in the U.S. market as an instrument because we expect correlations in product-level demand and supply between Portugal and the U.S.. Hence, we argue that the growth in imports from China in a given product in the U.S. is exogenous to the domestic conditions in Portugal and EU5.

A second issue is that many exporters shut down entirely, particularly those facing large increases in Chinese competition. In this case, the wagebill, employment, wage, and hours will equal zero. This leads to a censored data problem in which shocks drive changes in workforce outcomes for continuing firms (the intensive margin) and drive firms to exit (the extensive margin). This issue is addressed using a Tobit model or its instrumental variables equivalent, IV-Tobit. The Tobit model imposes strong restrictions on the nature of intensive and extensive margin effects by assuming that both processes are driven by the same set of parameters.

¹⁶Note that since we use changes in import *shares* as our product-level shock measure, this endogeneity concern is less serious than it would be if we used changes in import levels, but we address the concern nonetheless.

6 Empirical Results

6.1 Descriptive Statistics

Table provides the descriptive statistics for our main variables.

7 Conclusion

The goal of this paper is to examine the effects of firm-level product demand shocks on employment-related outcomes for Portuguese manufacturing firms, including employment, hours, and wages. More specifically, we use product-level Chinese import shocks weighted to the firm level based on firm's exposure to Portugal and the main export markets. To account for possible endogeneity issues, we parallel the Autor et al. (2013) approach to identification, using the U.S.'s China shock as an instrument for the China shock in Portugal or the main export markets.

References

- Álvarez, R. and Claro, S. (2009). David versus goliath: The impact of chinese competition on developing countries. *World Development*, 37(3):560–571.
- Amiti, M., Dai, M., Feenstra, R., and Romalis, J. (2017). How did china’s WTO entry benefit u.s. consumers? *NBER Working Paper*, (23487).
- Ashournia, D., Munch, J., and Nguyen, D. (2014). The impact of chinese import penetration on danish firms and workers. *IZA Discussion Papers*, (8166).
- Auer, R. and Fischer, A. (2008). The effect of trade with low-income countries on us industry.
- Autor, D., Dorn, D., and Hanson, G. (2013). The china syndrome: Local labor market effects of import competition in the united states. *American Economic Review*, 103(6).
- Autor, D., Dorn, D., Hanson, G., and Majlesi, K. (2016a). Importing political polarization? the electoral consequences of rising trade exposure. *NBER Working Paper*, (22637).
- Autor, D., Dorn, D., Hanson, G. H., Pisano, G., and Shu, P. (2016b). Foreign competition and domestic innovation: Evidence from us patents. *NBER Working Paper*, (22879).
- Autor, D. H., Dorn, D., and Hanson, G. H. (2015). Untangling trade and technology: Evidence from local labour markets. *The Economic Journal*, 125(584):621–646.
- Autor, D. H., Dorn, D., and Hanson, G. H. (2016c). The china shock: Learning from labor-market adjustment to large changes in trade. *Annual Review of Economics*, 8(1):205–240.
- Autor, D. H., Dorn, D., Hanson, G. H., and Song, J. (2014). Trade adjustment: Worker-level evidence. *The Quarterly Journal of Economics*, 129(4):1799–1860.
- Balsvik, R., Jensen, S., and Salvanes, K. (2015). Made in china, sold in norway: Local labor market effects of an import shock. *Journal of Public Economics*, 127:137–144.
- Bernard, A. B., Jensen, J. B., and Schott, P. K. (2006). Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of u.s. manufacturing plants. *Journal of International Economics*, 68(1):219–237.
- Blanchard, O. (2007). Adjustment within the euro: The difficult case of portugal. *Portuguese Economic Journal*, 6(1):1–21.
- Bloom, N., Draca, M., and Van Reenen, J. (2016). Trade induced technical change? the impact of chinese imports on innovation, it and productivity. *The Review of Economic Studies*, 83(1):87–117.
- Branstetter, L. and Lardy, N. R. (2008). China’s embrace of globalization. In Brandt, L. and Rawski, T. G., editors, *China’s Great Economic Transformation*, pages 633–682. Cambridge University Press.
- Broda, C. and Weinstein, D. E. (2006). Globalization and the gains from variety. *The Quarterly Journal of Economics*, 121(2):541–585.

- Cabral, S. and Esteves, P. (2006). Portuguese export market shares: An analysis by selected geographical and product markets. *Economic Bulletin*, Summer:1–18.
- Cabral, S., Martins, P. S., Pereira dos Santos, J., Tavares, M., et al. (2018). Collateral damage? labour market effects of competing with china – at home and abroad. *IZA Discussion Papers*, (11790).
- Centeno, M. and Novo, A. (2012). Segmentação. *Boletim Económico*, pages 7–30.
- Dauth, W., Findeisen, S., and Suedekum, J. (2014). The rise of the east and the far east: German labor markets and trade integration. *Journal of the European Economic Association*, 12(6):1643–1675.
- Dauth, W., Findeisen, S., and Suedekum, J. (2017). Trade and manufacturing jobs in germany. *American Economic Review*, 107(5):337–342.
- Dauth, W., Findeisen, S., and Suedekum, J. (2018). Adjusting to globalization: Evidence from worker-establishment matches in germany. *IZA Discussion Papers*, (11299).
- Donoso, V., Martín, V., and Minondo, A. (2015). Do differences in the exposure to chinese imports lead to differences in local labour market outcomes? an analysis for spanish provinces. *Regional Studies*, 49(10):1746–1764.
- Feenstra, R. C., Ma, H., and Xu, Y. (2017). Us exports and employment. *NBER Working Paper*, (24056).
- Ferrera, M. and Hemerijck, A. (2003). Recalibrating europe’s welfare regimes. In Zeitlin, J. and Trubek, D. M., editors, *Governing Work and Welfare in a New Economy: European and American Experiments*, pages 88–128. Oxford University Press Oxford.
- Flückiger, M. and Ludwig, M. (2015). Chinese export competition, declining exports and adjustments at the industry and regional level in europe. *Canadian Journal of Economics/Revue canadienne d’économie*, 48(3):1120–1151.
- González, P. and Figueiredo, A. (2015). The european social model in a context of crisis and austerity in portugal. In Vaughan-Whitehead, D., editor, *The European social model in crisis: Is Europe losing its soul*, pages 386–450. Edward Elgar Publishing.
- Hakkala, K. N. and Huttunen, K. (2016). Worker-level consequences of import shocks. *IZA Discussion Papers*, (10033).
- Handley, K. and Limao, N. (2015). Trade and investment under policy uncertainty: Theory and firm evidence. *American Economic Journal: Economic Policy*, 7(4):189–222.
- Iacovone, L., Rauch, F., and Winters, L. A. (2013). Trade as an engine of creative destruction: Mexican experience with chinese competition. *Journal of International Economics*, 89(2):379–392.
- Liu, R. and Treffer, D. (2011). A sorted tale of globalization: White collar jobs and the rise of service offshoring. *NBER Working Paper*, (17559).

- Malgouyres, C. (2017). The impact of chinese import competition on the local structure of employment and wages: Evidence from france. *Journal of Regional Science*, 57(3):411–441.
- Martin, J. and Mejean, I. (2014). Low-wage country competition and the quality content of high-wage country exports. *Journal of International Economics*, 93(1):140–152.
- Martins, P. S. (2009). Dismissals for cause: The difference that just eight paragraphs can make. *Journal of Labor Economics*, 27(2):257–279.
- Mion, G. and Zhu, L. (2013). Import competition from and offshoring to china: A curse or blessing for firms? *Journal of International Economics*, 89(1):202–215.
- Muendler, M.-A. (2017). Trade, technology, and prosperity: An account of evidence from a labor-market perspective. *World Trade Organization (WTO)*.
- OECD (1994). Implementing the oecd jobs strategy: Lessons from member countries’ experience. Technical report, Paris: OECD.
- Pereira, T. (2016). The effect of developing countries’ competition on regional labour markets in portugal. *GEE Papers*, (0058).
- Pessoa, J. P. (2018). Labor market responses to trade shocks: The uk-china case. Sao Paulo School of Economics.
- Utar, H. (2014). When the floodgates open: “northern” firms’ response to removal of trade quotas on chinese goods. *American Economic Journal: Applied Economics*, 6(4):226–250.
- Utar, H. and Ruiz, L. B. T. (2013). International competition and industrial evolution: Evidence from the impact of chinese competition on mexican maquiladoras. *Journal of Development Economics*, 105:267–287.
- Valadas, C. (2011). New challenges to a changing labour market and welfare state. the portuguese recent experience. *Sociologia On Line. Revista da Associação Portuguesa de Sociologia*, 2(4):9–487.
- Van Beveren, I., Bernard, A. B., and Vandenbussche, H. (2012). Concoring eu trade and production data over time. *NBER Working Paper*, (18604).
- Wood, A. (1995). How trade hurt unskilled workers. *Journal of Economic Perspectives*, 9(3):57–80.

8 Figures

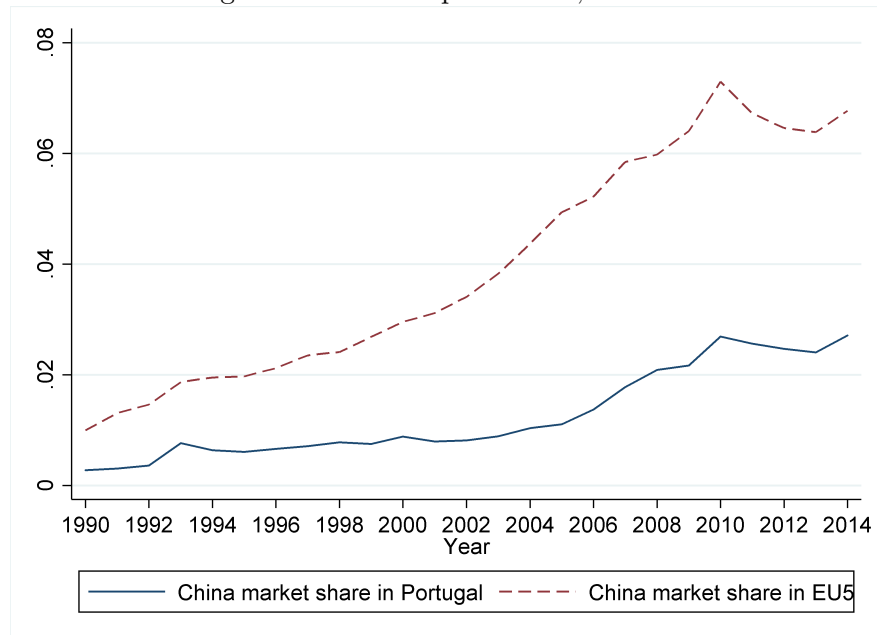
Figure 1: Portuguese Manufacturing Exports, 1990-2014



Notes: The figure plots the manufacturing exports in billion euros, on the left scale, and the manufacturing share of total exports (dash line), on the right scale. Manufacturing exports include products with combined nomenclature codes between 29 and 96.

Source: *Comércio Internacional* database

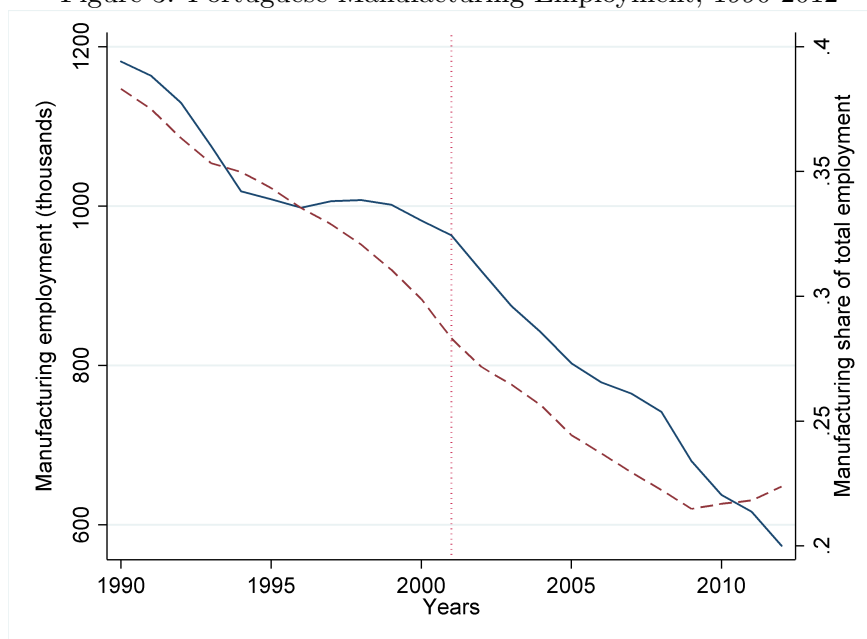
Figure 2: China Import Share, 1990-2014



Notes: The figure plots China import share in Portugal and in EU5 (Spain, France, Italy, Germany, United Kingdom). Manufacturing imports include products with combined nomenclature codes between 29 and 96.

Source: EUROSTAT database

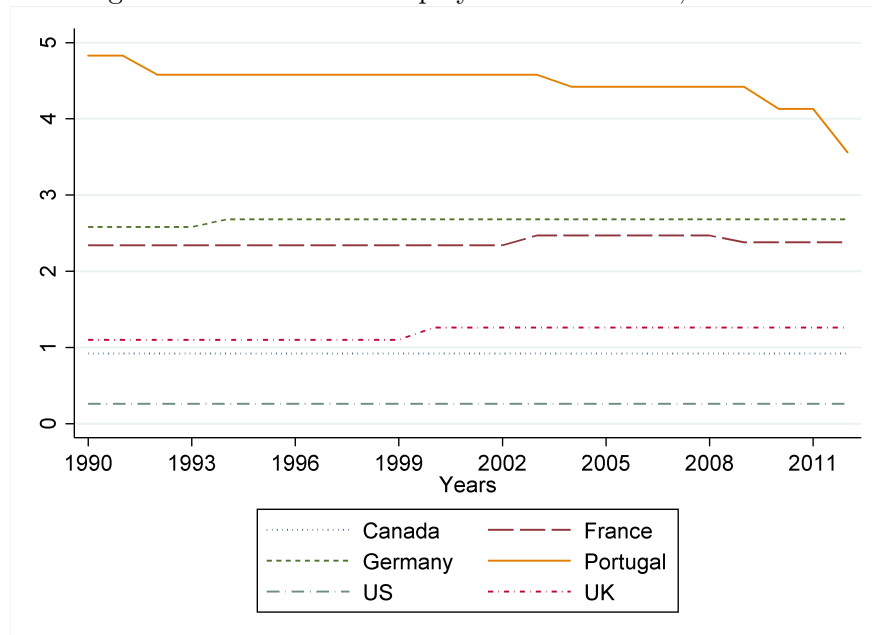
Figure 3: Portuguese Manufacturing Employment, 1990-2012



Notes: The figure plots the manufacturing employment in thousand, in the left scale, and the manufacturing share of total employment (dash line) for mainland Portugal, excluding Azores and Madeira islands, in the right scale. Manufacturing employment includes employees working in ISIC rev2.1. 1500 and 3699 industries.

Source: *Quadros de Pessoal* database

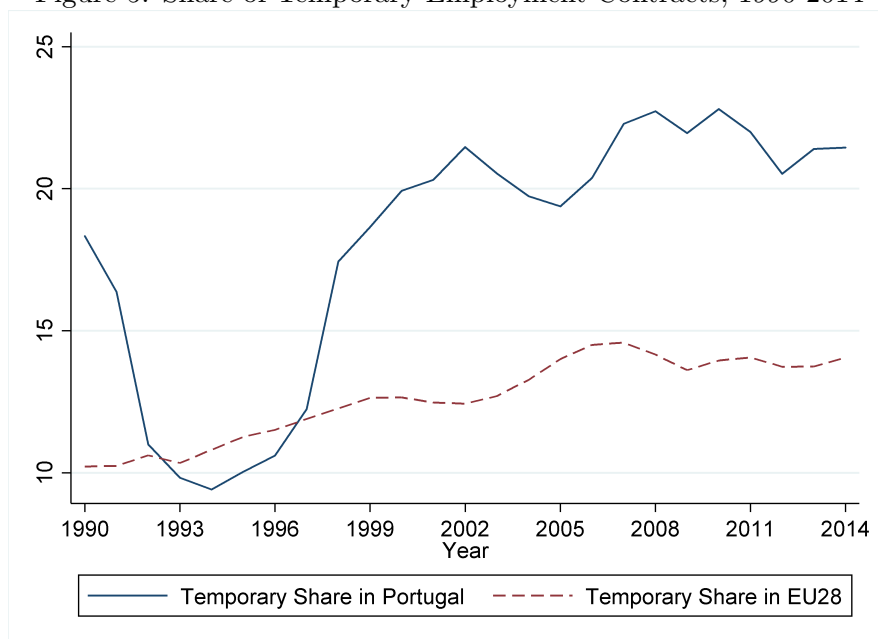
Figure 4: Strictness of Employment Protection, 1990-2012



Note: The figure plots OECD's official index of employment restrictions for individual and collective dismissals (regular contracts) for Portugal and other countries.

Source: OECD Indicators of Employment Protection Legislation

Figure 5: Share of Temporary Employment Contracts, 1990-2014



Note: The figure plots temporary employment contracts share of total dependent contracts for Portugal and EU28.

Source: OECD Temporary employment (indicator)

9 Tables

A Data Appendix

A.1 Data Sources

The *Quadros de Pessoal* (QP) are based upon a mandatory survey submitted annually to the Portuguese Ministry of Employment and Social Security by firms with at least one employee. Firms disclose their responses to the QP survey to their employees and labor unions, allowing workers to ensure the accuracy of the data. Firms failing to report worker information must pay a fine between €200 and €1,500. The full sample includes an average of 227,000 firms and 2 million individuals each year, covering nearly all firms and employees in the Portuguese private sector. QP data are available from 1986 until 2012, excluding 1999 and 2001. The reference month regarding the employee data is October of each year (March until 1993).

In each year, firms report their entry year, location, main industry, number of employees, number of establishments, initial capital stock, ownership structure, and sales. At the worker level, the database contains information on gender, age, education, occupation, type of contract, working hours, and earnings for the month of October. Individuals and firms each appear with a unique identifier, making it possible to track firms and workers over time and to track workers across firms.

Inquérito Anual à Produção Industrial (IAPI) is a mandatory survey, collected by Statistics Portugal (*Instituto Nacional de Estatística* – INE). This database collects annual information on outputs, inputs, and energy sources. The survey targets the largest firms operating in the mining and quarrying, manufacturing, and electricity, gas, and water industries. These firms account for approximately 90 percent of the total sales of each 5-digit industry code, using *Classificação das Actividade Económicas* (CAE) Revision 2 and Revision 2.1. The survey also includes all firms with more than 20 employees, as long as the sample of firms is not too large (less than 17,000 firms per year). If the number of firms that account for 90 percent of the total sales in an industry is less than 5, this industry is not surveyed, to ensure firms confidentiality. The product-level information includes sales and production by good, reported using a 12-digit PRODCOM classification, with approximately 5,300 different products. The IAPI data are available for the period between 1992 and 2014.

Comércio Internacional (CI) is a firm-level international trade database, collected by Statistics Portugal (INE). This database records individual trade transactions on a monthly basis between 1990 and 2014 for all Portuguese firms, and we collapse these transactions to the firm, trading partner country, product, year level. In order to appear in the dataset, a firm’s intra-EU trade must exceed specified import and export value thresholds. For example, in 2010, firms were obliged to report their intra-EU transactions the their volume of exports and imports in the previous year or current year were higher than €250,000 and €300,000, respectively. Throughout the sample period, the thresholds were set to ensure that the CI database overall includes at least 97 percent of intra-EU exports and 95 percent of intra-EU imports.

To compute China’s import share in the EU5 (France, Spain, Italy, U.K. and Germany) and in the U.S., we use EUROSTAT and UN Comtrade databases, respectively. EUROSTAT provides yearly trade flows for each 8-digit Combined Nomenclature (CN) product for each EU member and its trading partners. Comtrade provides similar information for the U.S. at the 6-digit Harmonized System (HS) product level. We use EUROSTAT rather than Comtrade for the EU5 because EUROSTAT total imports and exports matched those provided by each EU5 country’s Statistics Office.

A.2 Firm Sample

We examine two samples of firms - one focused on firms active in 1995 and the other focused on firms active in 2000. We include firms located in mainland Portugal (omitting those in the Azores and Madeira islands) that appear both in QP and IAPI in either 1995 and 2000. Of course, many firms appear in both time periods, so there is quite a bit of overlap between the two samples.

Some firms merge or acquire other firms, while others spin off a portion of their activities. We identify a firm as merged, acquired, or involved in a spin-off if more than 25 employees and more than 40 percent of its workforce moves to another firm. When this happens, we merge the firms and treat them as if they were a single firm throughout the relevant period. This procedure leads us to construct 263 merged firms during our sample period.

A.3 Firm Age

The QP data record the year of firm entry, which we use to calculate the firm age. In cases where the firm employs workers whose firm accession year is prior to the recorded firm entry year, we use the earlier year for our measure of firm entry.

A.4 Worker Sample

The QP data include all employees working in the private sector, but omit the self-employed workers. The salary information for the employer is unavailable in QP. We also omit a small number of fisherman who report positive earnings but zero hours.

A.5 Interpolation

The QP data are missing worker-level records in 1999 and 2001. For reasons that we have been unable to ascertain, these years' data were not digitized and integrated with the other years in the database. Additionally, in spite of the fines described above, firms nonetheless sometimes fail to report worker information. This occurs in 14.4 percent (1995), 8.8 percent (2000), and 1.7 percent (2007) of firm observations. In these cases, we linearly interpolate the firm's employment and wagebill between the surrounding years with reported worker information.

When calculating firm wage bill, our main analysis interpolates wages and hours for a small number of employees reporting zero earnings and zero hours. If these workers are furloughed, we interpolate their annual earnings, subtracting two months' pay under the assumption that firms delay furloughed workers' wages by the maximum legal limit of two months. If workers are on leave, we assume that their full salary is paid by the government, and interpolate their full wages. In interpolating these wages, we use similar workers in the same firm when available, otherwise we interpolate using similar workers in the same industry. All of our empirical analyses are run both including and excluding these interpolated wages, with no substantive differences in the results.

[Make sure we actually do this!]

A.6 Matching Across Datasets

We merge firm-level workforce information from QP with firm product-level information from IAPI and trade information from CI using a concordance between the firm identifiers in each dataset provided by INE. Of the firms in IAPI, in 1995 or 2000 (our sample restriction) we match 93.5

percent (1995) and 93 percent (2000) to information in QP. This process generates a set of 9,323 unique firms, of those 4,411 are exporting firms (3,225 firms export to EU5).

We also need to match product codes across PRODCOM, CI, EUROSTAT and UN Comtrade. We do so using concordance tables from the EUROSTAT RAMON Metadata Server and aggregate products as necessary to ensure consistent definitions across years and datasets, following a procedure similar to that in Van Beveren et al. (2012). This process yields a classification with 2,512 uniquely and consistently identified products across datasets. This classification and related concordances are available upon request.

A.7 Deflating

All euro values in the paper are quoted in year 2007 Euros, deflated using the Consumer Price Index from INE.